Responses to Comments

Public Review of Merrimack Station
NPDES Permit No. NH0001465

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Disclaimer

This document contains summarized and verbatim comments received by the U.S. Environmental Protection Agency (EPA) during three public comment periods for the Merrimack Station power plant located in Bow, New Hampshire: 1) public comment period for a Draft Permit, 2) public comment period for a Revised Draft Permit, and 3) a public comment period for EPA's Statement of Substantial New Questions for Public Comment. See Chapter I below for summary of public comment periods. Some of EPA's responses reflect changes made to the Final Permit issued in tandem with this document. It is important to note that the responses in this document might differ slightly from the language in the Final Permit. The permit language, however, has precedence and is legally binding on Merrimack Station.

Preface

The U.S. Environmental Protection Agency's New England Region (Region 1, EPA, the Agency) is issuing a Final National Pollutant Discharge Elimination System (NPDES) Permit for the Merrimack Station power plant in Bow, New Hampshire, effective September 1, 2020. This document presents the Region 1's responses to the comments received during three public comment periods and for two Draft Permits (No. NH0001465) issued for Merrimack Station. The individual responses explain and support the Region 1's determinations that form the basis of the Final Permit. The comments and the Region's corresponding responses are organized under eight major subject areas or chapters, as shown in the Table of Contents. Preceding each individual comment/response is the administrative record number and the individual commenter to which it correlates, and page number(s) in the document where the comment is found, as shown in the following example:

Comment VIII.2.5	**AR-1231, PSNH, p. 20**

The Responses to Comments document is available on EPA's website at https://www.epa.gov/npdes-permits/merrimack-station-draft-npdes-permit. Documents found in the administrative record are available on EPA's website at https://www.epa.gov/npdes-permits/merrimack-station-administrative-record or upon request to EPA; please contact Sharon DeMeo at 617-918-1995 or email at demeo.sharon@epa.gov.

EPA received additional comments after the close of the public comment period. Although the comments received were similar to those received during the public comment period, and therefore do not raise substantial new questions warranting that the Region exercise its discretion to reopen the public comment period under 40 CFR § 124.14(b), EPA chose to incorporate these comments within the document.

Acronyms, Abbreviations, and Symbols (Selective List)

AEI	adverse environmental impact
AIF	actual intake flow
APA	Administrative Procedure Act
AR	administrative record
BAT	best available technology
BATW	bottom ash transport water
BCA	benefit cost analysis
BCT	best conventional pollutant control technology
BIP	balanced indigenous population
BOD	biological oxygen demand
BPJ	best professional judgment
BPT	best practical control technology currently available
BTA	best technology available
CAA	Clean Air Act
CCC	closed cycle cooling
CFR	Code of Federal Regulations
cfs	cubic feet per second
CLF	Conservation Law Foundation
CRL	combustion residual leachate
CWA	Clean Water Act
CWF	combined waste stream formula
CWIS	cooling water intake structure
CWWS	cylindrical wedgewire screens
DIF	design intake flow
DMR	discharge monitoring report
DO	dissolved oxygen
EAB	Environmental Appeals Board
EFH	essential fish habitat
ELG	Effluent Limitations Guidelines
EMARS	enhanced mercury and arsenic removal system
EPA	Environmental Protection Agency
EPRI	Electric Power Research Institute
FAC	free available chlorine
FGD	flue gas desulfurization
fps	feet per second
gpm	gallons per minute
GSP	Granite Shore Power (current owner of Merrimack Station)
GZA	GeoEnvironmental, Inc
ISO-NE	Independent System Operator of New England

LMRLAC	Lower Merrimack River Local Advisory Committee
LVW	low volume wastewater
MAF	mean annual flow
MCW	metal cleaning wastes
MDL	maximum daily load
MGD	million gallons per day
mg/L	milligrams per liter
MK-1 and MK-2	Units 1 and 2 at Merrimack Station
ML	minimum level
MW	megawatt
NCMCW	nonchemical metal cleaning waste
NELG	National Effluent Limitations Guidelines
NERA	National Economic Research Associates
NHDES	New Hampshire Department of Environmental Services
NPDES	National Pollutant Discharge Elimination System
NSPS	new source performance standards
O&G	oil and grease
PAR	Pan Am Railways
PCB	polychlorinated biphenyl compounds
POC	pollutants of concern
POTW	publicly owned treatment works
PSES	pretreatment standards for existing sources
PSNH	Public Service Company of New Hampshire (former owner of Merrimack Station)
PSNS	pretreatment standards for new sources
PWWTS	public wastewater treatment system
PYSL	post yolk sac larvae
RCRA	Resource Conservation and Recovery Act
RIS	resident indigenous species
RTC	response(s) to comments
RTO	regional transmission organization
SBA	Small Business Administration Office of Advocacy
SFC	submerged flight conveyor
SIU	significant industrial users
T&E	threatened and endangered species
TDD	Technical Document Development
TDS	total dissolved solids
TMDL	total maximum daily load
TRC	total residual chlorine
TRO	total residual oxidants
TSS	total suspended solids
USGS	United States Geological Survey
UWAG	Utility Water Action Group
VCE	vapor compression evaporation

WET	whole effluent toxicity
WQBEL	water quality-based effluent limits
WQS	water quality standards
WTP	willingness to pay
WTP	waste treatment plant
WWTF	wastewater treatment facility
WWTS	wastewater treatment system
§, §§	section, sections
°C	degrees Celsius (as in 25 °C; note spacing)
°F	degrees Fahrenheit
μg/l	micrograms per liter
7Q10	the lowest 7-day average river flow that occurs once every ten years

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1.0 Executive Summary

In accordance with the provisions of 40 CFR § 124.17, this document presents the United States Environmental Protection Agency's (EPA or "Region 1" or "the Region") responses to comments received throughout its development of the Final 2020 NPDES Permit (the "Final Permit") for Merrimack Station ("the Facility").

The responses to comments evidence and explain EPA's consideration of significant comments submitted to EPA by the public concerning the new NPDES permit for the Facility and explain and support the EPA determinations underlying the Final Permit.

EPA invited the public to submit comments on the new Merrimack Station NPDES permit during three separate public comment periods, which will each be discussed in more detail below and are as follows:

1) Public Notice of the 2011 Draft Permit (comment period opened September 30, 2011, and closed February 28, 2012, *see* AR-1082, AR-1124 and AR-947).

2) Public Notice of the 2014 Revised Draft Permit (comment period opened April 18, 2014, and closed on October 22, 2014, *see* AR-1137 and https://www.epa.gov/npdes-permits/merrimack-station-draft-npdes-permit#tab-2); and

3) Public Notice of the 2017 Statement of Substantial New Questions for Public Comment (comment period opened August 4, 2017, and closed December 18, 2017, *see* AR-1533, AR-1692).

In addition, members of the public, including the owners of the Facility, continued to submit to EPA comments and information relevant to the permit even after the close of each comment period. While not required to consider and respond to such late-submitted material, EPA decided in this case to do so.

Merrimack Station was long owned and operated by Public Service Company of New Hampshire (PSNH or "the Permittee"). In recent years, PSNH also did business under the name of its parent company, Eversource. Even more recently, New Hampshire law, see RSA 369-B:3-a (2015), mandated that PSNH divest itself of its electrical generating facilities, including Merrimack Station. After a lengthy auction process, PSNH sold Merrimack Station and its other generating facilities to Granite Shore Power LLC. The sale closed on January 10, 2018. Each individual facility is now owned by a separate, wholly-owned subsidiary of GSP. Thus, Merrimack Station is now owned by GSP Merrimack LLC ("GSP-Merrimack" or "GSP" or "the Permittee"). GSP-Merrimack now owns and operates Merrimack Station and is responsible for compliance with the Facility's NPDES permit. In essence, GSP-Merrimack has stepped into the shoes of PSNH with regard to both ongoing NPDES permit compliance and participation in the current NPDES permit development proceeding for Merrimack Station. As such, PSNH's comments on the Draft Permit for Merrimack Station have been adopted by, and are now attributable to, GSP-Merrimack.

In these responses to comments, EPA will at times refer to PSNH because it previously owned and operated Merrimack Station and submitted comments on the 2011 Draft Permit, the 2014 Revised Draft Permit, and the 2017 Statement of Substantial New Questions. EPA will also at times refer to GSP-Merrimack or GSP, given that it currently owns and operates the power plant, is now the named Permittee on the existing permit issued in 1992, as modified, and is responsible for compliance with the new Final Permit going forward. Finally, EPA will also sometimes use the generic terms, the "Permittee," the "Company" or the "Facility," to refer to either PSNH or GSP-Merrimack, whichever is appropriate in context.

During the public comment period, numerous parties commented on the Draft Permit, Revised Draft Permit, and Statement of Substantial New Questions:

- Appalachian Mountain Club
- Applied Science Associates (ASA)
- Campaign for Ratepayers' Rights
- Clean Water Action
- Conservation Law Foundation (CLF)
- CREDO Action
- Conservation New Hampshire
- Duke Energy
- Defenders of Wildlife
- Earthjustice
- Electric Power Research Institute (EPRI)
- Enercon Services, Inc.
- Environmental Integrity Project
- Environment New Hampshire
- Lowell Regional Wastewater Utility (LRWU)
- National Wildlife Federation
- NERA Economic Consulting, Inc.
- New Hampshire Audubon Society
- Normandeau Associates, Inc.
- Ohio Utility Group Water Task Force

- Pan Am Railways (PAR)
- Public Service Company of New Hampshire (PSNH)
- Sierra Club
- Society for the Protection of New Hampshire Forests
- Southern Company
- Stonyfield Farm
- Super Law Group LLC
- Upper Merrimack River Local Advisory Committee (UMRLAC)
- Utility Water Act Group (UWAG)
- William O'Brien, Speaker of the New Hampshire House of Representatives (along with other New Hampshire State Representatives)
- Numerous individual citizens

In addition, several commenting entities hired consultants to submit comments on their behalf. These consultant comments sometimes took the form of technical reports or studies and presentations of data. All comments presented and responded to in this document have been either summarized or reproduced verbatim from each comment letter. In some cases, EPA has combined comments addressing common issues so that they could be responded to in a reasonably efficient manner. EPA received thousands of pages of material in the various comment periods and it would neither be possible nor helpful, much less required, to present all this material verbatim in these responses to comments.

EPA's decision-making process has benefited from the comments and additional information submitted by the public. In some cases, these submissions and comments contributed to EPA deciding to revise conditions proposed in the 2011 Draft Permit or the 2014 Revised Draft Permit and/or to improve and clarify the analyses supporting the Final Permit's terms. These revisions and improvements are reflected in the Final Permit and its supporting record. The analyses underlying the Final Permit, including any changes from the 2011 Draft, are discussed in the responses to comments that follow. At the same time, neither the information and arguments presented, nor the revisions to permit conditions, raise any substantial new questions concerning the permit that warranted the Region exercising its discretion under 40 CFR § 124.14 to additionally reopen the public comment period. A summary of the changes from the 2011 Draft Permit that are reflected in the Final Permit is presented in Part 2.0 of this Chapter.

1.1 History of Permit Development

The Final Permit authorizes Merrimack Station's discharges of pollutants to, and the withdrawal of water for cooling from, the Merrimack River. Merrimack Station is a coal-burning power plant located in Bow, New Hampshire. The Facility's pollutant discharges are regulated by EPA technology-based effluent limitation guidelines (ELGs) set under the Clean Water Act for the Steam Electric Power Generating Category of industrial dischargers. *See* 40 CFR § Part 423. The Facility's discharges of waste heat and withdrawals of river water for cooling are also subject to statutory and regulatory requirements under the Clean Water Act. *See* 33 U.S.C. §§ 1311(b)(2), 1326(a) and 1326(b). In addition, these discharges and withdrawal must also satisfy applicable New Hampshire water quality standards. *See* 33 U.S.C. § 1311(b)(1)(C). These three areas of regulation (*i.e.,* setting permit requirements for cooling water withdrawals, discharges of waste heat, and discharges of other types of steam electric power plant pollutant discharges) comprise the primary areas that EPA, the State of New Hampshire, the Permittee, and the public focused on throughout permit development.

In this Executive Summary, EPA provides an overview of the different stages of permit development, specifically concentrating on the three areas of regulation identified above. These different stages of permit development, which evolved over a number of years, were driven by factual and legal developments that altered development of the permit and took time to address. A more in-depth discussion of the relevant facts and law and EPA's rationale and foundation for the limits and conditions included in the Final Permit are set forth in the following Chapters of this document.

EPA last issued a new Final NPDES Permit to Merrimack Station on June 25, 1992. AR-236. The permit expired on July 31, 1997, but was administratively continued in 1997 as a result of PSNH's timely application for permit renewal. *See* 40 C.F.R. § 122.6(a).

a. The 2011 Draft Permit

EPA issued PSNH a new Draft NPDES Permit for Merrimack Station on September 30, 2011 (2011 Draft Permit). AR-609. *See also* AR-608 (Fact Sheet for the 2011 Draft Permit (2011 Fact Sheet)). As indicated above, the 2011 Draft Permit addresses the Facility's withdrawal of water from the Merrimack River for cooling uses and its discharges of a variety of pollutants to the river. Pollutants discharged, or potentially discharged, by the Facility to the River include waste heat, flue gas desulfurization (FGD) wastewater, bottom ash transport water, combustion residual leachate, non-chemical metal cleaning wastes, and many others. The comment period on the 2011 Draft Permit extended five months, from September 30, 2011, to February 28, 2012.

i. Cooling Water Intake

At the time of the 2011 Draft Permit, Region 1 conducted a Best Professional Judgment (BPJ) assessment to determine appropriate requirements for Merrimack Station's cooling water intake structures in the absence of effective CWA § 316(b) regulations setting specific standards.

The 2011 Draft Permit included a variety of requirements under CWA § 316(b), 33 U.S.C. § 1326(b), that addressed Merrimack Station's cooling water intake structures. CWA § 316(b) mandates the "best technology available" (BTA) standard for cooling water intake structures, specifying that:

> (b) **Cooling water intake structures**
>
> Any standard established pursuant to section 1311 of this title or section 1316 of this title and applicable to a point source shall require that the location, design,

> construction, and capacity of cooling water intake structures reflect the best technology available for minimizing adverse environmental impact.

At the time of the 2011 Draft Permit, there were no national BTA standards in place for existing facilities. Therefore, in accordance with 40 CFR § 125.90(b), EPA determined the BTA for Merrimack Station's cooling water intake structure on a case-by-case, site-specific, BPJ basis. As discussed and explained in more detail in the record for the 2011 Draft Permit, and in these responses to comments, the primary adverse environmental impacts of concern from the use of cooling water intake structures are mortality or injury to aquatic life in the source water body from entrainment of relatively smaller organisms through the cooling system and impingement of relatively larger organisms against the intake screens. Ultimately, the BTA proposed by EPA for Merrimack Station's Draft Permit consisted of adding closed-cycle cooling capability at the Facility for use on a seasonal basis (from April 1 through August 31, based on when the highest densities of aquatic life are present). EPA explained and discussed its finding in detail in the 2011 Draft Permit Determinations Document, which was attached as Attachment D to the 2011 Fact Sheet. *See* AR-618, Chs. 10-12. EPA also proposed certain intake screen operations and fish return system improvements to reduce impingement mortality. *Id*., pp. 346-347. EPA also concluded that these requirements would satisfy New Hampshire water quality standards.

ii. Thermal Discharge

Under the CWA, discharges of waste heat (i.e., "thermal discharges") are subject to regulation under technology-based and water quality-based limits, like other pollutants, or they may be regulated under alternative limits based on a variance under CWA § 316(a), 33 U.S.C. § 1326(a), from the otherwise applicable requirements. The Facility's 1992 Permit set thermal discharge requirements based on a combination of a CWA § 316(a) variance and water quality-based requirements.

For the 2011 Draft Permit, EPA proposed rejecting Merrimack Station's request that the new permit retain the same thermal limits as were in the 1992 Permit based on a renewal of the existing CWA § 316(a) variance. EPA concluded that renewal of the existing variance would not satisfy CWA § 316(a). The Agency, instead, decided that it should base thermal discharge limits on technology-based and water quality-based requirements. From among the available alternatives, EPA determined that converting Merrimack Station's open-cycle cooling system to a closed-cycle cooling system using wet or wet-dry hybrid mechanical draft cooling towers, and operating on a year-round basis, would be the best performing technology available for reducing the facility's discharges of its waste heat to the Merrimack River. In other words, EPA concluded on a site-specific, Best Professional Judgment (BPJ) basis, s*ee* 40 CFR § 125.3(c), that thermal discharge limits based on closed-cycle cooling would meet the applicable best available technology (BAT) standard pursuant to CWA § 301(b)(2)(a), 33 U.S.C. § 1311(b)(2)(A). *See* AR-618, Chs. 7 and 9. In addition, EPA included certain narrative requirements pertaining to thermal discharges designed to ensure satisfaction of New Hampshire water quality standards. *Id*. at Chs. 8 and 9.

iii. Wastestreams Regulated under the Steam Electric Effluent Limitations Guidelines (ELGs)

EPA, New Hampshire, the Permittee, and the public have primarily been concerned with the following distinct wastestreams subject to the Steam Electric ELGs: 1) flue gas desulfurization (FGD) wastewater; 2) bottom ash transport water (BATW); and 3) non-chemical metal cleaning wastes (NCMCWs). That said, the permit also addresses additional wastestreams subject to the ELGs. The Steam Electric ELGs in effect at the time of the 2011 Draft Permit were promulgated in 1982.

With respect to FGD wastewater, the 1982 Steam Electric ELGs did not include BAT limits to address toxic pollutants in many of the regulated wastestreams. Therefore, for the 2011 Draft Permit, Region 1 conducted a site-specific, BPJ evaluation, *see* 40 CFR §§ 125.3(a)(2)(iv) and (v), (c)(3), and determined that the BAT for the Facility would include biological treatment coupled with the Station's newly installed primary treatment system (providing physical/chemical treatment and the EMARS (mercury removal) feature). This analysis was detailed in Attachment E to the 2011 Fact Sheet. *See* AR-608, Attachment E; AR-616. Based on this proposed BAT treatment system, Region 1 included effluent limits for FGD wastewater in the 2011 Draft Permit, including specific limits for various metals (e.g., mercury, arsenic, selenium), chlorides, and total dissolved solids (TDS) applied at newly defined internal outfall (Outfall 003C). *See id*., Attachment E. In addition, as a result of this new wastestream, the New Hampshire Department of Environmental Services (NHDES), in coordination with EPA Region 1, assessed and determined that several water quality-based effluent limitations were also necessary to address several metals of concern. *See* AR-608, pp. 6-7, 22-26.

As for BATW, EPA applied limits for total suspended solids (TSS) and oil and grease ("O&G") as provided in the 1982 ELGs (40 CFR § 423.12) and conducted a site-specific determination of best conventional technology (BCT) limits equal to the existing TSS and O&G limits. AR-608 and 609.

Finally, to address NCMCWs, EPA conducted a site-specific BPJ assessment of BAT limits, and determined that the appropriate limits would be equal to the 1982 ELGs' limits applicable to chemical metal cleaning wastes. *See* AR-608, pp. 28-33. Thus, EPA required that nonchemical metal cleaning wastes at Merrimack Station should be subject to concentration-based effluent limits of 1.0 mg/L for total copper and total iron, and that all metal cleaning wastes be segregated for sampling at Outfall 003B.

b. The 2014 Revised Draft Permit

As EPA began work to consider the public comments that were submitted by the close of the comment period in February 2012 and develop the Final Permit, it learned that after the 2011 Draft Permit was issued, the Facility installed a new, highly effective treatment system for its FGD wastewater, and this new treatment system was not reflected in either the 2011 Draft Permit's proposed effluent limits or its supporting record. As a result, EPA gathered factual information and reevaluated the limits proposed in the 2011 Draft Permit for FGD wastewater.

On April 18, 2014, EPA issued for public comment a new, Revised Draft Permit proposing different effluent limits for Merrimack Station's FGD wastewater discharges based on a new BPJ determination that the Station's new FGD wastewater treatment system constituted the BAT. AR-1136. All other limits and outfalls remained essentially the same.

The public comment period was extended based on public requests and ended on October 22, 2014. *See* AR-1137 (2014 Revised Draft Permit Public Notice).

c. The 2017 Statement of Substantial New Questions

As Region 1 continued to review public comments on the 2011 Draft Permit and the 2014 Revised Draft Permit, several additional new legal and factual developments occurred that directly affected development of the permit. Ultimately, these developments led the EPA to exercise its discretion under 40 CFR § 124.14(b) to issue a new public notice and reopen the comment period for the draft permit for the Merrimack Station. Specifically, on August 2, 2017, EPA issued public notice to inform the public of the reopening of the comment period and the availability of EPA's 2017 "Statement of Substantial New Questions for Public Comment" (the 2017 Statement). AR-1533. While the public comment period was initial scheduled to end on October 4, 2017, *id.*, it was later extended to December 18, 2017. *See* AR-1691, AR-1692. The 2017 Statement discussed, and invited comment on, a variety of issues, including the following:

a) how to properly set requirements for cooling water intake structures under EPA's complex new regulations promulgated under CWA § 316(b) in August 2014, 79 Fed. Reg. 48,300 (Aug. 15, 2014) ("2014 CWA § 316(b) Rule"), and in light of new information regarding the feasibility and effectiveness of certain CWIS technologies;
b) how to properly set requirements for pollutant discharges covered by EPA's complex new regulations promulgated in November 2015 to modify the Steam Electric ELGs, 80 Fed. Reg. 67838 (November 3, 2015) (2015 ELGs);
c) how to properly set thermal discharge limits in light of (i) EPA's revised understanding of thermal data evaluated for the 2011 Draft Permit, (ii) new thermal data submitted since the 2011 Draft Permit, and (iii) new data on the presence of the Asian clam (*Corbicula fluminea*,) an invasive species, in the Hooksett Pool section of the Merrimack River;
d) how, if at all, should final permit limits be affected by Merrimack Station's evolution from a "baseload" facility that operated most of the time, to a facility that operates much less and more like a seasonal "peaking" type of facility that typically generates electricity only sometimes in the winter and summer;
e) how, if at all, should final permit limits be affected by Merrimack Station's evolution from a "baseload" facility that operated most of the time, to a facility that operates much less and more like a seasonal "peaking" type of facility that typically generates electricity only sometimes in the winter and summer; and
f) how does PSNH's then imminent sale of Merrimack Station to GSP affect the permit.

See AR-1534.

i. Cooling Water Intake

After issuing a Proposed Rule in 2011, and two Notices of Data Availability in 2012, EPA promulgated the new 2014 CWA § 316(b) Rule for existing facilities with cooling water intake structures, such as Merrimack Station, in August 2014. *See* 79 Fed. Reg. 48,300 (codified at 40 CFR § 122.21(r) and Part 125, Subpart J). These regulations are now in effect and govern the Final Permit for Merrimack Station. *See* 40 CFR §§ 122.43(b)(1), 125.91(a) and 125.94(a)(1).

EPA requested comment on the application of the new regulations at Merrimack Station and on new information related to wedgewire screen technology, among other things. Specifically, new information suggested that an effective screen array (using wedgewire half-screens) could potentially be implemented in the Hooksett Pool section of the Merrimack River, and that this technology could possibly be more effective at reducing the Facility's entrainment and impingement than previously thought.

ii. Thermal Discharge

Unlike the situation for CWA § 316(b) requirements and Steam Electric ELGs, since issuance of the 2011 Draft Permit, the legal regime governing thermal discharges under the CWA and New Hampshire water quality standards had not changed, but new information had come to light during the permit development process which raised substantial new questions pertaining to the application of CWA § 316(a) and New Hampshire water quality standards to the development of thermal discharge limits for the Merrimack Station permit. In its 2017 Statement, EPA discussed the new information and questions and invited public comment on these issues. Specifically, EPA identified clarifying information that it had received from PSNH concerning older temperature data, new temperature data, new scientific reports pertaining to the effects of Merrimack Station's thermal discharges on aquatic life in the Merrimack River submitted by PSNH, and new data and analysis relating to the presence and possible significance of the recently discovered Asian clam, an invasive freshwater mollusk, in the Hooksett Pool.

iii. Wastestreams Regulated under the ELGs

On November 3, 2015, EPA promulgated the 2015 Steam Electric ELGs, new national guidelines, after an extensive rulemaking process. 80 Fed. Reg. 67838 (Nov. 3, 2015). A number of the provisions of the 2015 Steam Electric ELGs apply to Merrimack Station, namely, those BAT limits applicable to FGD wastewater, BATW, combustion residual leachate, and NCMCWs. Therefore, as part of EPA's public notice, EPA explained that it planned to apply all effective limits from the new rules, including discussing PSNH's decision to "opt into the Voluntary Incentives Program" for FGD wastewater management under the 2015 ELGs, and requested comment on how and whether these new regulatory provisions would require changes to the effluent limits included in the previous 2011 and 2014 Draft Permits. AR-1534. EPA also requested comment on what the appropriate compliance or "as soon as possible" date for achieving zero-discharge for BATW was, in light of the new regulations and information received from PSNH. *See* AR-1534, pp. 59-61.

d. The 2020 Final Permit

Having received three rounds of public comments, the Region continued its review of the comments and its development of the Final Permit. During this time, however, several additional events occurred that have affected finalizing permit limits and conditions for Merrimack Station.

First, as mentioned above, ownership of Merrimack Station was transferred from PSNH to GSP on January 10, 2018. Moreover, GSP indicated to EPA that it was willing to consider permit limits reflecting the Facility's reduced operations.

Second, in 2017, EPA took a number of regulatory actions related to implementation of the 2015 Steam Electric ELGs. Ultimately, EPA conducted a rulemaking postponing the relevant compliance dates for a number of wastestreams regulated under the 2015 national guidelines (82 Fed. Reg. 43494 (Sept. 18, 2017)).

Third, and also related to the 2015 Steam Electric ELGs, as EPA worked to finalize the Merrimack Station permit, litigation resulting from numerous challenges to the 2015 national rulemaking was proceeding in the Fifth Circuit Court of Appeals. On April 12, 2019, the Fifth Circuit vacated and remanded several provisions from the 2015 ELGs. *See Southwestern Electric Power Co., et al. v. EPA*, 920 F.3d 999 (5th Cir. 2019) ("*SWEPCO*"). This court decision affected certain effluent limits that EPA had expected to apply from the 2015 ELGs.

Fourth, on March 25, 2020, the current owner of Merrimack Station, GSP, submitted a letter to EPA Region 1, wherein the company stated that it was "withdrawing the pending request for authorization in the new permit to directly discharge FGD wastewater to the Merrimack River." AR-1690, p. 2. The Facility indicated that it intended for the immediate future to continue to operate without discharging FGD wastewater to the Merrimack River, but that it might renew its request for authorization for such discharges in the future. This decision was based on the forthcoming "revisions to the ELGs and the VIP for FGD wastewater" and significant reductions in the Station's capacity utilization. *Id.*

i. Cooling Water Intake

As will be discussed in detail in Chapter III of this Response to Comments document, EPA determined that, based on the information and data in the record, the BTA is for the seasonal use (April 1 to August 15) of fine-mesh wedgewire screens with a maximum through-screen velocity of 0.5 ft/sec., use of a traveling screen system with low pressure spray wash systems to remove fish, and installation and use of a new fish return sluice to return to the river any fish and other aquatic organisms that have been collected or trapped on the intake screens. In addition, the Final Permit establishes a best management practice to schedule the Unit 2 maintenance outage to take place during the peak entrainment period (May 15 to June 15) whenever practicable.

ii. Thermal Discharge

As outlined and explained in full detail in Chapter II of this document, EPA ultimately decided, based on new data and the Facility's much reduced operations since the 2011 Draft Permit, to set thermal and operational limits based on a CWA § 316(a) variance (from technology-based and water quality-based requirements) that sets instream thermal limits for the Hooksett Pool that will assure the protection and propagation of the balanced indigenous population of the shellfish, fish, and wildlife in the Merrimack River and that reflect Merrimack Station's current mode of operation similar to a peaking facility. The approach of setting instream water quality-based temperature limits was discussed in detail in the record for the 2011 Draft Permit, *see, e.g.,* AR-618, pp. 214-17, and the issue of the Facility's reduced operations was discussed in the 2017 Statement.

iii. Wastestreams Regulated under the ELGs

While the legal landscape has shifted due to regulatory changes and the recent Fifth Circuit decision, EPA continues to apply the existing, effective ELGs to Merrimack Station's discharges of BATW, NCMCW, combustion residual leachate, and other wastestreams covered by Part 423 of EPA's regulations. 40 CFR Part 423. Specifically, for BATW, EPA is applying zero-discharge limits beginning on December 31, 2023, and limits for TSS and O&G prior to that date, based on the ELGs currently in effect. *See* Chapter V of this document. In addition, with respect to NCMCWs, EPA maintains the iron and copper limits and the requirements to segregate metal cleaning waste from other wastestreams prior to sampling, as set forth in its previous draft Permits. *See* Chapter IV. As for combustion residual leachate, EPA continues to apply TSS and O&G limits based on the effective ELGs, and consistent with those limits imposed in the 2011 Draft Permit. Finally, due to GSP's recent withdrawal of its request to authorization to discharge FGD wastewater, the Final Permit no longer authorizes such discharges. *See* Chapter VIII.

Chapters IV, V, and VIII of this document present a comprehensive discussion of the history of the Steam Electric ELGs, their application at Merrimack Station, and a thorough explanation of EPA's rationale for all of the Final Permit conditions. *See* Response to Comment V.1.1; Response to Comment IV.1.2; and Chapter VIII.1.

2.0 List of Permit Changes

The changes from the Draft Permit to the Final Permit are summarized immediately below and are explained in the responses to the comments that follow:

1. The Permittee's name has been changed to Granite Shore Power Merrimack LLC, and address has been updated as shown on the cover page of the Final Permit. See Chapter I – Introduction of this Responses to Comments (RTC) document.

2. The effective date of the Final Permit has been changed from "the first day of the calendar month immediately following 60 days after signature" to September 1, 2020, which is the first day of the calendar month immediately following 90 days after signature. See RTC II.1.1.

3. Given that the Final Permit is signed by the Director of the Water Division at EPA, Region 1, all instances in the Draft Permit referring to the Regional Administrator have been changed to Director.

4. Attachment A of the Draft Permit, *Freshwater Chronic and Modified Acute Toxicity Test Procedure and Protocol* has been replaced with *Freshwater Acute Toxicity Test Procedure and Protocol*, updated February 2011. See RTC VI.1.3

5. Attachment B of the Draft Permit, *Monitoring Location Map*, has been eliminated and each monitoring location in the Final Permit is designated with coordinates. See RTC II.1.1.

6. For every outfall table in the Final Permit, the row heading previously titled "Flow" has been changed to "Effluent Flow." The meaning and definition have not changed; this is simply a change consistent with the standard template used for every NPDES permit issued by EPA Region 1.

7. Internal Outfalls 001 and 002 have been added to the Final Permit to provide limitations and conditions for the once-through condenser cooling water from both generating units at the Station, because closed cycle cooling is no longer required to meet the Final Permit's thermal discharge limits and cooling water intake structure requirements, whereas it would have been required under the Draft Permit. See RTC II.1.1, Section 3, Section 4, RTC III.3.1, Section 4, and III.5.3. The applicable limits are as follows:
    - Flow limits (from 1992 Permit);
    - Temperature reporting;
    - TRO limits – 40 CFR 423.13(b)(1); and
    - Seasonal intake velocity limits.

8. Outfall 003

- Description of Outfall 003 has changed to include internal Outfalls 001 and 002, and the removal of Outfall 003D because closed cycle cooling is no longer required to meet the Final Permit's thermal discharge limits and cooling water intake structure requirements. See RTC II.1.1. Footnote 4, RTC III.5.3, and RTC VI.3.
- The total residual chlorine (TRC) requirement has been changed to total residual oxidants (TRO) to account for the possible use of bromine as a biocide in the once-through condenser cooling water. See RTC VI.1.1.
- The reporting only requirement for TRC in the Draft Permit has been changed to the existing 1992 Permit's TRO limit of 0.026 mg/L based on anti-backsliding requirements and a compliance level of 32 ug/L. See RTC VI.1.1.
- The pH monitoring frequency and sampling method has changed from daily grabs to continuous using a recorder when discharging. See RTC VI.1.2.
- Flow limits carried over from 1992 Permit and restored to continuous monitoring consistent with anti-backsliding. See RTC III.5.3, RTC II Section 1, Section 3, and Section 4.
- DO limit carried over from 1992 Permit based on anti-backsliding. See RTC II.1.1. Footnote 4, Section 3, and Section 4.
- Whole Effluent Toxicity (WET) testing requirements have changed to reflect an updated acute WET protocol and additional ambient reporting requirements that are part of the protocol but were missing from this table in the Draft Permit. Chronic WET testing is no longer required. See VI.1.3.

9. Outfall 003A
    - Description of Outfall 003A has been updated to reflect 1) that only bottom ash transport water generated before December 31, 2023, can be discharged to the slag settling pond; 2) additional wastestreams discharging to this location that were either missing from the Draft Permit or previously included in Outfall 003B; and 3) the removal of Flue Gas Desulfurization (FGD) wastewater and coal pile runoff and treated FGD, which are not authorized to be discharged by the Final Permit. See RTC VI.2.1, RTC V.1.1, RTC V.3.1, and RTC VIII.
    - Removal of flow limits that were in the Draft Permit (report only required in the Final Permit). See RTC VI.2.3.7.
    - Removal of copper limit from the Draft Permit. The weekly monitoring requirement for copper included in the Draft Permit has been changed to quarterly monitoring and reporting only (daily maximum) in the Final Permit. See RTC VI.2.3.2.
    - Removal of reporting requirements and limitations for aluminum, arsenic, mercury, selenium, and total recoverable chloride that were in the Draft Permit, consistent with the removal of authorization of FGD wastewater discharges by the Final Permit. See RTC VI.2.1, RTC VI.2.3.1, RTC VI.2.3.3, RTC VI.2.3.4, and RTC VI.2.3.8.

- TSS and Oil and Grease monitoring frequency has been changed from weekly to monthly. See RTC VI.2.3.6.

10. Outfall 003B
    - Description of Outfall 003B has been changed to reflect that this internal outfall location is dedicated to only chemical and non-chemical metal cleaning wastewater discharges. See RTC IV.1.1.
    - pH monitoring has been removed. See RTC IV.1.1. Footnote 7.

11. Outfall 003C – treated FGD wastewater -has been removed from the Final Permit because the Permittee withdrew its request for authorization to discharge FGD wastewater. See Section 1 – *Introduction and Chronology of Permit Conditions*, of RTC Chapter VIII.

12. Outfall 003D (Cooling Tower Blowdown) has been removed from the Final Permit because closed-cycle cooling will not be required to meet either the Final Permit's thermal discharge limits or cooling water intake structure requirements, whereas it would have been required under the 2011 Draft Permit. See RTC VI.3, RTC II Section 1, Section 3, Section 4, and RTC III Section 5.

13. Flow limit for Outfall 004A has been changed to report only. See RTC VI.4.1.

14. Flow limit for Outfall 004B has been changed to report only. See RTC VI.4.2.

15. Flow limit for Outfall 004C has been changed to report only. See RTC VI.4.3.

16. Outfall 004D and the corresponding requirement that the use of deicing water meet the New Hampshire Surface Water Quality Regulations mixing zone requirements has been removed from the Final Permit. See RTC VI.4.4.

17. Prohibition of the discharge of deicing water and associated conditions have been moved to Part I.H, *Unauthorized Discharges* of the Final Permit. See RTC VI.4.4 and RTC VI.6 (footnote 20).

18. Flow limit for Outfall 005A has been changed to report only. See RTC VI.5.1.

19. Outfall 005B has been eliminated because Outfall 005A represents the discharge of both cooling water intake sumps for Unit 1 during maintenance activities. See RTC VI.5.2.

20. Outfall 005B is re-designated as the discharge from Unit 2's cooling water intake structure sumps during maintenance (formally Outfall 005C in the Draft Permit). See RTC VI.5.2 and RTC VI.5.3.

21. Flow limit for Outfall 005B (formally Outfall 005C in the Draft Permit) has been changed to report only in the Final Permit. See RTC VI.5.3.

22. Outfalls 005C and 005D have been removed from the Final Permit because Outfall 005B (formally Outfall 005C in the Draft Permit) represents the discharge of both cooling water intake sumps for Unit 2 during maintenance activities and Outfall 005C has been re-designated at Outfall 005B. See RTC VI.5.2, RTC VI.5.3 and RTC VI.5.4.

23. Measurement frequency for flow, O&G, and pH at Outfalls 005A and 005B have been changed from once per annual outage (1/Annual Outage) to once per year (1/Year). See RTC VI.5.1.

24. Footnote Changes:
    - New footnote 1 has been added to the "Monitoring Requirements" heading of every outfall table in the Final Permit. This footnote provides administrative clarification of the monitoring requirements and consists of standard language currently added to every NPDES permit issued by EPA Region 1.
    - New footnotes 2 and 3 regarding the use of sufficiently sensitive test methods have also been added to the "Monitoring Requirements" heading of every outfall table in the Final Permit. See RTC VI.9.1.
    - New footnote 4 has been added to the "Measurement Frequency" heading of each outfall table in the Final Permit. This footnote consists of standard language currently added to every NPDES permit issued by EPA Region 1 and provides administrative clarification of the terms used for measurement frequencies.
    - New footnote 5 has been added to the "Sample Type" heading of each outfall table in the Final Permit that lists composite sampling. This footnote consists of the definition of composite sampling that was previously in Part II but is now consistently added to Part I of NPDES permits issued by EPA Region 1.
    - Footnote 6 has been changed to combine the flow-based requirements of footnotes 1 and 6 of the Draft Permit and to provide the definition of "MGD" used in every outfall table throughout the Final Permit.
    - Draft Permit footnote 2 regarding temperature monitoring at Outfall 003 has been moved to footnote 7 of the Final Permit and changed slightly to include temperature monitoring requirements for Internal Outfalls 001 and 002.
    - New footnote 8 has been added to explain and clarify that TRO sampling occurs only when biocides are being used and discharged, and that the only allowable biocides are chlorine and bromine. New footnote 8 also clarifies that TRO is not allowed to be discharged from any one generating unit for more than two hours per day. This requirement was previously included in the Draft Permit as footnote 13, for Outfall 003D. See RTC VI.1.1.
    - New footnote 9 in the Final Permit explains, pursuant to 40 CFR 423.13, that the TRO limit for Outfalls 001 and 002 is not a maximum daily limit but instead is a

"maximum concentration" or instantaneous maximum limit not to be exceeded at any time. See RTC III.5.3.

- New footnote 10 specifies that the 40 CFR §136 test method used for TRO must meet a minimum level (ML) of no greater than 30 ug/L. RTC. VI.1.1 for Outfall 003.
- New footnote 11 in the Final Permit specifies that the compliance level for TRO at Outfall 003 is 30 ug/L (0.030 mg/L). See RTC. VI.1.1.
- Footnote 3 of the Draft Permit regarding in-river thermal sampling requirements has been removed and replaced with "See Part 1.A.11" within the table for Outfall 003. See RTC II Section 3 and Section 4.
- Footnote 4 of the Draft Permit, expressing that the pH range limitations at Outfall 003 is a State certification requirement, has been removed from the Final Permit. See RTC VI.1.2.
- Part I.F.4 under Discharge Limitations in the table for Outfall 003 and footnote 19 for Outfalls 004A, 004B, 004C, 005A, and 005B in the Draft Permit, which point to or describe the State conditions that allow the Permittee to demonstrate that the pH range should be widened due to naturally occurring conditions, have been replaced with footnote 12 in the Final Permit. This footnote also provides that the pH range limit is an instantaneous limit, not to be exceeded at any time and that the Permittee shall report minimum and maximum values. See RTC VI.1.2.
- Footnote 5 of the Draft Permit has been moved to footnotes 13 – 16 of the Final Permit and updated to reflect changes in the standard protocol language relating to acute WET testing and ambient testing, as well as removal of chronic WET testing. See RTC VI.1.3.
- Footnote 5.e of the Draft Permit has been removed from Part I of the Final Permit because Part II includes similar language for reopening the permit to make appropriate revisions.
- Footnote 5.f of the Draft Permit has been moved to Part I.G, *Special Conditions* of the Final Permit and updated slightly to provide administrative clarification.
- Footnote 7 of the Draft Permit has been removed from the Final Permit because the requirements of Outfall 003B for metal cleaning wastewater have been clarified in the Final Permit. See RTC IV.1.1.
- Footnote 8 of the Draft Permit has been removed from the Final Permit. See RTC VI.6(8).
- Footnote 9 of the Draft Permit has been removed from the Final Permit because pH monitoring is no longer required at Outfall 003B. See RTC IV.1.1, Footnote 7.
- Footnotes 10 and 11 of the Draft Permit have been removed from the Final Permit because discharge of FGD wastewater is not authorized under this permit. See RTC VI.6 and RTC - Chapter VIII.
- Footnotes 12-16 of the Draft Permit have been removed from the Final Permit because these footnotes pertained to Outfall 003D (cooling tower blowdown),

which has been removed from the Final Permit. See RTC II Section 1, Section 3, Section 4, and III.5.3.

- Footnote 17 has been changed to include clarifying language for the visual inspections and maintaining a log of the inspections for Outfalls 004A, 004B, 004C, 005A, and 005B. See RTC VI.4.1-VI.4.3 and VI.5.1-VI.5.2.
- Footnote 18 has been changed to provide appropriate instructions for when a visible sheen is observed. See RTC VI.4.1-VI.4.3 and VI.5.1-VI.5.2.
- Footnote 19 of the Draft Permit - instructions that allow the Permittee to demonstrate that the pH range should be widened due to naturally occurring conditions for Outfalls 004A, 004B, 004C, 005A, and 005B - has been updated and moved to Part I.F – State Permit Conditions in the Final Permit. See RTC VI.1.2.
- Footnote 20 of the Draft Permit has been moved to Part I.H, *Unauthorized Discharges* of the Final Permit. See RTC VI.6(20).
- Footnote 19 of the Final Permit is being added to specify that intake velocity limits apply after wedgewire screens have been installed and operating. See RTC III.3.1.

25. Part I.A.11 (In-stream Monitoring 006) has been added as a supplement to Outfall 003 to include all in-river temperature monitoring requirements and limitations. See RTC II Section 1, Section 3, and Section 4.

26. Part I.A.14 – 16 of the Draft Permit is now Part I.A.12 – 17 of the Final Permit and includes updated WQ-based narrative requirements. See RTC II.2.2.

27. Part I.A.17 of the Draft Permit is now Part I.A.18 of the Final Permit.

28. Part I.A.18 of the Draft Permit, regarding feasibility studies for new chemicals proposed for discharge has been moved to be included in Part I.G, *Special Conditions* and expanded to provide clarifying language and more specific instructions common to all NPDES permits issued by EPA Region 1.

29. Part I.A.19 and Part I.A.21 of the Draft Permit, regarding the disposal of solids and water drawn from fuel oil tanks, respectively, has been moved to new Part I.H, *Unauthorized Discharges.*

30. Part I.A.20 of the Draft Permit is now Part I.A19 of the Final Permit.

31. Part I.A.23 of the Draft Permit regarding certain narrative water quality requirements pertaining to thermal discharges has been removed consistent with EPA setting thermal discharge limits for the final permit based on a CWA § 316(a) variance. See RTC II.6.3.3.

32. Part I.B contains updated *Reporting Requirements* instructions to be consistent with standard regional boilerplate language common to all NPDES Permits issued by EPA Region 1.

33. Part I.E, *Cooling Water Intake Structure Requirements to Minimize Adverse Impacts from Impingement and Entrainment* has been changed - removing requirements for closed-cycle cooling technology and instead including the installation and use of in-river wedgewire screen technology. See RTC III, Section 4 and RTC III, Section 5. This includes adding a compliance schedule for the installation of wedgewire screens and a new fish return system (see RTC III.3.1 and III.6.2), a requirement to complete an impingement technology performance optimization study (see RTC III.3.1), and authorization to divert withdrawals from the wedgewire screens to emergency intake under limited conditions (see RTC III.4.3). This also includes the addition of an option that ensures impinged fish and other organisms trapped on the intake screens are not subjected to high levels of chlorine from deicing water and that screens are continuously rotated to reduce the amount of time impinged organisms are subjected to elevated temperatures. See RTC VI.4.4.

34. Part I.F, *State Permit Conditions* has been changed slightly to be consistent with standard language currently added to every NPDES permit issued by EPA Region 1 and to provide administrative clarification of State permit conditions. In addition, Part I.F.5 of the Draft Permit regarding coal pile runoff has been removed from the Final Permit because coal pile runoff does not, and therefore is no longer authorized to, discharge to the on-site slag settling pond and then the river. See RTC V.3.1.

35. Part I.G, *Special Conditions* has been changed to include updated standard language clarifying when a change in the pH limits range can take effect.

36. Part I.H has been added to include *Unauthorized Discharges* common to all NPDES Permits issued by EPA Region 1 and includes: footnote 20 of the Draft Permit regarding deicing water, Part I.A.19 of the Draft Permit regarding solids disposal and Part I.A.21 regarding water drawn from fuel oil tanks. This Part also includes the added prohibitions against the discharge of 1) bottom ash transport water generated after December 30, 2023; and 2) PCBs pursuant to 40 CFR 423.13(a). See RTC V.1.1 and RTC VI.9.2.

37. Part II has been revised for clarity and to be consistent with current federal regulation and other NPDES permits issued by EPA Region I.

Table of Contents – Chapter II

1.0 Overview

This section of the Responses to Comments addresses comments related to the new NPDES permit's regulation of Merrimack Station's discharges of waste heat (also referred to as "thermal discharges") to the Hooksett Pool section of the Merrimack River. In prior documents, Region 1 has discussed in detail the source and character of the Facility's thermal discharges, as well as the legal requirements governing regulation of such discharges. *See, e.g.*, AR 608 (the Fact Sheet for Merrimack Station Draft Permit ("the 2011 Fact Sheet") (Sept. 29, 2011), pp. 4-11; AR 618 (Attachment D to the 2011 Fact Sheet: Clean Water Act NPDES Permitting Determinations for the Thermal Discharge and Cooling Water Intake Structures at Merrimack Station in Bow, New Hampshire ("the 2011 Determinations Document") (Sept. 29, 2011); AR 1533 (Joint Public Notice for the Reopening of the Public Comment Period for the Draft NPDES Permit for Merrimack Station …) ("the 2017 Public Notice") (August 2, 2017); AR 1534 (Statement of Substantial New Questions for Public Comment (Discussion of Substantial New Questions and Possible New Conditions for the Merrimack Station Draft NPDES Permit that are Now Subject to Public Comment During the Comment Period Reopened by EPA under 40 CFR § 124.14(b)) ("the 2017 Statement") (Aug. 2, 2017). To avoid adding unnecessarily to the already voluminous record for this permit, Region 1 is incorporating these records by reference herein and will try not to repeat material they already cover unless such repetition is necessary to provide a coherent, intelligible discussion of the facts and law related to the issues presented.

1.1 Whether the Final Permit's Thermal Discharge Limits Should be Based on a CWA § 316(a) Variance or on Technology Standards and/or Water Quality Standards.

Comment II.1.1	**AR-846, AR-1548, PSNH; AR-851, CLF et al., AR-1573, Sierra Club et. al.; AR-842, EPRI; AR-1577, EPRI**

EPA received many conflicting comments on whether thermal discharge limits in Merrimack Station's new NPDES permit should be based on a variance under Section 316(a) of the Clean Water Act, 33 U.S.C. § 1326(a), or, instead, on a denial of the Facility's variance request and the application of technology-based and/or water quality-based requirements. Many commenters provided detailed comments on this general subject and EPA responds to the individual comments farther below. Here EPA provides a general overview response.

EPA Response:

Regulating thermal discharges under the CWA is complicated. Discharges of heat are subject to the "best available treatment economically achievable" (BAT) technology standard, *see* 33 U.S.C. §§ 1311(b)(2)(A) and (F); 40 CFR § 125.3(a)(2)(v), but because there are no national effluent limitation guidelines (ELGs) in effect for thermal discharges, any BAT limits must be determined on a site-specific, Best Professional Judgment (BPJ) basis. *See, e.g.,* 33 U.S.C. § 1342(a)(1)(B); 40 CFR § 125.3(c)(3). Such site-specific determinations typically involve difficult engineering, scientific, and economic questions regarding the feasibility, effectiveness, and cost of different technologies for reducing waste heat discharges.

In addition to technology-based requirements, thermal discharge limits must also satisfy any more stringent water quality-based requirements that may apply. *See* 33 U.S.C. § 1311(b)(1)(C); 33 U.S.C. § 122.44(d). *See also* 33 U.S.C. §§ 1341(a)(1) and (d) and 1370. Under state water quality standards, thermal discharges may be subject to both numeric and narrative water quality criteria as well as antidegradation policies and requirements necessary to preserve the existing and designated uses of the water body receiving the thermal discharge. *See, e.g.,* 40 CFR §§ 131.2 and 131.6. State water quality standards may also be subject to certain "general policies," such as those pertaining to "mixing zones," *see* 40 CFR § 131.13, which, subject to certain criteria, allow the state to delineate a zone within which water quality standards do not have to be met, whereas the standards must be met beyond the zone. AR-746, p. 6-15. Applying water quality standards can present difficult scientific questions regarding the site-specific effect of the thermal discharge on water quality in the receiving water (*e.g.*, the magnitude and reach of a discharge's effects on water temperature, dissolved oxygen levels, eutrophication, *etc*.) and on aquatic life and habitat conditions. When both technology-based and water quality-based standards apply, whichever is more stringent governs the permit limits. EPA discussed water quality-based requirements in detail in the 2011 Determinations Document. *See* AR 618, pp. 174-216.

Relevant to this permit, the State of New Hampshire has classified the Hooksett Pool portion of the Merrimack River as a Class B water. Therefore, limits on thermal discharges must prevent non-compliance with Class B designated uses and water quality criteria. The Standards for Classification of Surface Waters of the State require that:

> any stream temperature increase associated with the discharge of treated sewage, waste or cooling water, water diversions, or releases shall not be such as to appreciably interfere with uses assigned to this class. The waters of this classification shall be considered as being acceptable for fishing, swimming and other recreational purposes and, after adequate treatment, for use as water supplies.

RSA 485-A:8(II). In addition, the standards include several narrative criteria designed to protect aquatic habitat and aquatic life. *See* AR 618, pp. 174-78 (discussing relevant New Hampshire water quality criteria). New Hampshire's water quality standards also allow for the delineation of site-specific mixing zones, subject to certain criteria. NH Code R. Env-Wq 1702.26, 1707.01, and 1707.02 Finally, New Hampshire state law dictates that "in prescribing minimum treatment provisions for thermal wastes discharged to interstate waters, the department shall adhere to the water quality requirements and recommendations of the New Hampshire fish and game department, the New England Interstate Water Pollution Control Commission, or the United States Environmental Protection Agency, whichever requirements and recommendations provide the most effective level of thermal pollution control." RSA 485-A:8(VIII). This provision applies to waste heat discharges to the Merrimack River because it is an interstate water.

Finally, under CWA § 316(a), 33 U.S.C. § 1326(a), dischargers may request alternative, less stringent thermal discharge limits pursuant to a variance from the applicable technology and water quality standards. To obtain a variance under CWA § 316(a), the discharger has the burden of demonstrating that limits based on technology and water quality requirements will be "more stringent than necessary to assure the protection and propagation of a balanced, indigenous population of shellfish, fish and wildlife in and on the body of water into which the discharge is to be made" (BIP). 33 U.S.C. § 1326(a); 40 CFR §§ 125.70, 125.72 and 125.73. If this demonstration is made, then the permitting authority may impose alternative, variance-based thermal discharge limits that will assure the protection and propagation of the BIP. *Id.* Once again, evaluating applications and setting limits under CWA § 316(a) can present difficult scientific questions regarding the site-specific effects of a thermal discharge on water quality and habitat quality in the receiving water (*e.g.*, the magnitude and reach of the thermal discharge plume's effect on water temperature, dissolved oxygen levels, eutrophication, *etc*.) and on the condition of the receiving water's aquatic life. *See* 33 U.S.C. § 1326(a); 40 CFR §§ 125.72 and 125.73. In determining whether the protection and propagation of the BIP will be assured, other environmental stresses on the BIP must also be considered. 33 U.S.C. § 1326(a); 40 CFR §§ 125.73(a) and (c)(i). The guiding principle of CWA § 316(a) is that thermal discharge limits may be based on a variance from the otherwise applicable technology-based and water quality-based standards if the limits will nevertheless assure the protection and propagation of the receiving water body's BIP.

As with many aspects of the Merrimack Station permit, determining thermal limits has been made even more complex by changed circumstances at the Facility since publication of the 2011 Draft Permit.[1] Specifically, EPA has needed to consider and evaluate (a) the ramifications of the Facility's much reduced operations and thermal discharges, (b) the Facility's prior submitted thermal discharge data based on a new understanding of how to correctly interpret that data based on clarifications submitted with public comments, (c) new, more recent thermal discharge data, and (d) the many public comments submitted from a variety of opposing perspectives. All of this has combined to lead EPA to revise its prior assessment of thermal discharge limits. Although the legal requirements applicable to thermal discharge regulation have not changed since the 2011 Draft Permit was published, the facts have substantially changed and this has altered the results of EPA's analysis for the Final Permit.

EPA's analysis has been affected and improved by its consideration of public comments on these issues. EPA first received and considered public comments and data submitted related to the thermal discharge issues raised by the 2011 Draft Permit and supporting record. EPA also received, and exercised its discretion to consider, new thermal data and related information and views from commenters after the comment period on the 2011 Draft Permit closed on February 28, 2012. *See* AR 1124. EPA decided that it should consider this post-comment-period material because not only did it appear to have potentially important ramifications for the correct application of CWA standards governing thermal discharge, but the permit was already going to

[1] Since the 2011 Draft Permit was published, determining requirements for cooling water intake structures (CWIS) under CWA § 316(b) has been affected by changed circumstances, such as new regulatory standards, *see* 40 C.F.R. Part 125, Subpart J, the Facility's reduced operations and the development of new intake technology designs and new data on technology effectiveness. Similarly, setting limits for pollutant discharges regulated under the Steam Electric ELGs or the BPJ application of CWA technology standards has also been affected by changed circumstances since publication of the 2011 Draft Permit, including the installation and evaluation of new treatment technologies for use at the Facility and the promulgation of new ELGs applicable to the Facility. *See* 40 C.F.R. Part 423.

be delayed because of legal and factual developments related to other aspects of the permit.[2] EPA knew, therefore, that not considering the late-submitted information would not provide the important benefit of expediting permit issuance because delay for other reasons was unavoidable.

Ultimately, in 2017, EPA decided for many reasons, including reasons related to the regulation of thermal discharges, that it should reopen the public comment period for the permit to share important new information and substantial new questions with the public and provide the public an opportunity to comment on it. *See* AR 1533 and AR 1534. Among the issues that EPA discussed and invited public comment on were the Agency's new understanding of the existing thermal data, the consideration of new thermal data and related biological data, and the implications for thermal discharge limits of Merrimack Station's reduced operations. See AR 1534, pp. 4-5, 7-8, 36-44. EPA again received voluminous comments on a range of issues, including thermal discharge limits. After the public comment period closed on December 4, 2017, *see* AR-1691 (8/17/17 EPA Public Notice of Extension), and during a period of a series of additional delays related to legal developments under the Steam Electric ELGs, both the Facility and Sierra Club have reached out to EPA to discuss and offer their views on various permit issues, including those related to thermal discharges. These communications continued over a period of time and have been documented for the record, and EPA has considered all of the comments and information submitted during this time from all sides. Here the Agency will describe and explain the evolution of its thinking on how to properly set thermal discharge limits for Merrimack Station's Final Permit. More specific comments are responded to farther below.

Merrimack Station Draft Thermal Limits

The thermal discharge limits in the Facility's current permit, which was issued in 1992, were set pursuant to a thermal discharge "variance" granted by EPA under CWA § 316(a), 33 U.S.C. § 1326(a). *See* AR-236 (1992 NPDES Permit), pp. 2-3, 8 and 16; AR-618 (2011 Draft Permit Determinations), pp. 27-28. The permit also regulates thermal discharges under New Hampshire water quality standards. AR-236, pp. 2-3.

In its permit application, PSNH sought renewal of the thermal discharge variance and the associated permit limits. *See* AR-618, p. 28. EPA discussed the application of CWA § 316(a), technology standards, and water quality standards to Merrimack Station's thermal discharges in Sections 4.0 through 9.0 of the 2011 Draft Permit Determinations (AR-618). After reviewing PSNH's permit application and a variety of related thermal and biological data and information, EPA proposed denying PSNH's request for renewal of the CWA § 316(a) variance. *See id.* at Section 6.0. Instead, EPA proposed thermal discharge limits based on applicable technology standards and determined that these limits would also satisfy state water quality standards. *See* AR-618, Sections 7, 8 and 9. More specifically, the proposed Draft Permit limits were based on a site-specific, BPJ application of the BAT technology standard, *see id.* at Sections 7 and 9, *see*

[2] For example, in early 2012, Region 1 learned that Merrimack Station had installed a vapor compression evaporation treatment system (VCE) to treat its flue gas desulfurization (FGD) wastewater, which led to EPA publishing the 2014 Revised Draft Permit. *See* AR 1134, 1135, 1136 and 1137. Moreover, later in 2014, EPA promulgated new regulations governing requirements under CWA § 316(b), 33 U.S.C. § 1326(b), for cooling water intake structures at existing facilities, which required further consideration and evaluation by EPA to ensure satisfaction of the new requirements. *See* 40 C.F.R. Part 125, Subpart J.

also 33 U.S.C. §§ 1311(b)(2)(A) and (F) and 40 CFR § 125.3(c)(2), and on a site-specific analysis of New Hampshire water quality standards. *See* AR-618, Sections 8 and 9. *See also* 33 U.S.C. § 1311(b)(1)(C); 40 CFR § 122.44(d).

As discussed above, under CWA § 316(a), 33 U.S.C. § 1326(a), the permitting agency may base permit limits for thermal discharges on a variance from the otherwise applicable technology-based and water quality-based standards if less stringent limits will nevertheless assure the protection and propagation of the receiving water body's BIP. An existing facility operating under an NPDES permit with thermal discharge limits based on a § 316(a) variance may seek renewal of its variance-based limits by attempting to demonstrate that existing operations have not caused "appreciable harm" to the BIP (a "retrospective" demonstration), or by trying to demonstrate that operations going forward will assure the protection and propagation of the BIP (a "prospective" demonstration). *See* 40 CFR § 125.73(c)(1)(i) and (ii). In some cases, an existing facility may attempt both types of demonstrations, which is what Merrimack Station has done in this case. *See, e.g.,* AR 618, p. 78.

In determining whether the protection and propagation of the BIP will be assured, any thermal stress to aquatic life is evaluated in conjunction with any adverse effects from other environmental stresses. *See* 33 U.S.C. § 1326(a); 40 CFR § 125.73(a) and (c)(1). The evaluation under CWA § 316(a) involves considerations such as (a) the scope of the discharger's waste heat discharges (*e.g.*, the amount of heat being discharged, the temperature of the discharge, and the timing and duration of the discharge (*e.g.*, are there seasonal or daily variations?)), (b) the effect of the discharge on ambient conditions (*e.g.*, what portion of the receiving water is affected by the discharge and what is the extent of that effect), and (c) the extent to which the alteration of water temperatures by the discharge affects aquatic life (*e.g.*, whether increased water temperatures affect the ability of aquatic organisms to survive, reproduce, or successfully compete with other native and non-native organisms). EPA will consider information regarding individual species as well as the overall assemblage or community of organisms in the water body receiving the thermal discharge. All of this factors into EPA's judgment about whether or not the protection and propagation of the BIP is assured.

Based on a thorough review of all pertinent data and analyses available at the time of development of the 2011 Draft Permit, EPA determined that:

- PSNH did not demonstrate that Merrimack Station's thermal discharge had not caused prior appreciable harm to the Hooksett Pool's balanced, indigenous population of fish;
- To the contrary, the evidence as a whole indicated that Merrimack Station's thermal discharge had caused, or contributed to, appreciable harm to Hooksett Pool's balanced, indigenous community of fish;
- PSNH did not demonstrate that thermal discharge limits based on applicable technology-based and water quality-based requirements would be more stringent than necessary to assure the protection and propagation of the balanced, indigenous population of shellfish, fish and wildlife in and on Hooksett Pool; and
- PSNH did not demonstrate that its proposed alternative thermal discharge limits – namely, retaining limits consistent with open-cycle cooling – would reasonably assure the protection and propagation of the Hooksett Pool's BIP.

Therefore, as stated above, for the 2011 Draft Permit, EPA proposed rejecting Merrimack Station's request for a CWA § 316(a) thermal discharge variance. *See* AR 618, p. 211. Instead, EPA proposed thermal discharge limits that satisfied both federal technology-based requirements and state water quality standards. *See* AR 618, pp. 121-22, 211-16. In setting technology-based limits, EPA considered the option of setting operating restrictions to control thermal discharges but rejected it because Merrimack Station was a baseload generator and could continue as such while controlling thermal discharges with retrofitted cooling towers. *Id.* at 144-45. In addition, EPA indicated that it was still considering the alternative of setting thermal discharge limits that would require seasonal ambient water temperatures to be maintained at specific locations within the Hooksett Pool based on critical temperatures for fish species present in the Hooksett Pool. *Id.* at 216-17. EPA indicated that such limits might potentially satisfy state water quality standards while providing the basis for a CWA § 316(a) variance from technology standards, and the Agency invited public comment on that possible approach. *Id.*

EPA's denial of PSNH's request for a § 316(a) variance was supported by its assessment of Merrimack Station's § 316(a) Demonstration, including the results of PSNH's fish sampling program from 1967 through 2005, as well as by science-based predictions of adverse thermal effects on representative species of fish in Hooksett Pool that would be likely to occur under the requested thermal discharge conditions. EPA assessed the results of PSNH's fish sampling program from 1967 through 2005 and found compelling evidence of appreciable harm to the balanced, indigenous fish community of Hooksett Pool. EPA next considered whether the thermal discharges from Merrimack Station caused or contributed to appreciable harm to the balanced, indigenous community. This assessment was rooted in analysis of over 21 years of Merrimack River temperature data that documented the effect of the Station's discharge of waste heat, particularly observations of substantial periods during summer when downstream temperatures exceeded levels considered protective of thermally sensitive representative species. See AR-618 at 112-116.

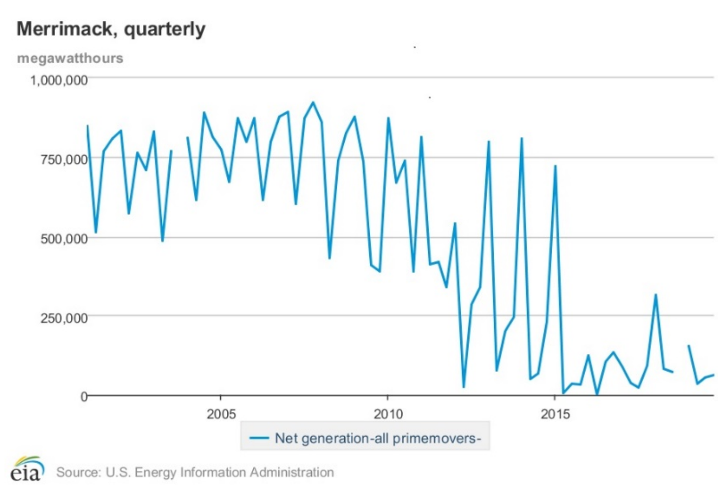
During the public comment period for the 2011 Draft Permit, EPA received numerous comments on the proposed thermal discharge limits and issues related to them. Some commenters supported the proposed permit limits, while others disagreed with the limits and opposed EPA's characterization of the BIP and its rejection of a § 316(a) variance. *See, e.g.*, AR-841, AR-846, AR-851, AR-866, AR-872. EPA has been considering all these comments as part of its effort to develop and issue the new Final Permit to Merrimack Station.

In addition, after the comment period on the 2011 Draft Permit closed on February 28, 2012, new information came to light which raised substantial new questions pertaining to the application of CWA § 316(a) and New Hampshire water quality standards to the development of thermal discharge limits for the Merrimack Station permit. AR-1534, pp. 4-5, 7-8, 36-44. As a result of this, and other, new information and new questions, EPA reopened the comment period in 2017 and issued the 2017 Statement. AR-1534. EPA explained that further submissions of information from PSNH indicated that EPA had misunderstood or misinterpreted certain aspects of the Company's thermal data as presented in the 2007 Normandeau Report, due, in part, to a lack of clarity in the Report itself. *See* AR-1534 at 38. *See also,* AR-1367, AR-872 at 97-98. In particular, PSNH clarified that the temperature data in the 2007 Normandeau Report are *not* the

21-year average of the daily maximum temperatures for each day of the calendar year, as EPA had thought, but rather represent the maximum of the daily averages that occurred on a given calendar day, possibly only one time, during the entire 21 years that monitoring data were collected (between 1984 and 2004). *See* AR-1367.

In order to reassess its interpretation of the data, EPA requested additional thermal data and further clarification of the 21-year data set. *See* AR-1298. In response, PSNH provided the requested data, but also submitted additional reports, including additional data that covered a time period that extended beyond that of the initial 21-year data set and which reflects conditions when Merrimack Station was operating at a much lower capacity factor than was reflected in the prior, older data. *See* AR-1299 through AR-1307. EPA notes that, in its view, the above-mentioned new data reflecting reduced operations was primarily useful for assessing conditions that would be associated with Final Permit limits reflecting this reduced operational profile. EPA found the new data was less helpful for determining limits to accommodate baseload operations, as past permit limits have done and as PSNH had requested. *See* AR-1534, p. 69. That said, EPA considered all the comments and materials submitted by PSNH and other members of the public.

At the time of the 2011 Draft Permit, Merrimack Station operated as a baseload power plant. In other words, to meet demand for electricity, the plant operated on a near-constant basis, with the exception of regularly scheduled maintenance outages. Consistent with this fact, PSNH had applied for NPDES permit conditions based on continued baseload operations and EPA was evaluating permit conditions on this basis. *See* AR-618, pp. 132, 145, 156 n. 51, and 158. Since EPA issued the 2011 Draft Permit for public comment, however, Merrimack Station's electrical generation has diminished substantially, illustrated in the figure below. *See* AR-1369; AR-1396. The Facility now operates, and has for a while been operating, as a "peaking plant" that generates electricity only during peak demand periods that typically occur in the winter and the summer. *See* AR-1369. This is primarily the result of market factors, including the emergence of relatively inexpensive natural gas and the new dominance of that fuel source in the New England market. *See* AR-1396.



As EPA was continuing to work on the permit, New Hampshire deregulated its electricity market and required PSNH to divest of its generating assets, including Merrimack Station (as well as

Schiller Station, Newington Station, and various hydro-electrical facilities). *See* AR-1396; *see also* Section IV(E)(3) below. Since issuance of the 2011 Draft Permit and the 2017 Statement, Merrimack Station was sold to Granite Shore Power, LLC (GSP). Unlike PSNH, which maintained its request for permit conditions based on the possibility of future baseload operations, GSP indicated a willingness to have a permit with appropriate permit conditions reflecting the Facility's current, and planned future, pattern of operations like a peaking plant that helps the region to meet intermittent periods of high demand for electricity. GSP understood that such permit conditions on thermal discharges would limit the plant's operations consistent with that operational profile.

Thus, comments on the Draft Permit, including new fisheries analysis and a more complete, correctly understood temperature dataset, in addition to a substantially different operational profile and new ownership willing to consider a permit not based on baseload operations, all caused EPA to re-consider the appropriate thermal limits for the Final Permit. In its 2017 Statement, EPA explained and described all of these considerations and invited public comment about them. AR-1534, pp. 39, 69. The Agency did, in fact, receive many comments on these topics and it has considered these comments in developing the Final Permit. On this basis, EPA has reassessed whether the Final Permit should retain the 2011 Draft Permit's technology-based and water quality-based thermal limits or, instead, whether the permit should be based on water quality requirements and/or a CWA § 316(a) variance, albeit different from the existing or previously requested variance, that would be protective of the Hooksett Pool's BIP taking into account Merrimack Station's current operating conditions.

Merrimack Station Final Permitted Thermal Limits

In response to comments on the 2011 Draft Permit and the 2017 Statement, and in light of the misinterpretation of key temperature data used to evaluate river conditions in comparison to thermal tolerance information, as well as consideration of reduced operations at Merrimack Station, EPA re-evaluated the temperatures in the Merrimack River needed to assure the protection and propagation of the BIP, including resident and migratory species and life stages of fish when they would be present in the water body. In particular, as explained above, EPA considered whether the substantial reduction in operations (and thermal discharges) with the Facility having transitioned from baseload operations to operations like that of a peaking plant would alter the potential of the thermal plume to affect the aquatic community.

In addition, understood correctly, EPA concluded that the single-day, maximum average temperature over a period of 21 years that PSNH had previously provided to EPA does not provide a useful data point to assess whether to renew the existing thermal discharge variance under CWA § 316(a). The clarifications about the data led EPA to reconsider how thermal data should be evaluated to support the determination of the potential impacts of the thermal discharge. After the 2011 Draft Permit, PSNH submitted new data based on long-term averages of water temperatures recorded in the river. While long-term averages have utility, long-term averages also obscure the more extreme conditions that fish and other aquatic life could be exposed to over shorter, but still biologically significant, periods of time. *See* AR-1534 p. 39-40. Therefore, for the Final Permit, EPA also evaluated daily temperature data received from the Facility in response to an EPA request for additional temperature data described above. *See* AR-

1298. EPA also considered the daily temperature data provided in the Facility's 2017, 2018, and 2019 annual reports.

EPA presented its analysis of the temperature effects from the heated discharges in Section 5.6.3.3 of the 2011 Draft Determinations. *See* AR-618 pp. 86-116. Temperature data available at the time of the Draft Permit, as EPA understood it, indicated that certain life stages of resident and migratory species are exposed to temperatures that could result in lethal and sub-lethal impacts resulting from the discharge of heated effluent from Merrimack Station. *Id*. EPA determined that the most thermally sensitive species in the Merrimack River are yellow perch and American shad. *See id*. pp. 178-180, 208-9. As the most sensitive species, protective temperatures and time periods derived for yellow perch and American shad will also be protective of other species and the BIP. *See id*. pp. 180-196, 201-208, 213, 216. For the Final Permit, EPA reassessed its initial analysis based on the observed, daily Merrimack River temperature data and the protective limits for resident and migratory species, including the most thermally sensitive species, considering periods representative of both baseload and peaking-like operations. *See*, generally, Response to Comment II.3.1.3.

EPA concluded that the analysis for the 2011 Draft Permit, by misunderstanding the maximum temperature value data, tended to overstate the severity of extreme temperature events. However, EPA's review of daily data under baseload operations confirms that temperatures at the end of the discharge canal (Station S0) and downstream from the discharge (Station S4) reach or exceed certain protective temperatures during critical periods in most years and, in some years, the elevated temperatures remained at these levels for much of the summer. Temperature data representative of peaking-like operations, however, indicates that under that operating scenario, extreme temperature events are relatively uncommon and, when they do occur, are limited in duration and severity. EPA's review of the observed, daily temperature data under current operations suggests that variance-based temperature limits drawn from water quality-based protective instream temperatures will satisfy the criteria of CWA § 316(a). EPA received comments suggesting that the instream protective temperatures proposed in the 2011 Draft Determinations, AR 618, pp. 214-216, were too stringent (*e.g*., AR-1554, AR-872), and other comments that these temperatures were not stringent enough (*e.g*., AR-851). EPA considered all these comments and, in some cases, made adjustments to the protective temperatures proposed in the 2011 Draft Determinations Document. *See* Response to Comment II.3.4.7.

The 2011 Draft Determinations Document discussed, and indicated that EPA was still considering, the approach of setting alternative effluent limits drawn from the water quality standards analysis that would both satisfy state water quality standards and would also satisfy CWA § 316(a) by assuring the protection and propagation of the BIP and, as a result, warrant a variance from technology-based requirements. *See* AR-618 pp. 216-217. The Final Permit, based on consideration of all the data and the current facts, takes this approach and establishes limits under a CWA § 316(a) variance that EPA independently determined would satisfy CWA § 316(a) by assuring the protection and propagation of the BIP of the Hooksett Pool. EPA maintains that rejection of the applicant's original variance request is appropriate because continuing baseload operations with open-cycle cooling would not satisfy § 316(a). This is not, however, how the Facility operates anymore. The Final Permit establishes in-stream temperature limits that apply downstream of the discharge canal (Station S4), which, in effect, allows a limited area of the river between the discharge canal and compliance point for initial mixing of the thermal plume while ensuring that temperatures outside this area remain protective of thermally-sensitive species. These limits are based on a CWA § 316(a) variance and are designed to protect the BIP from both chronic, sub-lethal impacts (applied as average weekly limits) and acute mortality (applied as maximum daily limits). *See* Response to Comment II.3.4.7.

EPA received different comments arguing either that EPA *must* or *must not* consider temperature data reflective of the recent decline in Station operations. *See* Response to Comment II.3.2 (and associated sub-comments). EPA agrees that if the recent decline in output, and the resulting decrease in the discharge of heated effluent, are considered as a basis for limits that satisfy the CWA, then the Final Permit must include limits that ensure the Facility continue with such reduced operations and not resume baseload operations after the Final Permit is issued, unless those limits are first changed through the public permit process. As discussed above and in these Responses to Comments, the new owners of Merrimack Station, GSP, indicated a willingness to accept permit limits based on the current (and anticipated future) reduced operations. Such limits are appropriate in this case because EPA's analysis has concluded that thermal discharge limits reflecting this type of operation will satisfy the conditions of CWA § 316(a). Namely, limits based on CWA § 301(b)(2) and 301(b)(1)(C), 33 U.S.C. § 1311(b)(2) and 1311(b)(1)(C), would be more stringent than needed to assure the protection and propagation of the BIP in the Hooksett Pool, and the Final Permit's limits based on critical temperatures to protect fish species and reflecting reduced operations will assure the protection and propagation of the BIP. *See* Response to Comment II.3.1.3, II.3.4 (and associated sub-comments).

From October through April, temperatures from the discharge do not reach or approach levels that would result in acute mortality of any life stages of fish, even under baseload operations. During this period, chronic thermal limits are designed to protect the most thermally-sensitive species and life stages (yellow perch spawning). The Final Permit establishes 7-day average, water quality-based temperature limits beginning October 1 through April 30 and applied at the compliance monitoring location downstream from the discharge (Station S4). The Final Permit requires year-round operation of continuous temperature monitors at the ambient locations (Stations N10 or N5, depending on the time of year) and downstream locations (S4) in addition to the continuous monitor at Station S0.[3]

From May through September, the intermittent and infrequent operation of Merrimack Station limits exposure of fish to temperatures that would result in chronic, sub-lethal impacts and ensures that the conditions in the Merrimack River are protective of the BIP. *See* Responses to Comments II.3.1.3, 3.3.2, 3.4 (and associated sub-comments). To ensure that Merrimack Station maintains this mode of operation, the Final Permit limits the maximum, 45-day rolling average

[3] The effective date of the Final Permit has been changed from the first day of the calendar month immediately following 60 days after signature (in the 2011 Draft Permit) to the first day of the calendar month immediately following 90 days after signature. This adjustment was made to allow the Permittee to install and calibrate new temperature monitoring equipment. To ensure that future monitoring is consistent with the location of available in-stream data, the Final Permit has replaced Attachment B of the 2011 Draft Permit (Map of Monitoring Locations) with the coordinates of monitoring locations in Parts I.A.3 and I.A11.

capacity to 40% from May 1 through September 30.[4] If the Facility exceeds a 40% rolling average capacity within any calendar month from May through September, the Final Permit establishes chronic thermal limits that must be met and are designed to protect the most thermally-sensitive species and life stages (yellow perch eggs, larvae, and adults and American shad larvae). In the event that the capacity factor limit is exceeded, the Permittee must demonstrate that the 7-day average, water quality-based (chronic) temperature limits were met during the reporting period. In addition, to chronic impacts, the Final Permit includes limits designed to protect drifting organisms (*e.g.*, yellow perch larvae, American shad larvae) from lethality during periods when these life stages are present in the Merrimack River. The Final Permit establishes maximum daily (acute) temperature limits that apply at the compliance point (Station S4) from May 1 through July 31 calculated based on an hourly average. *See* Response to Comment II.3.4.7. Finally, EPA recognizes that in-stream temperatures at the compliance point can be influenced by ambient, upstream temperatures or factors other than the thermal effluent. The Final Permit includes a provision that an exceedance of the water quality-based temperature limits when Merrimack Station is not generating a megawatt output will not be considered a permit violation. In addition, the Final Permit limits the rise in temperature based on the 7-day average at the compliance point (Station S4) to no more than 2°C above the 7-day average ambient temperature (at Station N10 or N5, whichever is applicable at the time). This limit applies only when the 7-day average ambient temperature is within 2°C or above the effective, water quality-based temperature limit.

As explained above and in response to comments below, the Final Permit's thermal discharge limits are based on a CWA § 316(a) variance, taking account of the Facility's reduced operations and using the same critical temperature approach identified in the 2011 Determinations Documentation with respect to possible water quality-based limits.[5] EPA has determined that the combination of reduced operations and protective instream temperature limits will assure the protection and propagation of the BIP. As with the limits in the 2011 Draft Permit, the Final

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[4] A rolling average will ensure that effluent limitations (in this case, capacity factor) are met throughout the reporting period, rather than on a single day. EPA evaluated the average rolling capacity for May 1 to September from 2012 through 2019 (when the Station operated at reduced capacity) over 30, 45, and 60 days to determine an averaging period and capacity factor that would be representative of the recent operation of the Facility. EPA evaluated daily temperature data representative of the Facility's recent, reduced operations and concluded that river temperatures typically meet protective temperatures downstream from Station S0. See Response to Comment II.3.1.3. As a result, limiting operations consistent with this recent operation will ensure that the river temperatures downstream of the Facility are consistent with the protective temperatures derived in the 2011 Draft Determinations Document. See AR-618, p. 178-210. A rolling, 45-day average capacity factor of 40% from May 1 through September 30 allows the Facility to continue operate during the summer as it has in recent years (in fact, in most years the 45-day average capacity factor was less than 40%) while limiting the impacts of the thermal plume on the aquatic community. A 30-day rolling average period limits the number of consecutive days of operation more than a 45-day rolling average but allows less time for the river to recover in between operating periods, while a 60-day rolling period would allow the Facility to operate for more consecutive days. A 45-day rolling average strikes a balance between limiting the number of days a facility can operate in a row and requiring sufficient "downtime" when the Facility is not operating to allow the river to recover to ambient temperatures. The capacity factor calculated as a rolling average will reasonably assure the protection and propagation of the BIP.

[5] As a result of the change for the basis of the temperature limits from BAT (i.e., closed-cycle cooling) in the 2011 Draft Permit to a CWA § 316(a) variance in the Final Permit, the Final Permit includes limitations and monitoring requirements on the discharges from Outfalls 001 and 002 (Parts I.A.1 and I.A.2) and certain changes to the limitations and requirements for Outfall 003 (Part I.A.3), including carrying forward the water quality-based limit on dissolved oxygen saturation consistent with the requirements of the 1992 Permit.

Permit's limits are much more stringent than those in the 1992 Permit. EPA has taken into account the Facility's reduced operations but has set specific, in-stream temperature limits and associated conditions that will assure the protection and propagation of the Hooksett Pool's BIP. These limits will not accommodate Merrimack Station returning to the baseload operations and conditions that warranted rejecting the applicant's § 316(a) variance request. The Facility could, of course, seek different limits in a future permit proceeding.

1.2 Introductory Comments

Comment II.1.2 (i)	**AR-1554, LWB Environmental Services, Inc. p. 1**

On Page 40 of its Statement of Substantial New Questions for Public Comment ("Statement") regarding the Merrimack Station draft NPDES permit, EPA included the following request: EPA invites additional public comment addressing the above-discussed issues and materials relevant both to EPA's decision on PSNH's CWA § 316(a) variance application and to EPA's application of New Hampshire's water quality standards with regard to thermal effects. In particular, EPA invites public comment on:

- The import of PSNH's new data submissions for EPA's application of CWA § 316(a) and New Hampshire's water quality standards in developing thermal discharge standards for the Merrimack Station permit;
- The question of how shorter-term and longer-term thermal data should be factored into the evaluation under CWA § 316(a) and New Hampshire's water quality standards of the effects of Merrimack Station's thermal discharge limits for the Merrimack Station permit.

This document responds to EPA's request for comments on these topics, based on the new information provided by PSNH to EPA.

EPA Response:

The comment from LWB Environmental Services, Inc. ("LWB" or "Dr. Barnthouse") is introductory, rather than substantive, and does not require a response.

Comment II.1.2 (ii)	**AR-1552, Normandeau, p. 1**
***See also* AR-1554, LWB, p. 8**	

Normandeau Associates Inc (Normandeau) is submitting these comments as a response to the EPA's "Statement of Substantial New Questions and Possible New Conditions" for both CWA §316(a) with regard to thermal effects on the aquatic communities and §316(b) in regard to the potential installation of wedgewire screens to reduce entrainment at Merrimack Station. For the 316(a) thermal issues, Normandeau is submitting a data report that includes two additional years of fisheries data collected from Garvins, Hooksett and Amoskeag Pools in 2012 and 2013. This report supplements the "*Merrimack Station Fisheries Survey Analysis of 1972-2011 Catch Data*" (Normandeau 2011a), referred to herein as the “1972-2011 Fisheries Report” by updating the observations and results with two additional years (2012 and 2013) of standardized electrofishing data. This 2012-2013 data supplement used the same methodology and analyses as the 1972-2011 Fisheries Report, unless otherwise noted, and is organized into the following three major sections:

1. results and analysis of fish community data collected in Garvins Pool (the thermally uninfluenced impoundment immediately upstream from Hooksett Pool and therefore the appropriate upstream reference), Hooksett Pool and Amoskeag Pool (the impoundment immediately downstream from Hooksett Pool) during 2012 and 2013 (Report Section 2.0),

2. an updated RIS population trends analysis for the 1972-2013 time period that builds on the results first presented in 2007 (Normandeau 2007a), and updated in 2011 (Normandeau 2011a), by adding more recent data collected from Hooksett Pool during the comparable time periods of August and September 2012 and 2013 (Report Section 3.0), and

3. an assessment of biocharacteristics for RIS and other resident fish species during the 2012 and 2013 study periods, that builds on the results first presented in Normandeau 2011a (Report Section 4.0).

In EPA’s Substantial New Questions and Possible New Conditions, the agency invited public comment on the question of how shorter-term and longer-term thermal data should be factored into the evaluation under CWA 316(a) and New Hampshire’s water quality standards of the effects of Merrimack Station’s thermal discharges on the Hooksett Pool and the development of thermal discharge limits for the Merrimack Station permit.
It is Normandeau’s position that there needs to be no further analysis of shorter-term or longer-term thermal data because numerous fish and aquatic community analysis conducted over 40 years of Merrimack Station operation have demonstrated there is no appreciable harm to the balanced, indigenous populations of shellfish, fish and wildlife in Hooksett Pool caused by the thermal discharge. An updated summary of these 316(a) studies and results will be presented in Section 2 and the 316(b) comments on the new wedgewire technology will be presented in Section 3.

EPA Response:

This comment is primarily introductory to the rest of Normandeau’s comments that follow and does not require an EPA response here. To the extent, there are substantive points made in this comment, it is addressed in responses below.

Comment II.1.2 (iii)	**AR-1557, EPRI, pp. 3-1 to 3-2**

In September 2011, EPA Region 1 issued a draft National Pollutant Discharge Elimination System (NPDES) permit for the Merrimack Station that called for restrictions in the discharge of waste heat to protect the aquatic communities in the Merrimack River, the waterbody receiving

Merrimack's thermal discharge. The need for these restrictions was based on a detailed analysis by EPA of the real and potential biological effects of Merrimack's thermal discharge that was described in Attachment D to this draft permit. Since the release of this draft permit, there has been extensive commenting on the conclusions reached in Attachment D as well as submittal of new information relative to the impacts of Merrimack's thermal discharge. As a result, on August 2, 2017, EPA reopened the comment period on this draft permit. With regard to thermal issues at Merrimack, EPA invited:

- "… additional public comment addressing the … issues and materials relevant both to EPA's decision on PSNH's CWA § 316(a) variance application and to EPA's application of New Hampshire water quality standards with regard to thermal effects. In particular, EPA invites public comment on:
- the import of PSNH's new data submissions for EPA's application of CWA § 316(a) and New Hampshire's water quality standards in developing thermal discharge standards for the Merrimack Station permit;
- the question of how shorter-term and longer-term thermal data should be factored into the evaluation under CWA § 316(a) and New Hampshire's water quality standards of the effects of Merrimack Station's thermal discharges on the Hooksett Pool and the development of thermal discharge limits for the Merrimack Station permit; and
- EPA is considering the above-mentioned material from Dr. Barnthouse, AR-1352, Attachments 2 and 3, and invites the public to review and comment on the import of this new information.
- Moreover, additional public comment is solicited regarding any thermal discharge-related materials submitted to EPA since closure (on February 28, 2012) of the public comment period on the 2011 Draft Permit…"

EPRI's comments begin with a brief review of background information relative to this topic including: (1) the regulation of thermal discharges from steam-electric power plants; (2) relevant standards and criteria relative to Merrimack's thermal discharge; and (3) the current NPDES permit limits for Merrimack. Next, we review and summarize the technical basis for EPA's revised thermal limits in Merrimack's draft permit (2011 and 2014 revision). Thereafter, we review and summarize relevant new technical information submitted subsequent to the 2011 draft permit. Finally, we provide a discussion of key technical issues relative to the potential thermal impacts that EPA may wish to consider in making a final permit determination for the Merrimack Station.

For clarity, throughout this section USEPA refers to the Environmental Protection Agency's Headquarters in Washington, D.C. while EPA refers to the Environmental Protection Agency's Region 1 Office (New England). EPA serves as the Regional Administrator for Merrimack's NPDES permit whereas USEPA provides oversight and guidance relative to the NPDES permitting program.

EPA Response:

This comment introduces EPRI's substantive comments that follow and, as such, does not require an EPA response.

1.3 Current NPDES Permit Requirements

Comment II.1.3	AR-1577, EPRI, p. 3-2 - 3-3

The existing NPDES permit for the Merrimack Station was originally issued in 1992 and was administratively continued thereafter. The fact sheet for this permit reviews the regulatory history associated with § 316(a) decisions for the Station and concluded that:

"…the Regional Administrator granted a 316(a)-variance based upon the previous hydrological and biological studies and upon the absence of detectable environmental impacts upon the local indigenous fish during the during the operating history of the station. It is noted that neither the State nor EPA are aware of any fish kills associated with the thermal plume within the discharge canal or in the main stream of the river itself, since the station began operation."

Further, this permit does not include limits on the thermal discharge but, instead, contains the following provision with regard to temperature:

"… power spray module system shall be operated, as necessary, to maintain either a mixing zone (station S-4) river temperature not in excess of 69ºF, or a station N-10 to S-4 change in temperature (Delta-T) of not more than 1ºF when the N-10 ambient temperature exceeds 68ºF."

This permit finally specified that thermal plume from the Station should not block the zone of fish passage, should not change the balanced indigenous population (BIP) of the receiving water, and should have minimal contact with the surrounding shorelines.
Relative to the use of 69ºF as a regulatory trigger, EPA offers the following explanation:

"The 69°F Tmix is recommended, for the present, since it represents the most environmentally conservative case under the State of New Hampshire's cold water fishery thermal limitations, i.e., 68°F ambient plus 1°F temperature rise." [AR 681 p. 28].

EPA Response:

In this comment, EPRI quotes certain language from the Fact Sheet for the 1992 Permit issued by EPA to Merrimack Station. As such, this comment does not require an EPA response.

1.4 EPA's Draft NPDES Permit

Comment II.1.4	AR-1577, EPRI, p. 3-2 - 3-3

On September 30, 2011, EPA released a draft permit for the Merrimack Station (EPA 2011) for public review and comment[1]. This draft permit required, among other things, for the Merrimack Station to substantially reduce its thermal load to the river.

The stated reason for this requirement was that PSNH:

"…has failed to demonstrate that the plant's past and current thermal discharges have not resulted in prior appreciable harm to the balanced, indigenous population of shellfish, fish, and wildlife in Hooksett Pool of the Merrimack River.

Further, based on its own extensive analysis of thermal data:

"EPA concludes that Merrimack Station has a significant capacity to thermally impact Hooksett Pool. This conclusion is based on the:

- *short length and shallow depths of Hooksett Pool;*
- *significant fraction of shallow water habitat in the lower pool affected by the plume during summer months;*
- *quantity of water withdrawn, heated, and discharged by Merrimack Station;*
- *high and persistent temperatures above ambient associated with the plume under typical summer conditions;*
- *plume's tendency to extend across the entire width of the river;*
- *plume's demonstrated capacity to cause water column stratification, which can contribute to low dissolved oxygen events above Hooksett Dam low flows in Hooksett Pool typical during summer months (i.e., July, August, September)."*

Finally, using fisheries data EPA concluded that:

"…the evidence as a whole indicates that Merrimack Station's thermal discharge has caused, or contributed to, appreciable harm to Hooksett Pool's balanced, indigenous community of fish."

Based on the above information, EPA rejected PSNH's request for a § 316(a) variance continuation at the Merrimack Station and imposed the significantly reduced thermal loading limit in the draft permit.

The analysis of the effects of Merrimack's thermal discharge on the aquatic community consisted of a predictive and a retrospective (No Prior Appreciable Harm) assessment as described in EPA's Draft § 316(a) Technical Guidance. The predictive assessment was based on EPA's understanding of the thermal exposures together with information on thermal sensitivities of representative fish species. The retrospective assessment compared the current fish community to that reported from the Hookset Pool of the Merrimack River in the 1960s.

In April 2014, EPA issued a revised draft permit for Merrimack. This revision technology-based requirements limiting pollutant discharges from Merrimack Station's flue gas desulfurization

(FGD) system. In this revised draft permit, EPA did not alter its analysis and conclusions regarding thermal issues at the Station.

[1] AR – 618.

EPA Response:

This comment is intended to summarize EPA's stated rationale for rejecting PSNH's request for renewal of the CWA § 316(a) variance-based thermal discharge limits in Merrimack Station's 1992 permit. As a summary of EPA's stated rationale, this comment does not require an EPA response. EPA points out, however, that it did not determine the 2011 Draft Permit's thermal discharge limits based on the same factors that were the basis of rejecting the requested CWA § 316(a) variance. The proposed thermal discharge limits were based on a BPJ application of the BAT technology standard and the conclusion that such limits would also satisfy New Hampshire water quality standards.

1.5 Forty-Five Years of Comprehensive Study Concerning CWA § 316(a) and New Hampshire Water Quality Standards Demonstrates the Absence of Appreciable Harm to the Hooksett Pool BIP and that PSNH's Existing Thermal Variance Should Be Extended

Comment II.1.5	**AR-1548, PSNH, p. 8**
See also AR-846, PSNH, p.7	

Section IV, Part B. of EPA's Statement requests additional public comment concerning PSNH's CWA § 316(a) variance application and EPA's application of New Hampshire water quality standards concerning Merrimack Station's thermal effects on the Hooksett Pool portion of the Merrimack River.[24] As discussed below, the information submitted by PSNH since its 2012 comments and now in response to the specific questions in EPA's Statement corroborates that Merrimack Station's thermal discharge is not causing appreciable harm to the BIP of Hooksett Pool. These comments respond to the Statement's specific questions concerning the new thermal information and data submitted by PSNH since 2011, and EPA's questions concerning the significance of the Asian clam, a ubiquitous invasive species found throughout the United States and spreading throughout New Hampshire. As explained below, Hooksett Pool hosts a successful BIP unharmed by Merrimack Station's thermal influence or the Asian clam. PSNH urges EPA to use this opportunity presented by its Statement to reconsider its arbitrary and capricious denial of PSNH's 316(a) variance request in 2011. As discussed below, the data submitted to date, as corroborated by the new data and analyses submitted with these comments, compel a finding that PSNH has more than met its burden of showing its operations have not caused and are not causing appreciable harm to the BIP of Hooksett Pool.

[24]AR-1534 at 40

EPA Response:

EPA's 2011 Draft Permit proposing denial of PSNH's application for renewal of its existing CWA § 316(a) thermal discharge variance was neither arbitrary nor capricious, as PSNH suggests. Instead, EPA carefully considered the relevant information and reached, and explained, a rational decision in light of this information and the applicable law. EPA also does not agree that new data indicates that the BIP in the Hooksett Pool has not been harmed by Merrimack Station's past thermal discharges. *See* Responses to Comments II.3.1.3 and II.4.4 (and associated sub-comments). Furthermore, EPA does not agree that the Asian clam, which PSNH correctly labels an "invasive species," should be considered "ubiquitous" and unaffected by the facility's past thermal discharges. *See* Responses to Comments II.5.0 (and associated sub-comments).

Comments on the Draft Permit, including new fisheries analysis and a more complete, correctly understood temperature dataset, in addition to a substantially different operational profile and new ownership willing to consider a permit not based on baseload operations, all caused EPA to re-consider the appropriate thermal limits for the Final Permit. EPA has reassessed whether the Final Permit should retain the 2011 Draft Permit's technology-based and water quality-based thermal limits or, instead, whether the permit should be based on water quality requirements and/or a CWA § 316(a) variance, albeit different from the existing or previously requested variance, that would be protective of the Hooksett Pool's BIP taking into account Merrimack Station's current operating conditions.

1.6 Merrimack's 316(a) Variance

Comment II.1.6	**AR-1573, CLF et al, p. 3**

The current Permit includes a 316(a) variance that permits Merrimack to operate without complying with numeric effluent limitations on thermal discharge based on the level of control achievable through use of the best available technology. Instead the permit specifies that discharges should not violate any applicable water quality standards. Permit. I.A.1.b. In addition, the Permit also requires that thermal plumes from the station should not block the zone of fish passage, should not change the balanced indigenous population of the receiving water, and should have minimal contact with the surrounding shorelines. Permit Part I.A.1.g.

[1] For a full background of Merrimack's recent permitting history see Comment Letter of Conservation Law Foundation regarding EPA's 2011 Draft Permit, AR 851 (Feb. 28, 2012), and Comment Letter of Earthjustice, Environmental Integrity Project, and Sierra Club to EPA's 2011 Draft Permit, AR 866 (Feb. 28, 2012) . Notably, Merrimack has been operating under a NPDES permit issued over twenty years ago. Comment Letter of Conservation Law Foundation at 7.

EPA Response:

EPA agrees that Merrimack Station's 1992 NPDES permit includes thermal discharge limits based on a CWA § 316(a) variance rather than on technology-based standards. The commenter has also correctly identified certain narrative conditions in the permit. The 1992 Permit also addressed thermal discharges in Part 1.A.11. EPA has addressed comments on narrative water quality-oriented conditions for the Final Permit in Response to Comment II.6.4.3 and 6.4.4.

1.7 2011 Draft Permit and EPA's Response

Comment II.1.7	AR-1573, CLF et al, pp. 3-5
See also AR-851, CLF, pp. 5-6 and Exhibit 1	

EPA issued a new Draft Permit for Merrimack Station on September 30, 2011. AR-609. The Comment period for the Draft Permit ended on February 28, 2012. After reviewing comments, EPA issued the Revised Draft Permit on April 18, 2014. AR-1136. The Comment period for the Revised Draft Permit ended on October 22, 2014. AR-1137.

In the Draft Permit, EPA rejected Merrimack's request for a CWA § 316(a) thermal discharge variance. EPA concluded that Eversource had not demonstrated that Merrimack Station's thermal discharge has not caused prior appreciable harm to Hooksett Pool's BIP of fish. *Clean Water Act NPDES Permitting Determinations for the Thermal Discharge and Cooling Water Intake Structures at Merrimack Station in Bow, New Hampshire,* NPDES Permit No. NH 0001465 ("Attachment D") at 121.[2] CLF supported the 2011 Draft Permit's denial of PSNH's request for a renewal of its CWA Section 316(a) variance, and the determination that year-round use of wet or wet-dry hybrid mechanical draft cooling towers in closed cycle configuration is the best available technology (BAT) for controlling thermal discharge at Merrimack Station (CLF 2012 comments 5,6, Exhibit 1 p. 1)

To the contrary, EPA found that the evidence as a whole indicates that Merrimack Station's thermal discharge has caused, or contributed to, appreciable harm to Hooksett Pool's BIP of fish. Attachment D at 121. In addition, EPA found that Eversource had not demonstrated that thermal discharge limits based on applicable technology-based and water quality-based requirements would be more stringent than necessary to assure a BIP. And Eversource had not demonstrated that its proposed alternative thermal discharge limits would reasonably assure the protection and propagation of the BIP on Hooksett Pool. *Id*. After rejecting Eversource's request for a 316(a) variance, EPA determined that, based EPA's Best Professional Judgment ("BPJ") a closed-cycling cooling system using "wet" cooling towers would be the BAT standard for thermal discharges at the Merrimack Station. *Id* at 122.

However, EPA never finalized the Revised Draft Permit and on August 2, 2017, in response to requests by Eversource, re-opened the public comment period for the Revised Draft Permit on a limited set of topics including, among other things, topics related to Merrimack River water temperatures and associated thermal impacts on aquatic species because Eversource presented new summaries of existing data and new arguments to EPA related to EPA's denial of the 316(a) variance.

In particular, at issue is the interpretation of a statistical summary of Merrimack River water temperature data provided by Eversource in a 2007 probabilistic thermal modeling report prepared by the biological consulting firm Normandeau Associates (the "Normandeau Report").

In a September 4, 2015 letter, Eversource argued EPA had misinterpreted the water temperature data, in part because the Normandeau Report was unclear. Eversource explained that the temperature data in the Normandeau Report Appendix A are not the 21-year average of the daily maximum temperatures for each day of the calendar year, but instead simply represent the maximum of the daily averages that occurred on a given calendar day. Eversource argues that EPA's misunderstanding is important because it contributed to EPA drawing inaccurate conclusions regarding Merrimack River water temperature data and, by extension, the nature and extent of the Merrimack River thermal plume.

In further support of its request that EPA reconsider its proposed denial of Eversource's request to renew the Merrimack 316(a) variance, on December 22, 2016, Eversource submitted a new temperature dataset for EPA's consideration, along with a CORMIX thermal plume modeling report.

Finally, Eversource submitted a report by Normandeau comparing benthic life near the Merrimack Station over several decades. AR-870. In reviewing this report, EPA became aware of the presence of non-native organisms in Hooksett Pool, particularly the highly invasive Asian clam (*Corbicula fluminea*). EPA began an inquiry that included field investigations confirming the presence of Asian clams and noting, at least qualitatively, that they are abundant in and near the Merrimack plume, rarer downstream, and not observed upstream of Merrimack's plume. EPA also reviewed two academic journal articles reporting on studies concluding that, in the St. Lawrence and in the Connecticut River, Asian clams had higher winter survival rates within the influence of the power plants' thermal discharge than in ambient areas, and that the elevated temperatures appeared to affect the clam's reproductive success, growth, and abundance.

[2] Except as otherwise specified, for the purpose of this comment letter, the owner and operator of Merrimack Station is referred to as "Eversource." The company had previously been known as Public Service of New Hampshire ("PSNH").

EPA Response:

This comment seeks to recount the history of this permit proceeding, particularly as it relates to the consideration and development of the permit's thermal discharge limits. EPA agrees with some aspects of this comment but feels other aspects would be more accurate if described differently. We address the latter aspects here.

First, it should be noted that the Revised Draft permit issued by EPA in 2014 only addressed new proposed effluent limits and related requirements for Merrimack Station's flue gas desulfurization (FGD) wastewater. *See, e.g.,* AR 1135, 1136, and 1137. Other provisions of the 2011 Draft Permit were left as is.

Second, the commenter correctly recites that EPA rejected Merrimack Station's request for renewal of its CWA § 316(a) variance and the associated thermal discharge limits. EPA notes, however, that it also indicated that it was still considering whether thermal discharge limits based on state water quality standards would, in some respects, be less stringent than applicable technology-based limits but nevertheless adequate to satisfy the standards of CWA § 316(a). If so, EPA explained, then such water quality-based limits could be granted based on meeting water quality requirements, as per CWA § 301(b)(1)(C), and being granted a CWA § 316(a) variance from technology-based requirements. See AR 618, § 9.5.

The commenter correctly notes that EPA again reopened the public comment period for the draft permit in 2017. While the 2014 Revised Draft permit only addressed new proposed limits for FGD wastewater, the reopened comment period in 2017 allowed public comment on a variety of issues. The commenter suggests that EPA reopened the comment period solely "because Eversource presented new summaries of existing data and new arguments to EPA related to EPA's denial of the 316(a) variance." In fact, EPA reopened the comment period for a number of reasons, including, for example, EPA's promulgation of new regulations applicable to Merrimack Station's cooling water intake structures and its discharges of FGD wastewater and bottom ash transport water as well as substantial changes in the manner of the Facility's operations (*i.e.*, changing from a baseload generator to an intermittent generator). Moreover, EPA did not reopen the comment period because Eversource provided new "summaries of existing data" and new arguments; rather, EPA decided that it should take additional comment in light of Eversource having provided information indicating that its previously submitted data had been misunderstood (due to its having been presented unclearly by the Facility). *See* AR 1534.

Having decided that reopening the comment period was necessary for various reasons, EPA specified an array of substantial new questions for which it welcomed public comment. *See* AR 1534, pp. 3-5. *See also* 40 CFR §§ 124.10, 124.14(c). EPA did not reopen the comment period lightly, as the Agency is, and has been, acutely aware of how lengthy this permit proceeding has been, albeit for a variety of necessary reasons (*e.g.*, multiple changes in applicable legal requirements have required multiple permit requirements to be reassessed and then reassessed again). Nevertheless, EPA concluded that reopening the comment period in 2017 was the correct thing to do under the circumstances.

1.8 The Hickey Report and the Nedeau Report

Comment II.1.8	AR-1573, Sierra Club et al., p. 5

Attached to this letter are two reports created in response to EPA's reopening of the comment period for the Revised Draft Permit's 316(a) thermal discharge limitations. The first is Review of Available Water Temperature Data and Thermal Plume Characterizations related to Merrimack Power Station in Bow, NH (Hickey, Shanahan 2017) ("Hickey Report") which analyzes Eversource's recent information submittals related to temperature data, the thermal plume in Hooksett Pool, and the request to reconsider a 316(a) thermal variance. The second is Potential Role of Merrimack Station's Thermal Effluent on Asian Clams, Native Mussels, and Ecology of the Merrimack River (Nedeau 2017) ("Nedeau Report") which analyzes Merrimack's effect on Asian Clams in Hooksett Pool, the Merrimack River, and connected waterways.

EPA Response:

EPA has reviewed and considered the two reports referenced in the above comment and addresses the reports and comments therein in the Responses to Comments below. *See, e.g.*, Responses to Comments II.3.3.5, 3.4.2, and 3.4.4.

2.0 Applicable Legal Requirements for Thermal Discharges

2.1 Relevant Legal Standard

Comment II.2.1	AR-1548, PSNH, pp. 9-13

Under CWA § 301, because Merrimack Station is a discharger of heat, it must satisfy both technology based standards and water quality standards, or obtain a variance from these standards under CWA § 316(a).[25] With respect to technology based standards, CWA § 301 requires that these standards reflect the "best available technology economically achievable . . . which will result in reasonable further progress toward the national goal of eliminating the discharge of all pollutants."[26] Additionally, CWA § 301(b) places more stringent requirements on a discharger if needed to meet state water quality standards.[27] However, "a basic technological approach to water quality control [cannot] be applied in the same manner to the discharge of heat as to other pollutants."[28] Thus, § 316(a) of the CWA authorizes EPA to grant variances for thermal discharges from "any point source otherwise subject to the provisions of section [301] . . . of [the CWA]."[29] Merrimack Station has in the past demonstrated that a § 316(a) variance from the technology based and water quality standards was appropriate; therefore, its current permit contains thermal discharge requirements based on a § 316(a) variance.[30]

CWA § 316(a) allows EPA to grant a variance from the § 301 standards described above whenever:

> [T]he owner or operator ... can demonstrate ... that any effluent limitation proposed for the control of the thermal component of any discharge from such source will require effluent limitations more stringent than necessary to assure the protection and propagation of a balanced, indigenous population of shellfish, fish, and wildlife in and on the body of water into which the discharge is to be made ....[31]

EPA may instead impose alternative effluent limitations on thermal discharges "that will assure the protection and propagation of a [BIP] of shellfish, fish, and wildlife in and on that body of water."[32] BIP is not defined by statute or regulations; however, "balanced, indigenous community" (which the regulations state is synonymous with BIP) is defined as:

> [A] biotic community typically characterized by diversity, the capacity to sustain itself through cyclic seasonal changes, presence of necessary food chain species and by a lack of domination by pollution tolerant species. Such a community may include historically non-native species introduced in connection with a program of wildlife management and species whose presence or abundance results from substantial, irreversible environmental modifications.[33]

As explained by EPA in its Fact Sheet for the 2011 Draft Permit, non-indigenous species that historically were not present in Hooksett Pool but appeared later in time should not be included in analysis of the BIP, except to consider how their presence has affected, if at all, the balanced indigenous community.[34]

The Environmental Appeals Board ("EAB") has summarized the § 316(a) variance determination process as follows:

> [R]eading CWA sections 301 and 316(a) together, the statute and regulations in effect establish a three- (and sometimes four-) step framework for obtaining a variance: (1) the Agency must determine what the applicable technology and WQS-based limitations should be for a given permit; (2) the applicant must demonstrate that these otherwise applicable effluent limitations are more stringent than necessary to assure the protection and propagation of the BIP; (3) the applicant must demonstrate that its proposed variance will assure the protection and propagation of the BIP; and (4) in those cases where the applicant meets step 2 but not step 3, the Agency may impose a variance it concludes does assure the protection and propagation of the BIP.[35]

EPA has promulgated regulations describing the factors, criteria, and standards for the establishment of effluent standards issued under a § 316(a) variance.[36] These regulations restate the requirements of § 316(a) and require the applicant to demonstrate that an alternative effluent limitation will "assure the protection and propagation of a balanced, indigenous community. ..."[37] For existing sources, this demonstration is based on the "absence of prior appreciable harm."[38]

Existing sources can show that there has been no appreciable harm in one of two ways: either by demonstrating that "no appreciable harm has resulted from the normal component of the discharge taking into account the interaction of such thermal component with other pollutants and the additive effect of other thermal sources to [the BIP]," *i.e.*, a retrospective demonstration,[39] or by demonstrating that "despite the occurrence of such previous harm, the desired alternative effluent limitations (or appropriate modification thereof) will nevertheless assure the protection and propagation of [the BIP]," *i.e.*, a prospective demonstration.[40] PSNH has demonstrated that no appreciable harm has resulted from its prior thermal discharges through a retrospective analysis.

"Appreciable harm" is not defined in EPA's regulations. However, EPA has attempted to give some meaning to the term in case law and guidance documents. In a 1974 guidance document for § 316(a), EPA describes "appreciable harm" as damage to the BIP resulting in a "substantial increase" of nuisance or heat tolerant species, a "substantial decrease" in formerly indigenous species, a "substantial" reduction of trophic structure, "reduction of the successful completion of life cycles of indigenous species," an "unaesthetic appearance, odor or taste of the waters," and "elimination of an established or potential economic or recreational use of the waters."[41] Importantly, EPA explains that "[i]t is not intended that every change in flora and fauna should be considered appreciable harm."[42]

Importantly, not all levels of impacts to a fish community rise to "appreciable harm." In fact, EPA's own guidance plainly states that some level of impact is acceptable.[43] Both the EAB and EPA Region 1 have confirmed this interpretation.[44] In sum, an existing discharger is entitled to a § 316(a) variance if, as noted above, it shows it has evaluated the typical indicators of long-term thermal effects (*e.g.*, abundance, diversity, community composition) in an appropriate manner, and determined there is no reasonable indication of thermal impacts attributable to the discharge in question.

PSNH has demonstrated that no appreciable harm has resulted from thermal discharges from Merrimack Station. Furthermore, the new data confirms that continuation of PSNH's § 316(a) variance at Merrimack Station will continue to assure the protection and propagation of the BIP; therefore, EPA should renew the variance.

[25] 33 U.S.C. § 1311.

[26] *Id.* at § 1311(b)(2)(A).

[27] *Id.*

[28] *See, e.g.*, *Appalachian Power Co. v. Train*, 545 F.2d 1351, 1356 (4th Cir. 1976).

[29] 33 U.S.C. § 1326(a).

[30] AR-236.

[31] 33 U.S.C. § 1326(a).

[32] *Id.*

[33] 40 C.F.R. § 125.71(c) (2017).

[34] AR-618 at 47 ("These species, and others that appeared later, should not have been included in an analysis of the balanced, indigenous community, except to explain how their presence may have affected the indigenous community."); *id.* at 52 ("Data provided in the Fisheries Analysis Report for the 2000s included (warmer water-favoring) species not present in Hooksett Pool in the 1960s and, therefore, not considered part of the balanced, indigenous community.").

[35] *In re: Dominion Energy Brayton Point, L.L.C. (formerly USGen New England, Inc.) (Brayton Point Station)*, 12 E.A.D. 490, 500 (EAB 2006) ("*Brayton Point I*").

[36] *See* 40 C.F.R. §§ 125.70-73.

[37] *Id.* at § 125.73(a).

[38] *Id.* at § 125.73(c)(1).

[39] *Id.* at § 125.73(c)(1)(i). In such a retrospective analysis, the existing discharger must demonstrate that it has appropriately evaluated the typical indicators of long-term thermal effects and determined there is no indication of "appreciable" thermal impacts on the BIP attributable to the discharge in question. *See Brayton Point I,* 12 E.A.D. at 553 (when looking at trends, § 316(a) determination only assigns to station those effects actually caused by station). Because ecosystems are dynamic and "changes occur continually due to natural processes and stresses," the focus of a retrospective § 316(a) demonstration's long-term assessment of fish must be on those changes that are reasonably, but definitively, attributable to a particular thermal discharge, not simply on changes alone. *In re Pub. Serv. Co. of Ind., Inc. (Wabash River Generating Station, Cayuga Generating Station)*, NPDES Appeal No. 78-6, 1979 WL 22675, at *7, 1 E.A.D. 590, 601 (EAB Nov. 29, 1979) ("*Wabash*").

[40] *See Brayton Point I*, 12 E.A.D. at 553 (citing 40 C.F.R. §125.73(c)(1)(i)-(ii)).

[41] *See* AR-1195 at 23.

[42] *Id.* Additionally, in *Brayton Point I*, 12 E.A.D. at 565 n.118, the EAB included a footnote stating that "[w]e note that the word 'measurable' is a synonym for 'appreciable.'" (citing The Doubleday Roget's Thesaurus in Dictionary Form 31 (Sidney I. Landau & Ronald J. Bogus, eds., 1977)). In response to comments on a § 316(a) variance request, EPA provided that a thermal discharge must cause a significant delay in the recovery of a BIP of fish, shellfish, and wildlife to qualify as appreciable harm. *See* AR-561 at III-8. Moreover, in response to comments regarding Brayton Point's final NPDES permit, EPA provided that "even significant adverse effects on a few species do not necessarily require a finding of appreciable harm to the BIP that would preclude a § 316(a) variance," EPA agreed "to the extent that the commenter is saying that even significant adverse effects on a few species might not create a 100 percent inviolate requirement that no § 316(a) variance could be issued." *Id.* at III- 35; *Brayton Point I*, 12 E.A.D. at 575 (providing that a permitting authority should select a temperature that "represent[s] an acceptable level of impact but [does] not represent a zero impact temperature") (citation omitted); *In re Dominion Energy Brayton Point, L.L.C. (formerly USGen New England, Inc.)*, 13 E.A.D. 407 (EAB 2007) (providing that an applicant is not required to show "no effects" to prove no prior appreciable harm).

[43] *See, e.g.*, AR-1180 at 23 (reductions in macroinvertebrate community diversity and standing crop "*may* be cause for denial of a 316(a) waiver" but applicant can still otherwise show no prior appreciable harm).

EPA Response

This comment discusses the standard for reviewing an application for issuance and renewal of CWA § 316(a) variance. It cites to a variety of sources in support of its discussion. EPA agrees with much of it but not necessarily with all of it. The Agency continues to hold the views about the applicable standards that it presented in its analyses in support of the Draft Permit. *See, e.g*., AR 618, pp. 18-23. That said, EPA mentions a few specific points here.

The comment's concluding paragraph asserts that PSNH's submissions "demonstrated that no appreciable harm has resulted from thermal discharges from Merrimack Station … [and] the new data confirms that continuation of PSNH's § 316(a) variance at Merrimack Station will continue to assure the protection and propagation of the BIP …." EPA disagrees with these assertions regarding the effects of the Facility's past thermal discharges as a baseload generator using an open-cycle cooling system and regarding whether the CWA § 316(a) variance reflected in the 1992 Permit should be renewed at this time. For the 2011 Draft Permit, EPA determined, instead, that PSNH's retrospective demonstration did not establish that there was no prior appreciable harm to the BIP from Merrimack Station's thermal discharges when operating as a baseload facility. *See* 40 CFR § 125.73(c)(1)(i).

That said, as explained in other responses, Merrimack Station is no longer a baseload generator and now operates like a peaking plant with intermittent operations in the winter and summer months. Based on more recent information reflecting the Facility's reduced operations, EPA has determined that the thermal discharges associated with such operations are not currently causing appreciable harm to the BIP and that the protection and propagation of the BIP of the Hooksett Pool will be assured going forward with the thermal discharge-related requirements included in the Final Permit. These permit limits are designed to maintain thermal discharge levels consistent with those associated with the current intermittent operations and which GSP indicates are expected to continue into the foreseeable future. These conclusions are discussed in more detail below. While the Facility may continue to hold the view that its renewal of the past variance would also satisfy CWA § 316(a), it has agreed with EPA that the new thermal discharge requirements in the Final Permit will also do so.

EPA also does not agree with the comment's statement that if the permit applicant "determines" that the protection and propagation of the BIP is assured after certain evaluations, then it is "entitled" to a variance under CWA § 316(a). The applicant for a CWA § 316(a) variance bears the burden of demonstrating "to the satisfaction of the Administrator" that the effluent limits in the absence of the variance would be more stringent that necessary to assure the protection and propagation of the BIP, and that the requested less stringent limits will assured the protection and propagation of the BIP. 33 U.S.C. § 1326(a); 40 CFR § 125.73(a). In addition, thermal discharge effects must not be considered in isolation; they must be considered in combination with the effects of other pollutant discharges and environmental stressors. S*ee* 33 U.S.C. § 1326(a); 40 CFR §§ 125.73(a) and 125.73(c)(1). If such a showing is made, then the statute provides that EPA "may" grant a variance with alternative thermal discharge limits. 33 U.S.C. § 1326(a). S*ee also* 40 CFR § 125.70(a). The statute and regulations do not establish an entitlement to a variance based on the permittee's own judgment as to whether the statutory standard has been satisfied.

EPA also notes that the comment seems to suggest that an absence of prior appreciable harm could be established by a prospective demonstration. Perhaps this is a matter of semantics, but EPA does not think a *prospective* demonstration can establish that a discharge did not cause *prior* appreciable harm; a prospective demonstration tries to establish that a variance is warranted by demonstrating that the proposed discharge will assure the protection and propagation of the BIP going forward.

2.2 Applicable Water Quality Standards and Criteria for Merrimack

Comment II.2.2	AR-1577, EPRI, p. 3-3

The State of New Hampshire defines the waters of the Merrimack River in the vicinity of the Station as Class B. Class B is the second highest quality, considered acceptable for fishing, swimming and other recreational purposes and, after adequate treatment, for use as water supplies.

The State does not have numeric temperature criteria for its surface waters. Instead, it relies on the following general narrative standard:

"There shall be no disposal of sewage or waste into said waters except those which have received adequate treatment to prevent the lowering of the biological, physical, chemical or bacteriological characteristics below those given above, nor shall such disposal of sewage or waste be inimical to aquatic life or to the maintenance of aquatic life in said receiving waters."

Further, with respect to discharge of heat, New Hampshire Code of Administrative Rules requires:

"Any stream temperature increase associated with the discharge of treated sewage, waste or cooling water, water diversions, or releases shall not be such as to appreciably interfere with the uses assigned to this class."

EPA Response

This comment summarizes certain aspects of New Hampshire water quality standards pertaining to the regulation of thermal discharges. EPA regards the discussion in the comment to be incomplete, however, and continues to understand the relevant New Hampshire water quality requirements in the manner discussed in EPA's "Clean Water Act NPDES Permitting Determinations for the Thermal Discharge and Cooling Water Intake Structures at Merrimack Station in Bow, New Hampshire" (September 30, 2011) (the 2011 Determinations Document), issued together with, and in support of, the 2011 Draft Permit. *See* AR 618, pp. 174-78. EPA notes in particular that the comment fails to reference either N.H. Rev. Stat. Ann. § 485-A:8(VIII) or N.H. Code R. Env-Wq 1703.13(b).

2.3 Clean Water Act Section 316(a)

Comment II.2.3	**AR-1573, Sierra Club et al., pp. 1-2**

Heat is defined as a pollutant under the Clean Water Act ("CWA"). 33 U.S.C. § 1362(6). The point source discharge of pollutants to a water of the United States is prohibited by CWA § 301(a), unless authorized by an NPDES permit issued under CWA § 402. Permit limits for thermal discharges must, at a minimum, satisfy federal technology-based requirements, as well as any more stringent requirements based on state water quality standards that may apply. *See* 33 U.S.C. § 1311(b)(1)(C). CWA § 316(a) provides for an exception – a variance – from the general requirement that NPDES permits include effluent limits that, at a minimum, satisfy federal technology-based standards, and that also satisfy any more stringent requirements based on state water quality standards that apply. Section 316(a) authorizes the permitting agency to grant a variance and impose less stringent thermal discharge limits if the permittee can demonstrate that "any effluent limitation proposed for the control of the thermal component of any discharges…will require effluent limitations more stringent than necessary to assure the protection and propagation of a balanced, indigenous population of shellfish, fish, and wildlife." 33 U.S.C. § 1326(a). Any 316(a) variance must "assure the protection and propagation of a balanced, indigenous population ["BIP"] of shellfish, fish, and wildlife in and on the body of water." *Id.*; 40 C.F.R. § 125.70.

The permittee has the burden of proof in persuading the permitting authority that the non-variance limits are more stringent than is needed and that an alternative set of limitations will be sufficient to protect the BIP. 33 U.S.C. § 1326(a); 40 C.F.R. § 125.73(a).

EPA Response

This comment fairly summarizes CWA requirements applicable to thermal discharges. EPA discussed these CWA requirements in detail in its Determination Document issued in support of the 2011 Draft Permit. *See* AR 618, pp. 16-26.

2.4 Regulation of Thermal Pollution under Clean Water Act

Comment II.2.4	AR-1577, EPRI, p. 3-2

The Clean Water Act clearly defines heat as a pollutant. Thus, the discharge of heat to the Nation's waters is prohibited unless explicitly authorized by a National Pollutant Discharge Elimination System (NPDES) permit. However, Congress recognized the unique nature of thermal pollution, including rapid dissipation and lack of accumulation, and included a special variance process in Section 316(a):

"With respect to any point source otherwise subject to the provisions of section 301 or section 306 of this Act, whenever the owner or operator of any such source, after opportunity for public hearing, can demonstrate to the satisfaction of the Administrator (or, if appropriate, the State) that any effluent limitation proposed for the control of the thermal component of any discharge from such source will require effluent limitations more stringent than necessary to assure the projection [sic] and propagation of a balanced, indigenous population of shellfish, fish and wildlife in and on the body of water into which the discharge is to be made, the Administrator (or, if appropriate, the State) may impose an effluent limitation under such sections on such plant, with respect to the thermal component of such discharge (taking into account the interaction of such thermal component with other pollutants), that will assure the protection and propagation of a balanced indigenous population of shellfish, fish and wildlife in and on that body of water."

In September 1974 and May 1977, USEPA issued draft guidance for the § 316(a) variance process (USEPA 1974 and 1977). Although never finalized, these draft documents are still commonly used as guidance for the conduct of demonstration studies as part of the application for a § 316(a) variance.

EPA Response

The commenter suggests that Congress took note that heat discharged to waters of the United States dissipates rapidly and does not accumulate and that this led Congress to create the variance process in CWA § 316(a). To be clear, EPA would add that the speed with which waste heat dissipates, and does or does not accumulate, is all relative and will vary from case to case. This is why Congress enacted CWA § 316(a) so that permitting authorities could evaluate the effects of particular thermal discharges and decide whether or not a variance should be granted. The effects of the thermal discharge, and whether heat dissipates rapidly or accumulates, will depend on, among other things, how much heat is being discharged, how cold the receiving water is, whether it is deep or shallow, fast-flowing or slow-moving or impounded.

In addition, EPA notes that on August 6, 2019, the Agency's Office of Water issued a policy memorandum titled, "Office of Water Policy for Draft Documents." https://www.epa.gov/sites/production/files/2020-02/documents/ow_policy_for_draft_documents_to_ow_program_directors_signed_002.pdf (website last visited on April 3, 2020). This memorandum, at p. 1, states that, "… effective immediately, all draft documents that were issued more than two years ago and have not been finalized are hereby rescinded." Based on this policy memorandum, the two draft guidances cited by the commenter have been rescinded and will not be cited to support these responses to comments. EPA also later produced a list of rescinded guidance documents which did not include the two draft guidance documents cited by the commenter, but the policy memorandum by its terms has rescinded the draft guidance documents, regardless of whether they were included in the list.

2.5 316(a) Variance Demonstration Requirements

Comment II.2.5	**AR-1573, Sierra Club et al., pp. 2-3**

A "balanced, indigenous population" ("BIP") is defined by EPA regulations to mean "a biotic community typically characterized by diversity, the capacity to sustain itself through cyclic seasonal changes, presence of necessary food chain species and by a lack of domination by pollution tolerant species." 40 C.F.R. § 125.71(c). Moreover, normally "such a community… may not include species whose presence or abundance is attributable to alternative effluent limitations imposed pursuant to section 316(a)." *Id.* To determine the BIP for a local waterway, EPA must consider what species would inhabit the receiving water body if it were not degraded by thermal discharges. For example, the presence of a large population of a heat resistant species that is caused by thermal discharges authorized under a previous 316(a) variance would indicate that the variance had not adequately protected and preserved the BIP.

The regulations and guidance allow for different types of 316(a) demonstrations which may include "any information [the permitting authority] deems relevant" and which may vary depending on site specific characteristics. 40 C.F.R. § 125.73(b).

An existing discharger may show that their proposed 316(a) variance is more stringent than necessary to protect and preserve a BIP by demonstrating the "absence of prior appreciable harm in lieu of predictive studies." 40 C.F.R. § 125.75(c)(1). Under this approach, normally referred to as a "Retrospective Analysis," an existing discharger must show that "no appreciable harm has resulted from the normal component of the discharge." 40 C.F.R. § 125.75(c)(1)(i). However, if there is some previous harm, the existing discharger may still obtain a 316(a) variance if it shows that the "desired alternative effluent limitations (or appropriate modifications thereof) will nevertheless assure the protection and propagation" of a BIP. 40 C.F.R. § 125.75(c)(1)(ii). This approach is quite similar, if not identical, to the central BIP standard under 40 C.F.R. § 125.75(a). This type of showing is referred to as a "Prospective Analysis."

In 1977, EPA issued a technical guidance manual to guide the development of 316(a) demonstrations. Although forty years have elapsed since its creation, EPA has never updated this manual and continues to rely upon it in evaluating 316(a) variance requests. The EPA manual provides guidance for identifying the appropriate level of information in demonstrations and in scoping thermal, fisheries, and other surveys to support the assessment of potential adverse impacts.

EPA Response:

EPA agrees with the commenter's general description of the standards applied under EPA regulations when reviewing a request for renewal of a CWA § 316(a) variance. EPA also agrees with the commenter's general characterization of the 1977 draft guidance document, but this draft guidance document has recently been rescinded by EPA. .

On August 6, 2019, the Agency's Office of Water issued a policy memorandum titled, "Office of Water Policy for Draft Documents." https://www.epa.gov/sites/production/files/2020-02/documents/ow_policy_for_draft_documents_to_ow_program_directors_signed_002.pdf (website last visited on April 3, 2020). This memorandum, at p. 1, states that, "… effective immediately, all draft documents that were issued more than two years ago and have not been finalized are hereby rescinded." Based on this policy memorandum, the draft guidance cited by the commenter has been rescinded and EPA will not cite to it to support these responses to comments. While EPA later produced a list of rescinded guidance documents which did not include the specific draft guidance document cited by the commenter, the earlier policy memorandum by its terms has rescinded the draft guidance document regardless of whether it was included in the list.

2.6 What is a Balanced Indigenous Population?

Comment II.2.6	**AR-1577, EPRI, pp. 3-2 to 3-3**

40 CFR § 125.71 defines "balanced, indigenous population of shellfish, fish and wildlife" as synonymous with "balanced, indigenous community" meaning:

"a biotic community typically characterized by diversity, the capacity to sustain itself through cyclic seasonal changes, presence of necessary food chain species and by a lack of domination by pollution tolerant species. Such a community may include historically non-native species introduced in connection with a program of wildlife management and species whose presence or abundance results from substantial, irreversible environmental modifications. Normally, however, such a community will not include species whose presence or abundance is attributable to the introduction of pollutants that will be eliminated by compliance by all sources with section 301(b)(2) of the Act; and may not include species whose presence or abundance is attributable to alternative effluent limitations imposed pursuant to section 316(a)." [§ 125.71]

The terms balanced, indigenous population (BIP) and balanced, indigenous community (BIC) are used interchangeably in the § 316(a) variance literature.

EPA Response:

This comment essentially repeats, as EPA explained in the 2011 Determinations Document, AR 618, pp. 18-20, that neither the CWA nor EPA regulations define BIP, but EPA's regulations provide a definition of BIC and indicate it is synonymous with BIP. EPA agrees with the comment.

3.0 Temperature Data Review and Re-Analysis

Comment II.3.0	AR-1548, PSNH, p. 60

PSNH appreciates EPA's reconsideration of the temperature data, which was previously misinterpreted and which misrepresentation led to an incorrect § 316(a) determination and denial of a thermal variance for Merrimack Station. The temperature data, when correctly interpreted, helps explain what 40+ years of actual biological data and analyses concerning the fish and macroinvertebrate communities, as well as New Hampshire water quality, already show—that Merrimack Station's thermal discharge has not caused appreciable harm to the BIP of Hooksett Pool, and the variance should be granted.

EPA Response:

In response to PSNH's new explanation of its data submission, EPA reevaluated how it used the 21-year temperature data set in its evaluation of Merrimack Station's thermal discharge, and the discharge's potential to impact the biological community of Hooksett Pool. EPA agrees that the Agency incorrectly understood the data to represent maximum temperatures averaged over the 21-year period, owing to "a lack of clarity in the Report itself," as Eversource acknowledged. AR-1367. Since the issuance of the Draft Permit, in response to comments received and because of the misinterpretation of the data, EPA received and reviewed actual daily temperature data from PSNH.

Upon review of the daily data, it was clear to EPA that mean, minimum, and maximum average daily temperatures over a 21-year period do not adequately support PSNH's request for renewal of the existing CWA § 316(a) variance. Relying solely on (21-year) averages of daily averages is not an appropriate way to assess the existing and potential environmental impacts from Merrimack Station's thermal discharge because such averages over a lengthy period of time could mask periodic, or seasonal, temperature excursions that could harm the biological community. In support of the Final Permit limits, EPA evaluated the actual daily temperature data from the period beginning in 2004 and extended through May 2019 (as well as additional operational and fish abundance data) to determine whether a variance under CWA § 316(a) should be granted for the Facility's thermal discharges. *See* Responses to Comments in Section II.3.1. As discussed further in these Responses to Comments, although EPA did at the time of the 2011 Draft Permit misunderstand what the data in PSNH's 21-year data set represented, EPA's decision was based on a variety of data, and the Agency later reconsidered the relevant issues based on a correct understanding of the 21-year data set and other information. Based on this assessment, EPA does not agree with the comment's statement that the Agency's proposed denial of PSNH's variance application, as detailed in the 2011 Determinations Document, was in error. Moreover, EPA disagrees with the comment's statement that the record shows that Merrimack Station's past thermal discharges while operating as a baseload generator with an open-cycle cooling system did not appreciably harm the Hooksett Pool's BIP.

3.1 Long-Term Temperature Data Set

3.1.1 EPA's Misinterpretation of Key Temperature Data In Its 2011 Draft Permit Further Undermines the Agency's Decision to Deny PSNH's Request for a Thermal Variance

Comment II.3.1.1	AR-1548, PSNH, pp. 41-42
See also AR-872, Normandeau, pp. 96-100, 111-117, 125; AR-1573, Sierra Club et al. p. 4	

As EPA acknowledged in its Statement, EPA denied PSNH's request for a thermal variance from the requirements of § 316(a) based on a material misinterpretation by EPA of temperature data contained in Appendix A of Normandeau's April 2007 report, "A Probabilistic Thermal Model of the Merrimack River Downstream of Merrimack Station."[201] Appendix A of the 2007 Report tabulates "Historical Maximum, Minimum and Mean Average Daily Temperature as Measured at Merrimack Station Monitoring Stations N10, S0 and S4 and Predicted at Monitoring Station A-0 for Merrimack during the 1 April to 1 November period of 1984-2004."[202] EPA seeks comment concerning the import of this misinterpretation and concerning PSNH's new data submissions since closure of the 2012 comment period, as well as how shorter and longer-term thermal data should be factored into EPA's evaluation of the effects of Merrimack Station's thermal discharges on Hooksett Pool and EPA's development of thermal discharge limits for Merrimack Station.[203]

As EPA recognizes in its Statement, PSNH acknowledges that EPA's misunderstanding and misinterpretation of this data may have stemmed from a lack of clarity in Normandeau's April 2007 report. Nonetheless, EPA's interpretative error is substantial and permeates the entirety of its 2011 Fact Sheet and § 316(a) determination. When correctly interpreted, these data provide the minimum, average, and maximum daily average temperatures on a given calendar day that occurred typically only one time during the 21 years monitoring data was collected between 1984 and 2004.[204] By assuming the maximum daily average temperatures reported in Appendix A represented the 21-year average for each calendar day, EPA greatly overstated the actual river temperatures to which fish were exposed during those years. Indeed, based on this error, EPA concluded that the temperatures exceeded thermal tolerance criteria for alewife, American shad, yellow perch, and white sucker. When correctly interpreted, the data shows that most of the thermal tolerance limits used in EPA's analysis were never exceeded on dates at which the species and life stages in question are present in the river.[205] Compounding the error, EPA did not consider that, with respect to the RIS and their thermal tolerances, the area and volume of the Pool affected by the plume is negligible. Finally, EPA's confusion of a short term, 24-hour average value with a long term average does not yield a new data point of significance. Forty-five years of actual study demonstrate an absence of prior appreciable harm to the fish and macroinvertebrate communities and water quality of Hooksett Pool. Theoretical temperature tolerance thresholds pulled from a patchwork of academic reports cannot supersede the exhaustive, hands-on studies of every component of the aquatic ecosystem in the waterbody.

[201] *See* AR-1534 at 38.

[202] AR-10, Appendix A-2 through A-8.

[203] *See* AR-1534 at 40.

[204] *See* AR-10, Appendix A-2 through A-8.

[205] *See* AR-1300 at 13. And in those few instances in which EPA's criteria were exceeded, the number of dates on which they were exceeded, and the durations of the period when any exceedances occurred, were much smaller than was asserted by EPA and do not support a finding of appreciable harm. LWB 2017 Response at 2.

EPA Response:

Eversource comments that EPA's misinterpretation of the temperature data "permeates the entirety of its 2011 Fact Sheet and § 316(a) determination." EPA explained in its 2017 Statement that it would re-evaluate the conclusions from the 2011 Draft Determinations Document that were based on the Agency's original interpretation of the temperature data and would re-evaluate the use of the data in its assessment of the variance request. *See* AR-1534 p. 39. EPA first clarifies the error in its interpretation of the data, and then responds to the implications of the error on the § 316(a) variance determination for the Draft and Final Permits.

The temperature tables in Appendix A of Normandeau's 2007 Report include the title "Average Daily Maximum, Minimum and Mean Water Temperatures Measured at Monitoring Stations N-10, S-0, and S-4 and Predicted at A-0 for Merrimack Station for the 1 April – November Period of 1984 through 2004." *See* AR-10. These tables are also presented in the Determination Document as Appendix A. EPA understood this data to reflect the average daily minimum, mean, and maximum temperature for each day from April 1 to October 31 over a period of 21 years. *See* AR-1534 p. 38. The "average daily mean water temperature" would be calculated as the average of the mean daily temperature values reported for that day over 21 years. Similarly, EPA interpreted the "average daily maximum temperature" would be calculated as the average of 21 reported maximum temperature values for that day. This interpretation is consistent with the data format used to present temperature values in PSNH's annual environmental monitoring reports as far back as 1991 (*see, e.g.*, AR-298). The annual reports have consistently presented temperature data in a tabular format that includes the maximum temperature recorded (and time sampled,) the daily average temperature, and the minimum temperature recorded (and time sampled) for each day of the monitoring period. Accordingly, EPA interpreted the "Average Daily Maximum, Minimum and Mean Water Temperature" in Normandeau's 2007 Report to be the average of the maximum daily temperatures (and minimum and mean) consistent with the temperature data provided in its annual reports.

In its comments on the 2011 Draft Determinations Document (AR-872), Normandeau pointed out that EPA evaluated thermal impacts using a maximum water temperature documented to have occurred once in 21 years, not on an annual basis. *See* AR-872 p. 95. *See also* Response to Comment II.3.1.4. EPA understood this comment to mean that it may have mistakenly interpreted the "Average Daily Maximum, Minimum and Mean Water Temperatures' as presented in Appendix A of the 2007 Report. On September 4, 2015, after the public comment period, PSNH sent EPA a letter acknowledging that "EPA based its decision to reject PSNH's request for a thermal discharge variance due, at least in part, to what we now recognize as a misinterpretation of some of the key thermal results presented in Normandeau Associates ('Normandeau') April 2007 report entitled A Probabilistic Thermal Model of the Merrimack River Downstream of Merrimack Station (the 'Report')." *See* AR-1367. In its letter, PSNH clarified the errors in the interpretation of Normandeau's data, and recognized that "any misinterpretation of the data by the agency is due to a lack of clarity in the Report itself … and we regret that it was not presented better." *Id*. p. 2. Eversource verified Normandeau's comments that, in fact, the "average daily maximum temperatures" used in EPA's analysis are not 21-year averages of the daily maximum temperature, but the maximum value of the daily average temperature which occurred in a single year of the 21-year period. This an important distinction and EPA agreed that it had indeed misinterpreted the temperature data set provided in Normandeau's 2007 Report. *See* AR-1534 p. 39.

As explained in EPA's 2017 statement (AR-1534 p. 38), EPA requested additional information in response to PSNH's 2015 letter to clarify any potential uncertainty or confusion concerning the temperature data. *See* AR-1298. EPA requested a re-analysis of the temperature data to include the annual daily water temperature from the annual monitoring reports (in spreadsheet format rather than pdf), and a re-calculation of the 21-year data as average daily "instantaneous maximums" "instantaneous minimums" and "daily means." *See Id*. p. 3. In response to this request, Eversource submitted a new review of EPA's §316(a) determination from LWB (AR-1300), daily recorded temperature data for the period beginning 2002 through 2015, and the calculations EPA requested for the period 2002 through 2015. *See* AR-1299. PSNH responded that it presented values for the new time period (2002 through 2015, rather than Normandeau's original time period of 1984 through 2001) because the records from 1984 through 2001 were "not maintained in the normal course of business" and that generating electronic spreadsheets of this data would "require a significant amount of time and manpower for little to no benefit." *See Id*. p. 4. For the Final Permit, and in response to the comments received on the 2011 Draft Permit and 2017 Statement, EPA evaluated actual temperature data received in response to this request. EPA also considered the temperature data provided in the Facility's 2017, 2018, and 2019 annual reports.[6] *See* AR-1302; 1303; 1304; 1305; 1306; 1307; 1607; 1657; and 1658.

PSNH comments that denial of its request for a thermal variance under § 316(a) was based on a "material misinterpretation" of the temperature data. EPA acknowledges that, due to misleading titles in the tables, the data was incorrectly interpreted as average daily maximum temperatures. At the same time, the 2017 Statement explains that EPA's consideration and analysis of this temperature data was only part of the basis of the Agency's rejection of PSNH's proposed § 316(a) variance. AR-1534 p. 38. PSNH recognized this in its letter to EPA, stating that the Agency's "decision to reject PSNH's request for a thermal discharge variance [was] due, *at least in part*, to what we now recognize as a misinterpretation of some of the key thermal results…." AR-1367 (emphasis added). While the temperature data was a major component of EPA's

[6] Consideration of the actual, daily temperature data is consistent with comments received from CLF and Sierra Club that EPA consider the long-term, comprehensive continuous monitoring data for the three locations in the Merrimack River instead of relying on high-level summaries that hide peak temperatures and variation over time. *See, e.g.*, AR-1575 p. 9.

evaluation of the potential thermal impacts of the plume on the BIP (*see* AR-618, p. 78-116) the Agency also considered a substantial volume of fisheries data. Based on this fisheries data, EPA concluded that a significant change to the Hooksett Pool's balanced, indigenous population was evident and, moreover, that PSNH's analysis of fish population trends did not support its claim that Merrimack Station's thermal effluent had not appreciably harmed the BIP of the Hooksett Pool. *See* AR-618, p. 39-78. These two, distinct analyses together supported EPA's initial determination to deny the § 316(a) variance for Merrimack Station. Having said that, the 2017 Statement makes clear that EPA intended to re-evaluate conclusions from the 2011 Draft Determinations Document that were based on the original interpretation of the temperature data. EPA provides this re-evaluation in response to comments below.

PSNH comments that, due to the error in interpreting the maximum average temperatures, EPA greatly overstated the actual river temperatures to which fish were exposed during those years. PSNH adds that, when correctly interpreted, the data shows that most of the thermal tolerance limits used in EPA's analysis were never exceeded on dates when the species and life stages in question are present in the river. EPA's review of the actual, reported daily temperatures in the Merrimack River support the conclusions from the 2011 Draft Determinations Document in some cases, and show that in other cases EPA did unknowingly overstate some of the river temperatures to which fish were exposed. EPA addresses this issue in more detail in Response to Comment II.3.1.3, below.

PSNH also comments that EPA "did not consider that, with respect to the RIS and their thermal tolerances, the area and volume of the Pool affected by the plume is negligible." PSNH provides no supporting information or reference for this statement but raises the issue in other comments referencing the 2016 CORMIX model and additional analysis provided by LWB. EPA addresses the model and supporting analysis in detail in Responses to Comments II.3.3.3 and 3.3.4. EPA notes here, however, that PSNH did not provide an evaluation of the area and volume of the thermal plume for the 2011 Draft Determinations Document, and not did provide the necessary information for EPA to characterize the area and volume of the plume while developing the Draft Permit.

Finally, PSNH comments that the "confusion of a short term, 24-hour average value with a long term average does not yield a new data point of significance." Understood correctly, the single, maximum 24-hour average temperature for each calendar day over a period of 21 years does not provide a useful data point to assess PSNH's request to renew its existing thermal discharge variance under CWA § 316(a). The 2017 Statement, however, indicates that the clarifications about the data led EPA to reconsider how thermal data can support development of protective temperature limits. While long-term averages have utility, long-term averages can obscure the more extreme conditions that fish and other aquatic life could be exposed to over shorter, but still biologically significant, periods of time. *See* AR-1534 p. 39-40. PSNH does not explain its statement or comment on the issues raised in the 2017 Statement about the importance of exposure to high temperatures over shorter periods of time. As in the 2011 Draft Determinations Document, evaluation of the thermal impacts for a § 316(a) variance determination should consider "any information contained or referenced in any applicable thermal water quality criteria and thermal water quality information published by the Administrator under section 304(a) of the Act, or any other information he deems relevant." 40 CFR § 125.73(b). In other words, EPA maintains that fisheries data and analysis, applicable water quality criteria, and water quality standards must be considered *in combination with* the actual daily temperature data and knowledge of the thermal tolerance of the fish species in Hooksett Pool. This Response to Comments addresses comments and new analyses received during, and subsequent to, the public comment period for the 2011 Draft Permit. EPA addresses each of these issues in detail in the Responses to Comments below. *See, e.g.*, Response to Comments in Section II.3.1, 3.2, 3.3, and 4.0.

3.1.2 EPA's Interpretative Error is Substantial and Permeates Its Entire § 316(a) Analysis

Comment II.3.1.2	**AR-1548, PSNH, pp. 42-45**

PSNH's consultant, Normandeau, first identified the agency's interpretive error in its February 2012 Comments on EPA's Draft Permit for Merrimack Station.[206] It was not until PSNH submitted its September 4, 2015 letter to EPA, however, that the agency appreciated the gravity of its misinterpretation. The maximum temperature values provided in Appendix A of Normandeau's 2007 Thermal Model Report represented the maximum daily average that occurred on a given calendar day typically only one time during the 21 years monitoring data was collected between 1984 and 2004. EPA incorrectly construed these values as the 21-year average of the daily maximum temperatures for each day of the calendar year (*i.e.*, the "averaged daily maximum"). Normandeau's individual-day data tables in Appendix A do not offer any analyses with respect to the duration specific temperatures occurred on any given day, much less whether such durations spanned multiple days.

As explained in PSNH's September 4, 2015, letter to EPA, two examples illustrate the magnitude of EPA's error in its interpretation of the 21-year data set.[207] On page 120 of EPA's 2011 Fact Sheet (Attachment D) for the Draft Permit, EPA states: "The averaged daily maximum water temperature exceeded 83.0°F (28.3°C) . . . every day at Station S-4 from June 15 to September 10."[208] But this statement is incorrect. While it was proper for EPA to conclude from Appendix A to Normandeau's 2007 report that at some point in time during the 21-year data record the maximum daily water temperature at downstream Monitoring Station S4 exceeded 83°F at least one time on each given calendar day between June 15 and September 10 during the 21-year monitoring period, it was not correct to assert from the Appendix that these temperatures occurred on consecutive days in every year or even consecutively on any given days in any single year during this 21-year period. Second, the maximum water temperature values reported for Hooksett Pool Monitoring Stations N10, S0, or S4 (A0 is predicted) in Appendix A of Normandeau's 2007 Report do not represent actual, consecutive maximum daily mean temperatures occurring within the same year. Specifically, PSNH explained in its September 4, 2015 letter:

> [T]he maximum daily water temperature at downstream Monitoring Station S-4 in the Hooksett Pool on August 10th during the period 1984 through 2004 was 94.1°F. Although not reported in Appendix A, this single maximum daily water temperature among all 21 years of recorded data at Monitoring Station S-4 actually

> occurred on August 10, 1988. The maximum water temperature for August 11th among all 21 years of Monitoring Station S-4 data was 93.6°F, but this temperature occurred almost three years earlier, on August 11, 1985 . . . . EPA therefore erred in assuming that the maximum temperatures are consecutive within the same year and in using the Appendix A data in this manner.[209]

EPA's misinterpretation of Normandeau's 2007 Thermal Model Report is a cornerstone of the agency's 2011 Fact Sheet and its entire § 316(a) analysis.[210] EPA acknowledges this in its 2011 Fact Sheet: "Given its spatial and temporal coverage, EPA considered this data set [from the 2007 Normandeau Thermal Model Report] to be representative of actual thermal conditions in Hooksett Pool, and used it to assess potential temperature effects on certain species and lifestages . . . ."[211] What follows is a representative sample of instances in the 2011 Fact Sheet in which EPA relied upon its misinterpretation of the data in a manner that calls into question the agency's assertions and/or conclusions:

- Fact Sheet at 84-85: Comparing the 21-year Normandeau data set to Applied Science Associates, Inc.'s 2009 temperature study period and discrediting the 2009 data as not representative of typical river conditions by utilizing the misinterpreted Normandeau data;
- Fact Sheet at 89: Incorrectly asserting that the averaged maximum temperatures at Station S4 exceeded 84°F every day from June 25 to September 8;
- Fact Sheet at 93: Incorrectly asserting that that the average maximum temperature at Station S4 exceeded 85°F every day from June 25 to September 3;
- Fact Sheet at 93-94: Incorrectly asserting that the averaged maximum temperatures at Station S0 reached 92.9°F in mid-June;
- Fact Sheet at 104: Incorrectly asserting that the average daily maximum water temperatures at Station S0 ranged from a low of 79.2°F on May 3 to a high of 94.3°F on June 12;
- Fact Sheet at 105: Incorrectly asserting that temperatures "well exceeding" 89.6°F at Station S0 continue for the duration of the yellow perch larval period;
- Fact Sheet at 106: Referencing average daily maximum water temperatures and incorrectly asserting that they were at or exceeding certain threshold temperatures annually during discrete time periods;
- Fact Sheet at 107: Incorrectly asserting the averaged daily maximum temperature exceeded 82.4°F at Station S4 every day from June 10 to September 10 from 1984 to 2004;
- Fact Sheet at 112-13: Incorrectly referencing averaged daily maximum temperatures at S0 and S4 as exceeding certain thresholds on certain dates;

- Fact Sheet at 115: Incorrectly asserting that average daily maximum temperatures exceeded 85.8°F every day at Station S4 from June 25 to September 1;
- Fact Sheet at 119: Incorrectly referencing averaged daily maximum temperatures at S0 as exceeding certain thresholds on certain dates;
- Fact Sheet at 203: Incorrectly referencing averaged daily maximum temperatures at S0 as exceeding certain thresholds on certain dates;
- Fact Sheet at 204: Incorrectly asserting that the difference between maximum ambient river temperatures and average maximum temperatures at the mouth of the discharge canal "routinely exceeded" a certain threshold; and
- Fact Sheet at 206: Incorrectly asserting that the averaged maximum recorded temperatures at Station S0 reached 92.9°F in mid-June for the 21-year data set.

There are other instances of EPA relying on its misinterpretation of this data in the Fact Sheet and/or administrative record that are not readily apparent from the text. Nevertheless, it is clear from the above examples that this misinterpreted temperature data is foundational to the agency's § 316(a) analyses and conclusions and must be revisited by EPA.

[206] AR-1534 at 38 (citing AR-10, Appendix A-2 through A-8).

[207] *See* AR-1367 at 2.

[208] AR-618 at 120.

[209] AR-1367 at 2.

[210] *See generally* AR-618.

[211] *Id.* at 81-82.

EPA Response:

PSNH comments that EPA's misinterpretation of Normandeau's 2007 Thermal Model Report is a cornerstone of the Agency's entire § 316(a) analysis and, as a result, the assertions and/or conclusions of the analysis are called into question. PSNH also provides a "representative sample of instances" from the 2011 Draft Determinations Document where erroneous conclusions were based on this misinterpretation of data.

EPA acknowledges that the temperature data at issue was an integral part of its analysis of the Facility's thermal impacts in the 2011 Determinations Document and, therefore, a key factor in its proposed decision to reject PSNH's requested variance under CWA § 316(a). (As PSNH's consultants have acknowledged, though it is not mentioned in the above comment, EPA's misinterpretation of the data resulted from the misleading or unclear way in which it was presented by the Facility.) EPA's misinterpretation of temperature data (due to a lack of clarity in presentation) does not, however, necessarily support either that PSNH's proposed § 316(a) variance should be granted or that the BIP will be protected. Instead, it supports a re-examination of the in-stream temperature data and the potential of the Facility's thermal discharge to impact the biological community of Hooksett Pool for the Final Permit. Consistent with that, in the comment above, PSNH lists examples where the maximum temperature led EPA to conclude that conditions in the Merrimack River are unsuitable for various life stages and species and suggests that, as a result of these errors, the temperature data and conclusions from the 2011 Draft Determinations Document must be revisited.

In response, EPA *has* undertaken such a re-examination, as discussed in these Responses to Comments. Moreover, EPA discussed the data misinterpretation issue in the 2017 Statement and specifically invited additional public comment on that issue and the question of how to factor short-term and long-term data into the evaluation. AR 1534, p. 39-40. EPA has considered the comments submitted in response and factored them into its re-examination. EPA has also looked at the most recent temperature data available.

Plainly, the Agency's misinterpretation of the single maximum average daily value in 21 years as the average maximum daily temperature over 21 years resulted in an overestimate of the number of days that certain threshold values would be exceeded. As one example, PSNH references EPA's conclusion that "the averaged daily maximum water temperature exceeded 83.0°F (28.3°C) – the temperature Merrimack Station identified as an avoidance temperature for yellow perch - every day at Station S-4 from June 15 to September 10." AR-618 at 120. EPA now understands that AR-10 (Appendix A) demonstrates only that the maximum daily temperature at Station S4 exceeded 83°F during at least one of the 21 years of record on each calendar day between June 15 and September 10. As PSNH points out, temperatures exceeding 83°F may or may not have occurred in every year or on consecutive days in any single year. In fact, the summary data (AR-10 Appendix A), which only provides the range (*i.e.*, minimum and maximum) and average daily temperatures over 21 years provides no information about conditions in the river during any given year.

Still, when ambient river temperatures are elevated and river flow decreases, as can occur during the summer months at times, the plant's thermal effects on the lower Hookset Pool can be profound, particularly when the plant is operating both units. Such conditions occurred in 2004, a year when extensive fish sampling was conducted in August and September by Normandeau. Data shows that mean daily water temperatures at Station S0 exceeded the yellow perch avoidance temperature (28.3ºC) every day between June 21 and September 19, 2004 (excluding several days in July when Unit 2 was taken offline). The mean daily temperature at Station S4 also frequently exceeded 28.3°C during this period. Notably, the S4 mean daily temperature reached or exceeded 83°F for two weeks between July 31 through August 13 (See Figure II.1, below). While PSNH is correct that the maximum daily average data provided in AR-10 (Appendix A) and referenced in the 2011 Draft Determinations Document does not indicate that elevated temperatures occurred on consecutive days in every year or even consecutively on any given days in any single year during this 21-year period, EPA's re-evaluation of the daily temperature data from the annual reports demonstrates that river temperatures at Station S0 and even S4 were, indeed, higher than protective temperatures for thermally-sensitive species for many consecutive days or weeks in some years.

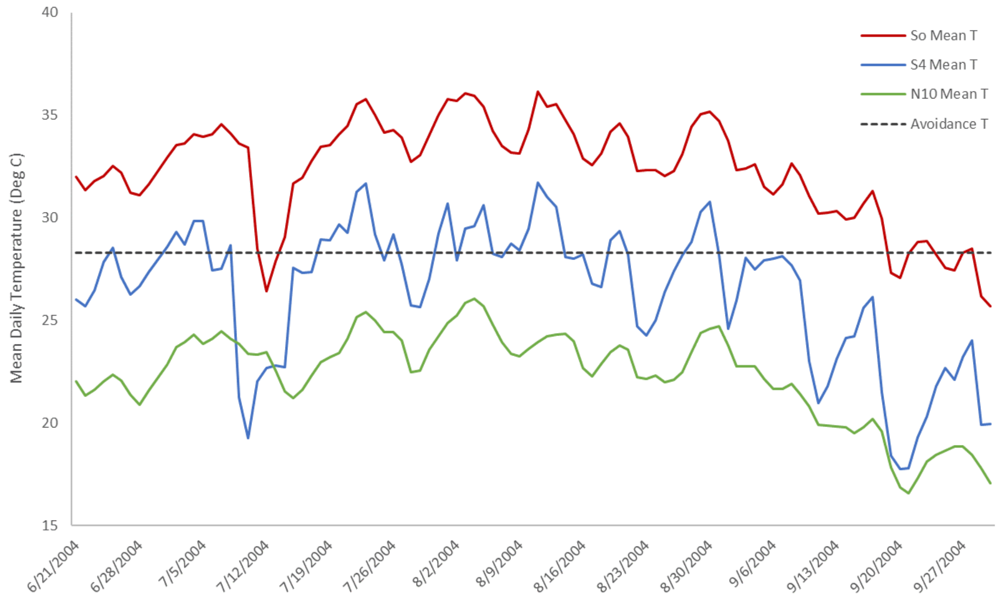

Figure II.1. Mean daily (24-hour average) temperature (deg C) at Stations S0 (discharge), S4 (downstream), and N10 (ambient) from June 21 through September 30, 2004 compared to the yellow perch avoidance temperature (28.3°C).

Fisheries data for 2004 presented in Normandeau's 2007 Fisheries Analysis Report (AR-3) suggests that the fish may have responded to the elevated temperatures in the thermal plume by avoiding the lower pool. According to the report, fish abundance in general was much lower in the "thermally-influenced" zone downstream from the plant's discharge with a total catch-per-unit-effort (CPUE) of 22.00 compared to 79.30 in the "ambient" zone upstream from the thermal discharge. For yellow perch, whose abundance was already low pool-wide, the CPUE was almost seven times lower in the thermally-influenced zone (CPUE 1.22 v. 0.18). AR-3, p. 62-63. Examining data over a single year, rather than relying solely on long-term averages, EPA demonstrates that thermal impacts from Station operation can result in river temperatures above exclusionary limits and these temperatures may result in behavioral changes (e.g., avoidance) in resident fish populations.

Thermal stress that extends for prolonged periods during a season, particularly the critical summer season when many fish utilize thermal conditions to optimize their ability to grow in length and weight, and to mature, can cause adverse effects to fish populations sensitive to those conditions. While EPA was initially confused by Normandeau's mislabeled temperature data, daily temperature data representative of baseload Station operation support EPA's conclusions that, in at least some years, the thermal discharge from Merrimack Station has resulted in elevated temperatures in the lower Hooksett Pool that can impact the aquatic community.

Reviewing the temperature data from Normandeau's 2007 Report and the updated data provided in 2016, two additional things became clear: (1) Merrimack Station's submission of individual day maximum temperatures over the 21-year period did not adequately support its request for renewal of the existing CWA § 316(a) variance; and (2) relying solely on (21-year) averages of daily average temperature data is not the best representation of the environmental impacts from Merrimack Station's thermal discharge because 21-year average values mask periodic, or seasonal, temperature excursions that reflect unsuitable conditions for the aquatic community.

For the Final Permit, EPA evaluated actual daily temperature data reported in the Environmental Monitoring Program Annual Reports. *See* AR-1715. In particular, in Responses to Comments 3.1.3 and 3.1.4, below, EPA addresses specific inconsistencies identified by PSNH's consultants that result from the error in interpreting the data and re-examines the conclusions from the 2011 Draft Determinations Document using daily, observed maximum and mean temperatures instead of relying only on long-term summary data that masks periods of prolonged elevated temperatures in any given year.

3.1.3 EPA's Misinterpretation of Representative Data Substantially Overstates Actual Temperatures to Which Aquatic Species Were Exposed

Comment II.3.1.3	**AR-1548, PSNH, pp. 46-51**
See also AR-1300, LWB, pp. 11-14, 34-37; AR-1554, LWB, pp. 1-2; AR-872, Normandeau, pp. 95-101, 106-108, 112, 118-119; AR-851, CLF, pp. 20-21, AR-1577, EPRI, pp. 3-3 to 3-8, 3-13 to 3-14	

EPA relied on the erroneous interpretation of the temperature data in evaluating the thermal effects on fish, comparing critical temperature values from scientific literature for various life stages of fish to temperatures from Appendix A for two stations: Stations S0, at the end of the Merrimack Station discharge canal, and Station S4, a thermally influenced station downstream from the canal. PSNH's consultant, Dr. Barnthouse, reviewed EPA's misapplication of this temperature data and summarized his findings in a report entitled "Review of technical documents related to NPDES Permitting Determination for the Thermal Discharge and Cooling Water Intake Structures at Merrimack Station," which was submitted to the agency in February 2016.[212] This report sets out a representative sample of EPA's errors in its Attachment D to the 2011 Draft Permit and explains how EPA's analyses must be revised to account for the actual temperature data included in Appendix A of Normandeau's 2007 Thermal Model Report. These examples are discussed below and provide further proof EPA must revisit the entirety of the agency's § 316(a) analysis.

First, three of the species evaluated by EPA—the alewife, American shad, and Atlantic salmon—do not reproduce naturally in the Merrimack River and therefore would be present in the Hooksett Pool solely because of upstream stocking efforts.[213] Eggs and larvae from the three species could only be present in the waterbody segment due to potential drift following spawning, according to Dr. Barnthouse.[214] Juveniles of these three species would only be present in the Hooksett Pool for a discrete period of time as they pass through during outmigration.[215]

As to the alewife species, EPA's assertion that Merrimack Station's discharge creates an "unsuitable habitat" based on the agency's comparison between a temperature observed to be lethal to alewife larvae (94.1°F) and what EPA misinterpreted as the average maximum temperature recorded at Station S0 on a given date when herring larvae were collected in entrainment samples at the station (also 94.1°F) is likewise erroneous.[216] As explained above, this 94.1°F was the singular highest average temperature observed at Station S0 on one given date during a 21-year period, not the average maximum temperature for that date over all 21 years.[217] EPA's use of this singular day data-point in a 21-year period to support a conclusion of appreciable harm provides "an unrealistically conservative analysis."[218]

Dr. Barnthouse also successfully refutes EPA's use of temperature data from S4 to maintain that temperatures at the monitoring Station are higher than the published, preferred temperatures of alewife juveniles and therefore Merrimack Station's thermal discharge creates an unsuitable habitat for juvenile alewives. These temperatures occur at S4 only between June 25 and September 4. Years of historical impingement data collected by PSNH, in fact, reveal that outmigrating juvenile alewives do not pass by Merrimack Station until early September through October. EPA's analysis is therefore arbitrary and capricious and cannot reasonably be used to support a conclusion of appreciable harm.

Further, Dr. Barnthouse notes EPA incorrectly applied temperature data from Normandeau's 2007 report to assess the effects, if any, of Merrimack Station's thermal discharge on American shad.[219] Utilizing laboratory-derived thermal tolerance limits, EPA provides on page 93 of its 2011 Fact Sheet that the habitat at Station S4 is an unsuitable habitat for juvenile American shad because the average maximum temperature at that station from Appendix A exceeds the maximum tolerance limit from published literature on "every date from June 25 to September 3."[220] This conclusion, like many others in the 2011 Fact Sheet, is incorrect due to EPA's misinterpretation of the temperature data. Applying average daily temperatures over the 21 year period, between June 25 and September, temperatures at S4 were well below the tolerance limit (85°F) for American shad.[221] The data, when correctly interpreted, "means that on average the habitat at Station S-4 was suitable for American shad on all days throughout this period, although during exceptionally warm years temperatures outside the preferred range occurred on some days."[222] EPA's analysis of acute mortality due to thermal plume exposure is also invalid, according to Dr. Barnthouse, "because it assumes that juvenile shad are acclimated to cool temperatures found upstream of the discharge (Station N-10), swim or drift downstream to Station S-0, and remain within the plume long enough to die. In reality, any juvenile [American] shad approaching the plume would simply avoid the elevated temperatures altogether."[223]

Misinterpretation of temperature data from Normandeau's 2007 Thermal Model Report by EPA also renders ineffectual the agency's assessment of Merrimack Station's thermal discharges on the survivability of yellow perch larvae, according to Dr. Barnthouse. EPA utilizes thermal tolerance limits from literature to support its assertion that temperatures at Station S0 would cause appreciable harm to yellow perch larvae.[224] In fact, mean daily temperatures at Station S0 did not exceed any of the thermal limits discussed by EPA between May 1 and June 14, which is the time yellow perch larvae were collected in Normandeau's ichthyoplankton survey, and neither the mean nor the maximum average daily temperature exceeded these limits at Station S4.[225] EPA's analysis of effects of thermal exposure on juvenile and adult yellow perch is equally flawed based on the agency's misinterpretation of temperature maximums provided in Appendix A of Normandeau's 2007 report.[226] Specifically, EPA claims in its 2011 Fact Sheet that the average daily maximum water temperature at Station S4 exceeded the avoidance temperature of yellow perch on every day from June 15 to September 10, in each of the 21 years in the data set.[227] This is incorrect. Correctly interpreted, the maximum temperature listed in Appendix A from June 15 to September 10 was reached in only one year out of the 21-year data set and these maximums often were not reached in the same or even sequential years.[228]

As a result of EPA's erroneous interpretations, the entirety of EPA's yellow perch reproduction discussion in the agency's 2011 Fact Sheet is necessarily flawed. EPA specifically asserts that yellow perch are attracted to the thermal refuge of the discharge canal during winter months, which may result in premature spawning in the canal and may impair reproductive ability due to the lack of a "chill period" necessary for complete development of the species' gonads.[229] As explained by Dr. Barnthouse, this supposed "chill period" hypothesis for yellow perch is highly speculative and EPA's premature spawning theory is "highly unlikely."[230]

EPA's misapplication of the temperature data in Normandeau's 2007 report also resulted in its erroneous evaluation of the effects of Merrimack Station's thermal discharge on the white sucker population.[231] As to larvae and juveniles, EPA improperly compares what it perceives are the average maximum temperatures at Stations S0 and S4 to laboratory-derived thermal tolerance limits to conclude thermal discharges from Merrimack Station are causing appreciable harm to white suckers at these life stages.[232] Looking only at the mean average daily temperatures, Dr. Barnthouse explains:

> [T]emperatures at Station S-0 would have begun to exceed the lethal temperature for white sucker larvae on or about June 22, near the end of the period during which white sucker larvae are present in the vicinity of Merrimack Station. At Station S-4 downstream from the discharge, the average temperature would never exceed the thermal tolerance limit. Similarly, the average daily temperatures at Station S-4 never exceeded the thermal tolerance limit identified by EPA for juvenile and adult [yellow] perch . . . .[233]

Although a discrete set of maximum average daily temperature values at Station S4 during exceptionally warm periods did exceed the tolerance limit for white sucker in the 21-year data set, these exceedances are immaterial because electrofishing samples discussed by EPA on page 114 of its 2011 Fact Sheet reveal the distribution of white suckers during the summer is primarily upstream from the thermal discharge.[234] These fish may prefer cooler water upstream of the discharge, according to Dr. Barnthouse, and simply avoid the lower portions of the Hooksett Pool during these times, although other habitat characteristics besides temperature could explain this distribution.[235]

[212] *See* AR-1300.

[213] *Id.* at 12.

[214] *Id.*

[215] *Id.*

[216] AR-618 at 88.

[217] *See* AR-1300 at 12.

[218] *Id.*

[219] *See* AR-1300 at 12-13.

[220] AR-618 at 93.

[221] AR-1300 at 13.

[222] *Id.*

[223] *Id.*

[224] *See, e.g.*, AR-618 at 100, 180-81.

[225] AR-1300 at 13-14.

[226] AR-1300 at 14.

[227] *See, e.g.*, AR-618 at 106.

[228] AR-1300 at 14.

[229] AR-618 at 100-102.

[230] *See* AR-1300 at 13 (citing Carlander (1997) as support for the fact that yellow perch prefer to spawn over vegetation or submerged branches, which would not be present in Merrimack Station's discharge canal).

[231] *See* AR-1300 at 14.

[232] *See, e.g.,* AR-618 at 112-13.

[233] AR-1300 at 14.

[234] AR-618 at 114.

[235] *See* AR-1300 at 14.

EPA Response:

Section 5.6.3 of the 2011 Draft Determinations Document considered the thermal impacts of the discharge from Merrimack Station on nine representative important species (RIS) of the balanced, indigenous population (BIP), which is represented by a suite of resident and migratory species. In the comment, PSNH summarizes findings from LWB's 2016 assessment of how the misapplication of the Normandeau temperature data influenced EPA's consideration of the thermal impacts on the RIS. *See* AR-1300. The comment above, as well as the 2016 Report (AR-1300), LWB's comments on the 2017 Statement (AR-1554), and Normandeau's comments on the 2011 Draft Permit (AR-872) present examples of analyses and conclusions from the 2011 Draft Determinations Document that, according to the commenters, are incorrect due to the misinterpretation of the temperature data (discussed in detail in Responses to Comments II.3.1.1 and 3.1.2). EPA addresses the comments in detail below.

PSNH's comment and supporting document (AR-1300 at 12) appear to suggest that alewife, American shad, and Atlantic salmon should not be included in the BIP because they do not reproduce naturally in the Merrimack River and would be present in the Hooksett Pool solely because of upstream stocking efforts. First, alewife, American shad, and Atlantic salmon are native to the Merrimack River and stocking of these species is an effort to *restore* their populations.[7] *See* AR-618 at 87, 90, 94. In keeping with the objective of the Clean Water Act, which is "to restore and maintain the chemical, physical, and biological integrity of the Nation's waters" (33 U.S.C. § 1326(a)), EPA considered the BIP of the Merrimack River to include species that were historically part of the indigenous population and are currently the focus of efforts to restore natural populations. The Agency's approach is consistent with 40 CFR § 125.71(c). Neither the comment nor the supporting report cite to any EPA guidance or regulation to support its statement that alewife, American shad, and Atlantic salmon should not be considered simply because they are stocked, especially when stocking of these species is an effort to restore their natural populations to the river. EPA also received comments expressing the contrary view that anadromous species must be included in the analysis of thermal impacts. *See* AR-851 p. 20-21. LWB comments that it is unknown whether "significant numbers of early life stages of any of these species are present in Hooksett Pool…where they could be exposed to the thermal discharge from Merrimack Station." AR-1300 at 12. Yet, alewife and American shad eggs, larvae, and juveniles have been observed during biological sampling in the Hooksett Pool and, as a result, could be exposed to the thermal discharge from Merrimack Station. *See* AR-2, AR-1550. *See also* AR-618, p. 89, AR-203, AR-226, AR-227 AR-228. In its comments on the 2011 Draft Permit, Normandeau comments that American shad were documented successfully spawning in Hooksett Pool during a 1978 study and juvenile American shad were captured during sampling in July and August that year. *See* AR-872 at 96, 99. Normandeau's comments also indicate that the timing of observations of juvenile American shad at the Amoskeag Pool suggests that they developed in Hooksett Pool. *See* AR-872 at 97. The information reviewed for the 2011 Draft Permit the comments submitted on the 2011 Draft Permit support the inclusion of American shad and alewife as part of the BIP.[8]

In the 2011 Draft Determinations Document, EPA focused on what the Agency had thought were long-term average maximum daily temperature data because this data (as misinterpreted) demonstrated consistent exceedances of certain protective threshold temperatures and, as a result, supported EPA's conclusion that the thermal discharge under the requested variance would not be sufficiently protective of the BIP. As explained above, EPA misunderstood the maximum daily average temperature data from Appendix A in AR-10 due to the misleading or unclear way in which the data was presented. *See* AR-1534 pp. 38-39 and Responses to Comments II.3.1.1 and 3.1.2. The "maximum daily average" that EPA understood as the 21-year average maximum temperature on a given day is actually the maximum average daily temperature that occurred on a single date over the 21 years. As the comments point out, this misunderstanding led EPA to, in some cases, overstate the duration of exposure to temperatures above certain thresholds in the 2011 Draft Determinations Document. PSNH, LWB, and Normandeau all provide examples from the Draft Determinations Document where EPA

[7] For the Final Permit, EPA focuses on American shad and alewife because Atlantic salmon stocking was terminated in 2016 in New Hampshire. https://www.wildlife.state.nh.us/fishing/profiles/atlantic-salmon.html. In addition, as explained in the Determination Document, American shad and yellow perch are the most thermally sensitive species, and thermal limits derived for the protection of these species will also be protective of Atlantic salmon.

[8] The current Federal Energy Regulatory Commission (FERC) license for hydroelectric projects on the Merrimack River (AR-1671) requires fish passage for anadromous fish to be operational within three years after the passage of a threshold number of fish at the Amoskeag Dam (which has an operational fish ladder). The number of river herring at the Amoskeag Dam surpasses this threshold during the 2016 migration season. At the time, Eversource initiated consultation with state and federal agencies to begin the process of installing upstream passage at the Hooksett and Garvins Falls Dams. https://lowimpacthydro.org/hooksett-lihi-162/

misinterpreted the data, but the comments lack sufficient evidence to support the contrary conclusion, namely, that the life stages and species *are* protected from exposure to elevated temperatures in the thermal plume. After indicating where EPA's interpretation of the temperature data was in error, both LWB and Normandeau rely on long-term average temperatures provided in 2007 (the "2007 data") (AR-3 Appendix A), which spanned the years from 1984 to 2004 or the revised data provided in 2016 ("2016 data") (AR-1299), which spanned the years from 2002 through 2015. In EPA's view, the comments highlight the shortcomings of relying on average temperature values summarized over many years of data. The values illustrate only the average value over many years of data but do not demonstrate how the thermal plume could impact the BIP in any given year. Long-term average temperatures mask occurrences of daily temperatures that exceed protective temperatures on a given day or grouping of days in any year(s). The exceedance of protective temperatures over multiple days and/or in consecutive years represent conditions could harm the biological community. In responding to comments on thermal conditions in the Merrimack River, EPA evaluated available, daily temperature data from Stations N10, S0, and S4 over the period from April 2004 through May 2019 from Merrimack Station's Annual Monitoring Reports and daily generating data (MWh) for Merrimack Station Units 1 and 2 for the years 2004 through 2019 from EPA's Air Markets Program Database.[9] *See* AR-1715. As PSNH suggests, this range of years provides years that are representative of past, current, and likely future operation of the Station and, as such, are suitable for examining the thermal impacts of the Station on the BIP.

Alewife

The Determination Document concluded that Merrimack Station's discharge creates unsuitable habitat for alewife larvae because the maximum temperature at Station S0 on June 11, when alewife larvae have been observed in the Merrimack River, reached a level that is potentially lethal to larvae even after limited exposure (34.5°C). See AR-618 p. 88. EPA's understanding of Normandeau's temperature data (AR-10) indicated that the average daily maximum temperature at Station S0 on June 11 over 21 years reached 34.5°C (94.1°F), which EPA maintains would indicate that the habitat is not suitable. In fact, the data demonstrates that the maximum average daily temperature reached 34.5°C in at least one of the 21 years. LWB comments that the average daily maximum S0 temperature on June 11 from 2002 through 2015 was 27.8°C (82°F) and that the average daily maximum S0 temperature did not reach 34.5°C until July 16. *See* AR-1300 at 34. *See also* AR-872 p. 95-6. However, that the average, maximum daily (or mean daily) temperature over fourteen years does not reach 34.5°C does not indicate how often river temperatures may have reached lethal temperatures in any given year. In addition, the 2016 average temperature data likely underestimates the actual temperature of the effluent when the Station is operating because it combines years in which the Station was operating as a baseload plant (2002 through about 2010) with years when operations were similar to a peaking plant (2011 to 2015) and the Facility was likely not operating for much of the summer.[10] *See* Response to Comment II.3.2.2, 3.2.3.

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[9] https://ampd.epa.gov/ampd/

[10] EPA reviewed the difference in the calculated 21-year average of the mean daily temperature at Stations S0 and S4 from the 2007 Normandeau data (from 1984 to 2004) and the revised 2016 data (from 2002 to 2016). Average temperatures in the 2016 dataset were typically 1°C to 3°C lower than the average on the same day in the 2007

Instead of relying on long-term averages, EPA reviewed daily temperature data over the period from 2004 through 2018. Maximum daily temperatures in early to mid-June rarely reached levels that would be lethal to alewife larvae and mean daily S0 temperatures never reached 34.5°C. Still, there are times when the maximum daily temperature at Station S0 may not be suitable for alewife larvae when this life stage is likely to be present. For example, the maximum daily temperature reached 34.5°C on June 10 through June 12 in 2008, and on June 8 and 9 in 2011 At the same time, the highest daily maximum temperature at Station S4 was 28.4°C when the daily mean at Station S0 exceeded 34.5°C (on June 10, 2008). On days when the S0 temperature reached 34.5°C, the temperature decreased between 7.1 and 9.3°C in the approximately 2,000 feet between Station S0 and S4. EPA estimated the drift time at about 60 minutes assuming a minimum river velocity of about 0.5 fps. *See* AR-618 p. 189-90, AR-872 p. 99. A drifting larval alewife would only be exposed to potentially acutely lethal temperatures for a portion of the time it takes to travel from Station S0 to S4, and, given the overall decrease in temperature, such exposure would likely be for a sufficiently short duration and distance not to result in mortality. Re-examining river temperatures in June when alewife larvae are present suggests that temperatures are generally not high enough to cause lethality in late May and June. *See* AR-1306. In addition, maximum temperatures in 2008 and 2011 were reached only when the Station was operating at relatively high capacity (more than 80%). Prior to 2012, when the highest temperatures were observed, Merrimack Station operated near capacity in early to mid-June. Since 2012, Merrimack Station has operated, at most, 5 days between June 1 and June 15, and frequently only operates one of the two units. Recent temperature data suggests that under current operating conditions, river temperatures will be protective of alewife larvae when they are likely to be present.

According to PSNH, LWB's analysis refutes EPA's 2011 conclusion that juvenile alewives are not protected during the period when they may be present, which PSNH asserts is early September through October. The Agency's 2011 Determinations Document (AR-618 pp. 89, 206) states that out-migration of alewives typically occurs in September and October, consistent with PSNH's description, but also points out that juvenile and young-of-year river herring have been collected in late August (See AR-3, pp. D-52-53). *Id*. at 89. Both commenters characterize the out-migration period as early September through October, and LWB states that "impingement of alewives at Merrimack Station has been documented no earlier than September 3." AR-1300 at 35. *See also* AR-228. Neither PSNH nor LWB refute Normandeau's 2006 fisheries data that demonstrates the presence of juvenile alewives in late August. If PSNH's own studies have demonstrated the presence of juvenile alewife in the Merrimack River in late August, EPA's consideration of river temperatures from late August and early September in its evaluation of thermal impacts to juvenile alewife cannot be "arbitrary and capricious."

In the 2011 Draft Determinations Document, EPA concluded that the daily average maximum temperature at Station S4 exceeded 28.9°C (84°F) (the avoidance temperature for juvenile alewife) on every date from June 25 through September 8. *See* AR-618 p. 89. Again, the 2007 Normandeau data actually demonstrates only that the maximum S4 temperature exceeded 84°F on every day from June 25 through September 8 in at least <u>one</u> year during the 21-year period.

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dataset, likely because the revised 2016 data includes recent years when Merrimack Station transitioned to substantially reduced operations during the summer during the years from 1984 to 2004.

Based on the 2016 averaged data summary, LWB states that the average maximum temperature only exceeded 28.9°C on 14 days between July 16 and August 10, which is before juvenile alewife would be migrating. *See* AR-1300 p. 35, AR-1299. LWB and PSNH conclude that temperatures will be protective during the period in which alewives would be migrating past Merrimack Station. *See id*. EPA reviewed *daily* temperature data over the period from 2004 through 2018. The maximum daily temperature at Station S0 and S4 frequently exceeds 28.9°C after August 10 through early September, including as late as September 22 (at Station S4) and September 28 (at Station S0). Daily data from 2010 demonstrate that the mean daily temperature at S4 during that year was above 28.9°C from August 13 through August 22 and again from August 31 through September 9, and that the maximum daily temperature exceeded 28.9°C for nearly the entire period from August 10 through September 9 (Figure II.2, below). The daily data demonstrates that, in contrast to the LWB's analysis and consistent with EPA's conclusion in the 2011 Draft Determinations Document, temperatures in the river are above the protective temperature during the period when outmigrating juvenile alewife are present.

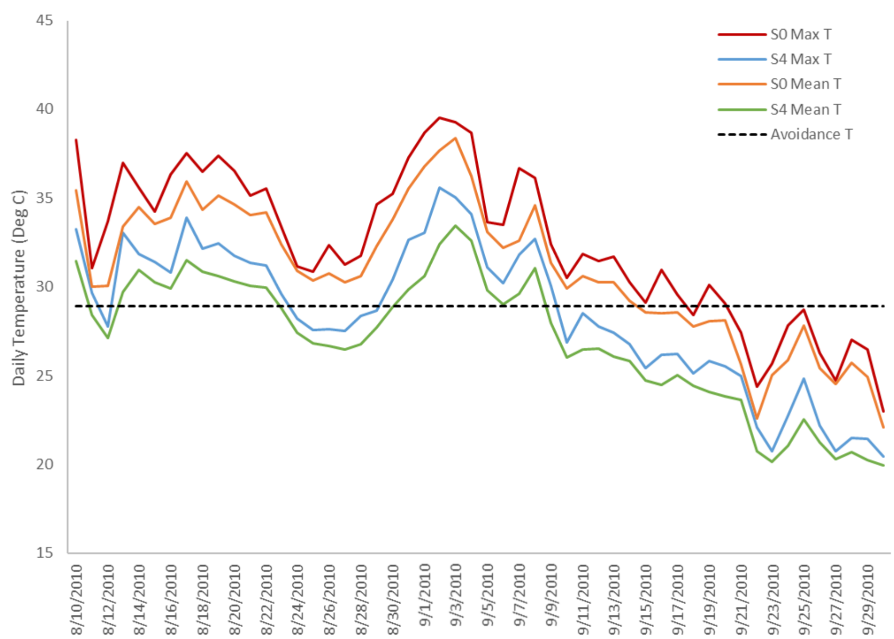

Figure II.2. Mean and maximum daily (24-hour average) temperature (deg C) at Stations S0 (discharge) and S4 (downstream) from August 10 through September 30, 2010 compared to the juvenile alewife avoidance temperature (28.9°C).

At the same time, EPA acknowledges that juvenile alewives could potentially avoid higher temperatures if the plume were sufficiently limited to allow areas of passage. The 2016 data demonstrate that the average daily temperature at Station S0 is less than the avoidance temperature of 28.9°C (84°F) on each day beginning on September 5, which indicates that river temperatures at S0 appear to be suitable for juvenile alewives by the end of the first week of September. When operating as a baseload plant, such as in 2010, the sustained, elevated temperatures could potentially exclude juvenile alewife from habitat downstream of the Merrimack Station for sustained periods, including when juveniles are outmigrating and must travel through the lower Hooksett Pool. However, under current operations (like a peaking plant) Merrimack Station operates infrequently in August and September, and, as a result, the temperature at Station S4 is typically well below the avoidance temperature for juvenile perch. As an example, Figure II.3 presents the mean and maximum observed temperatures at Stations S0 and S4 in August and September 2016, when the capacity of the Station was, on average, 9%. Excursions of protective temperatures for juvenile alewives are limited in duration and extent. This data suggests that, under current operations, the thermal plume is unlikely to impact juvenile alewives because juveniles can avoid the plume and will not be excluded from potentially suitable habitat for extended periods of time.

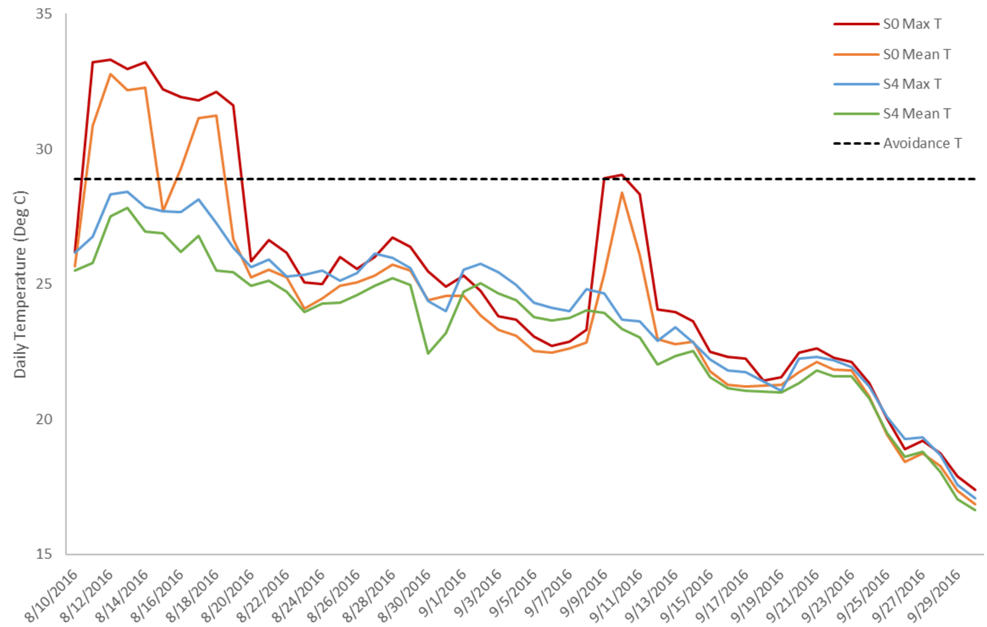

Figure II.3. Mean and maximum daily (24-hour average) temperature (deg C) at Stations S0 (discharge) and S4 (downstream) from August 10 through September 30, 2016 compared to the juvenile alewife avoidance temperature (28.9°C).

American Shad

In the 2011 Draft Determinations Document, EPA concluded that Station S4 is unsuitable habitat for juvenile American shad because maximum daily temperatures exceeded 29.4°C (the tolerance limit for juvenile American shad) on every date from June 25 through September 3. *See* AR-618 p. 93. Comments from PSNH and LWB indicate that the average daily S4 temperatures between June 25 and September 3 over the 21-year period were well below 29.4°C. *See* AR-1300 at 35-6. *See also* AR-872 p. 96. PSNH maintains that, on average, and when correctly interpreted, "the habitat at Station S-4 was suitable for American shad on all days throughout this period, although during exceptionally warm years temperatures outside the preferred range occurred on some days." LWB's 2016 review of the temperature data (2002 through 2015) indicates that the average maximum temperature at Station S4 reached 29.4°C on six dates between July 18 and August 5. *See also* AR-872. pp. 97-8. Review of daily temperature data from 2004 through 2018, however, indicates that the mean and maximum S4 temperatures frequently reach or exceed 29.4°C between June 25 and September 3 when Merrimack Station is operating, in some instances for durations more than 30 days (e.g., 2005, 2010).

Normandeau also comments that, based on the mean average daily temperature (rather than just the maximum), Station S0 did not reach the lethal temperature identified for larval American shad (33.3°C) at all in June and only on 10 dates in July, and that the mean average daily temperature at Station S4 is well below the lethal temperature for all dates in June and July. *See* AR-872 pp. 98-9. Yet, EPA's review of daily temperature data from 2004 through 2018 indicates that the mean, maximum, and minimum S0 temperatures reach or exceed 33.3°C in July, when Merrimack Station is operating, in some cases for 25 days or more (e.g., 2004, 2007, 2010, 2011). The mean daily temperature at Station S4, however, is typically below lethal temperatures, though mean temperatures did reach or exceed 33.3°C on 8 days in 2010. In addition, the maximum S0 temperature has rarely reached 33.3°C at Station S0 since 2014, and S4 temperatures have not reached lethal temperatures since 2010.

While EPA overestimated the duration that the maximum temperature at S4 exceeded certain thresholds (due to a misunderstanding of the data), PSNH, Normandeau, and LWB, by relying only on long-term average data, plainly underestimate the severity and duration of exceedances of the protective temperature for juvenile and larval American shad due to the thermal plume during the period when they are likely present in the Merrimack River. Again, however, the potential impacts of the thermal plume on American shad have changed substantially since Merrimack Station transitioned to reduced operations like that of a peaking plant. As an example, Figure II.4 presents the mean and maximum daily temperature at Station S4 in 2018, which is representative of average operation in August and September and includes 6 dates in July when exceeded protective temperatures for larval American shad at Station S0. Under current operations, temperatures at Station S4 rarely reached or exceeded protective temperatures for juvenile American shad and exceedances that did occur were limited in duration. EPA concludes that the thermal plume under current operations is unlikely to impact juvenile American shad because juveniles are likely to avoid the plume for the limited period when it is present downstream of the discharge and will not be excluded from potentially suitable habitat for extended periods of time. EPA has also determined, in response to this and other comments received, that acute mortality is not likely to occur as a result of exposure to the thermal plume because, as just noted, American shad juveniles are mobile, will likely avoid extreme temperatures that may occur in the relatively limited segment from S0 to S4, and because under current operations it is uncommon for river temperature to exceed the acutely lethal temperature. In addition, an acute mortality limit at Station S4 will ensure that conditions in the river are protective of American shad larvae and will not result in acute mortality. *See* Response to Comment II.3.4.7.

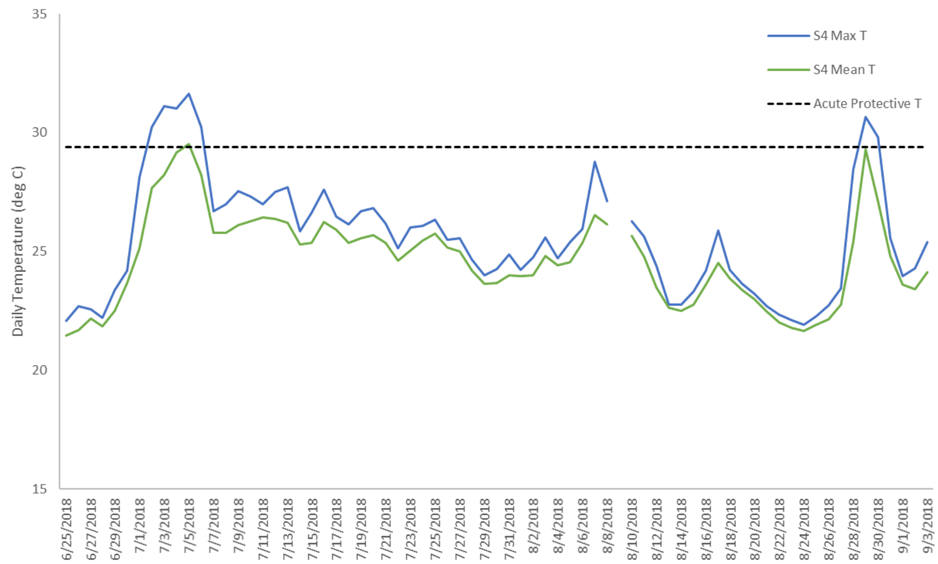

Figure II.4. Mean and maximum daily (24-hour average) temperature (deg C) at Station S4 (downstream) from June 25 through September 3, 2018 compared to the acute protective temperature for juvenile American shad (29.4°C).

Yellow Perch

In the 2011 Draft Determinations Document, EPA concluded that yellow perch larvae were likely to have been exposed to potentially lethal temperatures in the thermal plume. *See* AR-618 p. 104-5. Based on its review of the 2007 Normandeau data, temperatures at Station S0 exceeding 31.3°C can begin as early as May 20 and extend through the end of the larval period (June 15). *See id*. PSNH and LWB comment that, correctly interpreted, the average, mean daily temperatures at Station S0 did not exceed any of the thermal limits discussed by EPA between May 1 and June 14 and neither the mean nor the maximum average daily temperature exceeded tolerance limits at Station S4 during this period. *See also* AR-872 p. 107. EPA's review of daily temperature data from 2004 through 2018 confirms that the mean and maximum S4 temperatures did not exceed 31.3°C between May 1 and June 14; however, the maximum and mean daily temperature at Station S0 did reach or exceed 31.3°C in 2005, 2008, 2010, and 2011, and the maximum daily S0 temperature exceeded 31.3°C in 2007 and 2013. Therefore, in contrast to the comment, the daily data suggest that, while not persistent, temperatures at Station S0 have reached or exceeded potentially lethal temperatures for yellow perch larvae in some years from May through June 14. In many cases, Station S4 temperatures were 26°C or less when the Station S0 temperature exceeded 31.3°C, suggesting that the duration of exposure to potentially lethal temperatures would be limited. However, on multiple days in 2008 and 2011, yellow perch larvae acclimated to temperatures of 22°C to 23°C were exposed to mean daily S0 temperatures at 34°C or more. Wismer and Christie (AR-95) observed lethality of yellow perch larvae under similar conditions in as little as 10 minutes, which suggests that, at least during some periods when the Station is operating as a baseload plant, yellow perch larvae may be exposed to temperatures at durations that could result in lethality. *See* AR-618, p. 104.

When operating like a peaking plant, from 2012 through 2018, the Facility operates infrequently during May and June. Since 2012, the maximum daily river temperature at Station S0 has only reached 31.3°C on one date (6/2/2013). On this single date, the temperature at Station S0 reached or exceeded 31.3°C for a duration of 6 hours, during which time the Station S4 temperature ranged from 19°C to 21°C, which indicates that yellow perch are unlikely to be exposed to lethal temperatures that could result in mortality during the period when they will be present in the Merrimack River under current operation conditions. Moreover, the Final Permit includes an acute mortality limit at Station S4 of 29.3°C from May 1 through May 31 and 30.9°C from June 1 through June 21 to assure that conditions in the river are protective of yellow perch eggs and larvae and will not result in acute mortality. *See* Response to Comment II.3.4.7.

In the 2011 Draft Determinations Document, EPA concluded that temperatures at Station S4 reached or exceeded the avoidance temperature for yellow perch juvenile and adults (28.3°C) every day from June 15 to September 10. *See* AR-618 p. 106. Correctly interpreted, the maximum temperature from June 15 to September 10 was reached at Station S0 in at least one year out of this 21-year data set but not necessarily in the same or sequential years. LWB comments that, based on the average daily temperature data over the period from 2002 through 2015 (received in 2016), the 14-year average mean daily temperature at Station S4 did not exceed 28.3°C (83°F) on any calendar day during this period and the average daily maximum temperature reached or exceeded 28.3°C on 22 calendar days between July 16 and August 10. LWB also comments that juvenile and adult yellow perch would avoid the plume during the hottest part of the day when the S4 temperature exceeds the avoidance temperature. *See also* AR-872 p. 107-8. EPA notes that there are only 26 dates between July 16 and August 10, so the data shows the maximum average daily S4 temperature over the period 2002 through 2015 exceeded 28.3°C nearly all of the time between July 16 and August 10. EPA's review of daily temperature data from 2004 through 2011 indicates that the mean and maximum S0 and S4 temperatures steadily exceed 28.3°C between June 15 and September 10 in most years under baseload conditions, consistent with the analysis in the 2011 Draft Determinations Document. As an example, Figure II.5 illustrates persistent temperatures at the discharge and downstream that exceed the avoidance temperature for juvenile and adult yellow perch for the entire summer period. Even if adults and juveniles can avoid the plume by staying, as LWB suggests, in the cooler water upstream of the discharge, the thermal plume from Merrimack Station plainly caused a portion of Hooksett Pool to be unsuitable for yellow perch for the entire summer in multiple years.

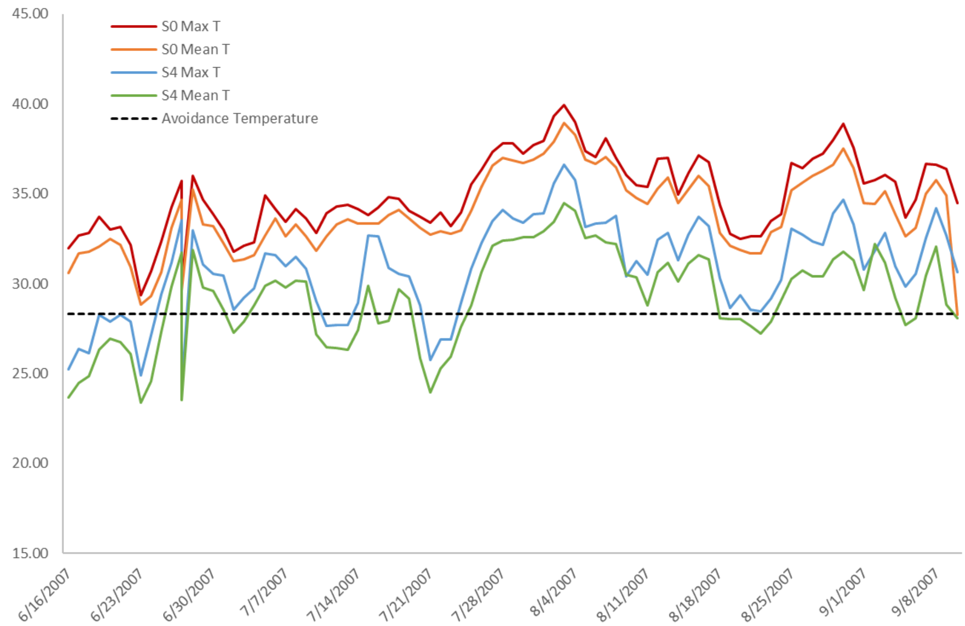

Figure II.5. Mean and maximum daily (24-hour average) temperature (deg C) at Stations S0 (discharge) and S4 (downstream) from June 16 through September 10, 2007 compared to the juvenile and adult perch avoidance temperature (28.3°C).

However, the potential impacts of the thermal plume on juvenile and adult yellow perch have changed substantially since 2012 when Merrimack Station transitioned to a peaking plant. Figure II.6 illustrates that, under current operating conditions (in 2016, which is representative of above average operating capacity compared to recent summers), the mean and maximum daily temperature at Station S0 only occasionally reached or exceeded avoidance temperatures for yellow perch and exceedances that did occur were limited to a few days. The mean daily temperature at Station S4 did not exceed avoidance temperatures for yellow perch and the maximum temperature rarely exceeded the avoidance temperature. The data suggests that, under current operations, juvenile and adult yellow perch are likely to avoid the plume and will not be excluded from potentially suitable habitat for extended periods of time. EPA has also determined, in response to this and other comments received, that acute mortality is not likely to occur as a result of exposure to the thermal plume first because under current operations it is uncommon for river temperatures to exceed the acutely lethal temperature between Stations S0 and S4 and second, because yellow perch juveniles are mobile and can avoid the relatively rare extreme temperature events that may occur for limited periods of time in the segment of the river between Stations S0 and S4. *See* Response to Comment II.3.4.7. Finally, PSNH and LWB comment that protective temperatures for yellow perch maturation during the winter is "highly speculative." EPA addresses comments on protective temperatures during the yellow perch maturation period in detail in Response to Comment II.3.4.7.

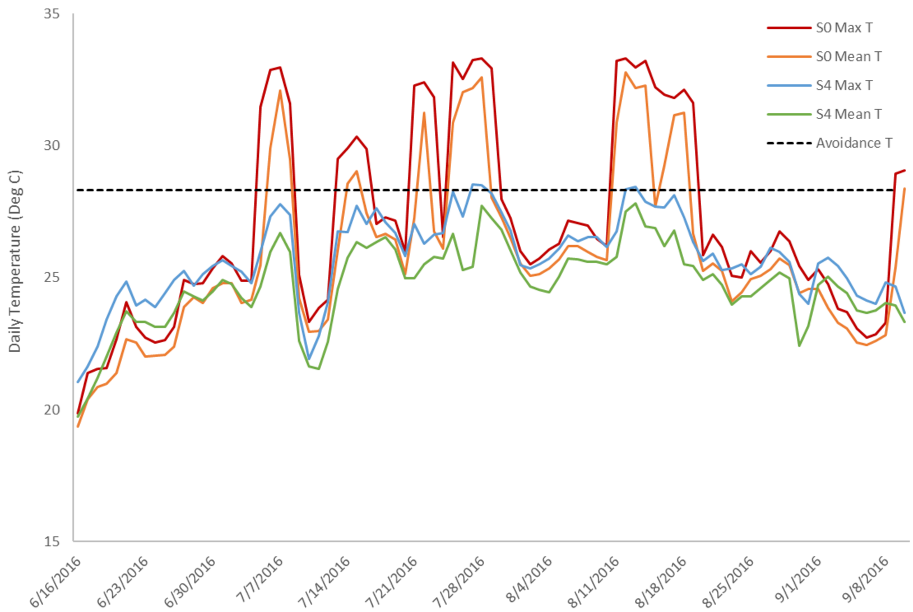

Figure II.6. Mean and maximum daily (24-hour average) temperature (deg C) at Stations S0 (discharge) and S4 (downstream) from June 16 through September 10, 2016 compared to the juvenile and adult perch avoidance temperature (28.3°C).

White Sucker

In the 2011 Draft Determinations Document, EPA concluded that maximum daily temperatures at Station S0 and S4 exceeded lethal temperatures for white sucker larvae (30°C - 31.7°C) when larvae are present in the Merrimack River. *See* AR-618 p. 112. Correctly understood, however, the 2007 Normandeau report data only showed that the maximum temperature from June 4 to July 2 reached potentially lethal temperatures on each day in at least one year out of the 21-year data set and did not necessarily reach that level on multiple days in the same year or in sequential years. According to LWB, the 2016 temperature data show that the average daily maximum temperature during all dates between June 4 and July 2 never exceeded the white sucker upper incipient lethal temperature at either station. *See* AR-1300 p. 36-7. Reviewing the daily temperature data for June 4 to July 2 for the years 2004 through 2018, however, demonstrates that the daily maximum and mean temperature at S0 frequently exceeded 31.7°C in every year from 2004 to 2011 on multiple, consecutive days (except in 2006, when there was only one exceedance of 30°C). The mean daily temperature at Station S4 exceeded 31.7°C on only two dates (at the end of July in 2007) over the entire period, while the maximum daily S4 temperature exceeded 31.7°C in three of the years (on 2 consecutive days in 2004, 6 days in 2007, and 7 days in 2010). As an example, Figure II.7 presents the mean and maximum daily temperatures at S0 and S4 for this time period in the year 2007. Re-examining the observed daily temperature data supports the 2011 Draft Determinations Document's conclusion that white sucker larvae could be exposed to potentially lethal temperatures in the thermal plume during the period when they are likely to be present, including, in some years, in early to mid-June when surface-feeding yolk-sac larvae are expected to be present. *See* AR-618 p. 113-14. At the same time, temperatures fell, on average, 4°C to 10°C between Stations S0 and S4, and temperatures were typically below the UILT by Station S4, suggesting that the duration of exposure to potentially lethal temperatures would be limited in most cases. In addition, temperatures have not exceeded the UILT at Station S4 since 2012, when operations transitioned to a peaking-like plant, with a single exception (maximum daily temperature on 7/2/2018). As a result, EPA concludes that the Final Permit's limits, which include an acute mortality limit at Station S4, will ensure that conditions in the river are protective of white sucker larvae and will not result in acute mortality. *See* Response to Comment II.3.4.7.

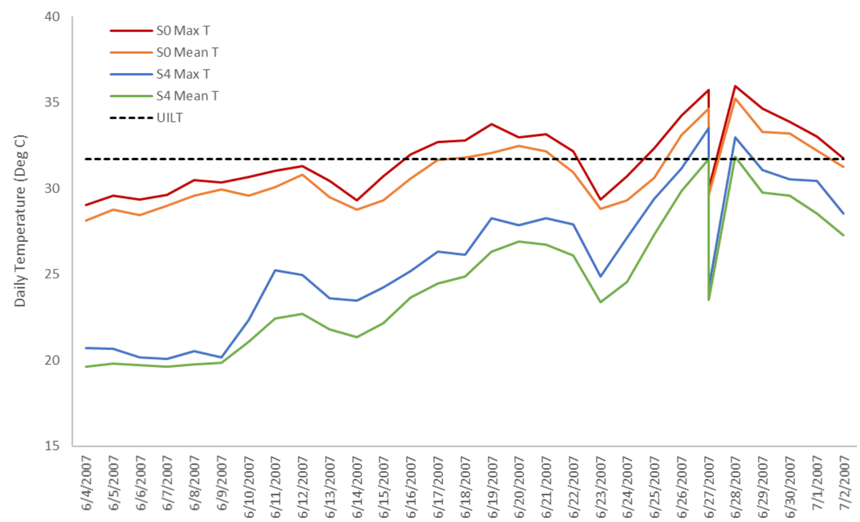

Figure II.7. Mean and maximum daily (24-hour average) temperature (deg C) at Stations S0 (discharge) and S4 (downstream) from June 4 through July 2, 2007 compared to the larval white sucker lethal temperature (31.7°C).

In the 2011 Draft Determinations Document, EPA concluded that maximum daily temperatures at Station S4 routinely exceeded avoidance temperatures for white sucker juveniles and adults (29.9°C) every day from June 25 to September 1, while average maximum temperatures at Station N10 remained below 29.9°C. *See* AR-618 p. 112. Correctly understood, the 2007 Normandeau report data only showed that the maximum temperature from June 25 to September 1 exceeded avoidance temperatures on each of those days in at least one year out of the 21-year data set, but did not necessarily do so on multiple days in the same year or in sequential years. According to LWB, the 2016 report presenting the average of the multi-year temperature data shows that the average daily maximum temperature at Station S4 reached 29.4°C (85°F) on only 3 dates during July, and never exceeded the avoidance temperature (29.9°C). *See* AR-1300 p. 37. *See also* AR-872 p. 112. Yet, reviewing the actual, observed daily temperatures demonstrates that the daily maximum and mean temperature at S4 routinely exceeded 29.9°C between June 25 to September 1 in 2004, 2005, 2007, 2010, and 2011, albeit not every day. Figure II.8, from 2007, supports the 2011 Draft Determinations Document's conclusion that daily maximum and, in some cases, mean S4 temperatures reach avoidance temperatures for juvenile and adult white sucker for large portions of the summer.

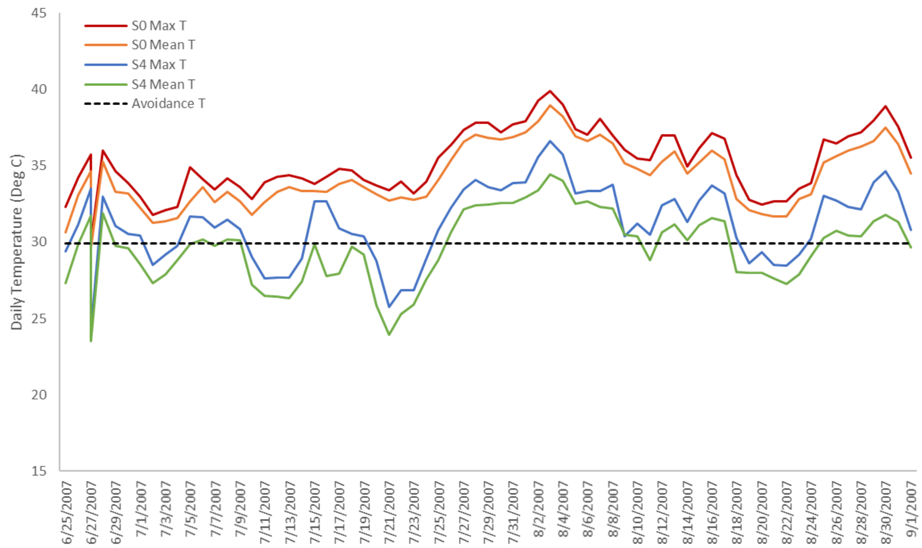

Figure II.8. Mean and maximum daily (24-hour average) temperature (deg C) at Stations S0 (discharge) and S4 (downstream) from June 25 through September 1, 2007 compared to the avoidance temperature for juvenile and adult white sucker (29.9°C).

LWB points out that white sucker adults and juveniles can avoid the thermal plume, for instance, by staying upstream of the discharge where ambient temperatures are in the preferred range. According to LWB, “these fish may prefer cooler water upstream from the discharge than warmer water below the discharge, although other habitat characteristics besides temperature could explain this distribution.” AR-1300 p. 14. Electrofish sampling in 2010 and 2011 (when the Facility was operating at a relatively high capacity) supports this assertion as catch-per-unit-effort (CPUE) for white sucker north of the discharge was more than four times higher than the CPUE at stations south of the discharge. *See* AR-871, p. 42 (where Group IIB2 is represented mainly by stations in northern Hooksett Pool and IIB1 is represented mainly by stations in southern Hooksett Pool). White sucker adults and juveniles can avoid the plume, but persistent, elevated temperatures downstream of the discharge could exclude these fish from this habitat for nearly the entire summer. Under current operating conditions (*i.e.*, operating like a peaking plant from 2012 through 2018), however, the maximum daily river temperature at Station S4 reached 29.9°C on several occasions but, with the exception of July and August 2012, the duration of the event was limited (5 days or less) and the mean daily S4 temperature did not exceed 29.9°C. The change in operations of the Station since 2012 has decreased the number and duration of events when the temperature at Station S4 reaches or exceeds the white sucker avoidance temperature, which suggests that the habitat downstream the discharge would typically be available to, and protective of, white sucker juveniles and adults. There was no difference in the CPUE for white sucker in the northern and southern sections of Hooksett Pool during electrofish sampling in 2012 and 2013, when the Facility ran 5-15 days in August and September. *See* AR-1551, p. 19.

Summary

LWB conclude that the revised (2016) thermal data do not support the conclusions reached by EPA in the 2011 Draft Determinations Document and that, in most cases, actual exposure temperatures in recent years have been lower than the protective temperatures proposed in the

Draft Determination. *See* AR-1300 p. 37. LWB also concludes that, in the "few cases" where protective temperatures were exceeded, the number of dates and durations of exceedances were much smaller and do not support a finding of appreciable harm. *Id*. EPA considered LWB's comments on the misinterpretation of the maximum temperature data in the 2011 Draft Determinations Document, considered the data in the 2016 report that LWB relies on, and then re-evaluated the conclusions from the Determination based on review of the reported daily temperature data from 2004 through 2018. In most cases, the daily temperature data supports the conclusions from the 2011 Draft Determinations Document and refutes LWB's conclusions, which are based on long-term average temperature data that masks persistent, extreme temperature events that occur over long periods and in multiple years. In particular, LWB's analysis is flawed because the averaging period used (2002 through 2015) includes several years when the Station is operating like a peaking plant and, as such, is not representative of the actual thermal discharge from the Station when it is generating electricity. The discharge temperature is significantly lower when the Station is not operating. EPA's review of the daily temperature data from when Merrimack Station was operating as a baseload plant (e.g., 2004 through 2011), support the conclusions from the 2011 Draft Determinations Document and suggest that the thermal plume could result in appreciable harm to the BIP by causing river temperatures to exceed potentially lethal temperatures and possibly resulting in acute mortality, or avoidance temperatures and causing fish to be excluded from habitat downstream of the Station.

However, LWB correctly states that protective temperatures have been met in recent years, because these years represent peaking operations when the Station has not generated electricity for the majority of the spring and summer. *See* Responses to Comments II.3.4.1, 3.4.3. If future operations are consistent with operations from recent years, which are similar to that of a peaking plant, temperatures in the river will continue to be protective of the life stages and species of fish discussed above. However, the fact that the impact of the thermal plume is substantially less severe under current operations does not obviate the need for permit limits on thermal discharges. Instead, it is a reason for limits that will reflect the reduced operations and limit the Facility to future operations consistent with these operations going forward. As discussed in these Responses to Comments, the new owners of Merrimack Station, GSP, indicated a willingness to accept permit limits based on the current (and anticipated future) reduced operations. Furthermore, such limits are appropriate because EPA's analysis has concluded that thermal discharge limits reflecting this type of operation will satisfy the conditions of CWA § 316(a). Namely, limits based on CWA § 301, 33 U.S.C. § 1311 – i.e., technology-based limits under CWA § 301(b)(2) and water quality-based limits under CWA § 301(b)(1)(C) – will be more stringent than needed to assure the protection and propagation of the BIP in the Hooksett Pool, and the Final Permit's limits reflecting reduced operations and maintaining instream protective temperatures for the most temperature-sensitive native species will assure the protection and propagation of the BIP. *See* Responses to Comments in II.3.4. The Final Permit will continue to require monitoring of thermal discharges and, if needed, permit conditions can be revisited in future permit modifications or renewals.

3.1.4 The New Information Is Insufficient to Alter EPA's Denial of a 316(a) Thermal Variance: The Normandeau Report

Comment II.3.1.4	**AR-1573, Sierra Club et al., pp. 5-7**
See also AR-1575, Hickey and Shanahan	

Eversource's clarification of the Normandeau Report should not alter EPA's denial of the 316(a) variance. The question of whether the data presented are 21-year averages or 21-year maximums or minimums is trivial and irrelevant. The underlying point is that neither 21-year averages nor 21-year extremes are a suitable basis for evaluating thermal discharge impacts. Eversource should produce the actual temperature data, not statistical summaries of it. The Normandeau Report's probabilistic models are not valid or credible substitutes for the underlying temperature data, which Eversource has failed to produce. The Normandeau Report is not suitable for evaluating dynamic thermal plumes and potential effects on aquatic species and therefore cannot support a conclusion that a 316(a) variance would assure the protection and propagation of a BIP.

Eversource's clarification that the tables in Appendix A of the Normandeau Report expressed the maximum and minimum temperature for each day over a 21-year period as opposed to the *average* maximum and *average* minimum temperature for each day over a 21-year period cannot cure the fundamental problem with relying on the Normandeau Report as support for a 316(a) demonstration. To the contrary, Eversource's need to clarify the data shows precisely why relying on the Normandeau Report's summary of data is misleading and imprecise.

The Normandeau Report contains a probabilistic thermal modeling evaluation and daily statistical summary tables for a 21-year period. Hickey Report at 8. To create each average daily entry, the average daily temperatures for each of 21 years on the same date are averaged. *Id*. However, daily statistical summaries "mask river temperature fluctuations over time making it impossible to see temperature fluctuations that would be apparent in the continuous temperature measurements." *Id.* For example, large, short term temperature variations that can harm aquatic organisms are not detectable in daily summary statistics. The Normandeau Report used these summaries to model the thermal plume in Hooksett Pool.

The Hickey Report concluded that "the Normandeau [Report's] probabilistic thermal modeling analysis [is] ill-suited for supporting a 316(a) demonstration and concur[ed] with EPA's rejection of the report." Hickey Report at 9. Specifically, there was not a need for a probabilistic thermal model of the study area, rather there was a need for a clear presentation of available temperature data. The "model is ill-suited to support a 316(a) demonstration because it uses long-term averaging and model prediction to replace presentation of temperature measurements." *Id*. As a result, the Normandeau Report "has hidden peak water temperatures and temperature fluctuations experienced by aquatic species in Hooksett Pool from review." *Id.*

Moreover, a comparison of the model's predictions and the actual temperature data shows the limits of the model. According to the Normandeau Report's probabilistic thermal model there should be less than one day in every one-hundred year period that exceeds 90º F at two of the monitoring stations; however, a review of the average daily water temperature showed that, in 14 out of 20 years, temperatures exceeded 90º F on at least one day, and often more. Hickey at 9. This review of the field data from the Merrimack Station "strongly contradict[s] the probabilistic model predictions." *Id.* The model is simply not accurate at predicting the real-world characteristics of Merrimack Station's thermal plume.

Therefore, the clarification of the data underlying the Normandeau Report should not alter EPA's denial of the 316(a) variance because "the misunderstanding relative to maximum and minimum temperatures in Appendix A tables is inconsequential. However defined, the 21-year statistical summaries do not represent useful or appropriate temperature data submittals in a 316(a) demonstrations context." Hickey Report at 9-10.

EPA Response:

In the Determination Document, EPA focused on what the Agency had thought were long-term average maximum daily temperature data because this data (as understood by EPA) demonstrated persistent exceedances of certain threshold temperatures protective of RIS and, as a result, supported EPA's conclusion that the thermal discharge under the requested variance would not be sufficiently protective of the BIP. As discussed in response to the comments above, EPA misunderstood the maximum temperature data from Appendix A in AR-10 because of the ambiguous or misleading way in which it was presented. In an effort to correct this error, and in response to a §308 request from EPA (AR-1298), PSNH compiled and submitted average daily minimum, mean, and maximum temperatures on each date from April 1 through October 31.[11] *See* AR-1306. PSNH and its consultants have presented average temperature data from Appendix A of the 2007 Report (AR-10) and average temperature data submitted in 2016 in response to EPA's request (AR-1299) to refute statements from the Determination Document.

The commenter, with support from a 2017 Review of Available Water Temperature Data and Thermal Plume Characterizations related to the Merrimack Power Station in Bow, NH ("Hickey Report" AR-1575), indicates that neither 21-year averages nor 21-year extremes are a suitable basis for evaluating thermal discharge impacts and recommends that the final determination examine the actual temperature data, not statistical summaries. As the comment suggests, long-term average daily mean (or maximum) data indicates only that the average of the daily mean (or maximum) temperature on a given day over 21 years was below certain temperature thresholds.

[11] EPA requested the daily temperature data (instantaneous minimum, maximum, and daily average) for April 1 – October 31 over the 21 years of the initial 2007 Normandeau study (1984-2004) and the calculated 21-year daily average, average of the instantaneous daily maximum, and average of the instantaneous daily minimum temperatures for each date. See AR-1298. PSNH did not provide the requested data. In its response, PSNH instead calculated the daily average, average daily maximum, and average daily minimum for the years 2002 through 2015. PSNH asserts that the 1984-2001 data was not electronically available and was not necessary because the more recent data is "more representative of actual operations at Merrimack Station." AR-1299. EPA has considered this data as it represents the current and likely future operation of the Station, but, as explained in response to comments above, the 2016 dataset and calculations provided are not directly comparable to the initial 2007 data (as in AR-1300) because it excludes the years 1984-2001 and adds the years 2005-2015. In particular, the years 2011-2015 represent periods when Merrimack Station was operating at very low capacity in summer and rarely in spring and fall months.

Long-term average temperatures do not necessarily demonstrate that the thermal discharge is protective because summarizing 21 years of data could mask occurrences where protective temperatures are exceeded on a given day in any year(s). The exceedance of protective temperatures over multiple days and/or in consecutive years represent conditions that could harm the biological community. Consistent with the comment, for the Final Permit, EPA evaluated available, daily temperature data from Stations N10, S0, and S4 over the period from April 2004 through May 2019 from Merrimack Station's Annual Monitoring Reports and daily generating data (MWh) for Merrimack Station Units 1 and 2 for the years 2004 through 2019 from EPA's Air Markets Program Database.[12] *See* AR-1715.

Finally, CLF and Hickey comment that Normandeau's probabilistic thermal modeling analysis is ill-suited for supporting a 316(a) demonstration. See AR-1575 p. 9. The comment recognizes that the 2011 Draft Determinations Document rejected the probabilistic model for the purposes of supporting the proposed § 316(a) variance. *See* AR-618 p. 83. Normandeau (AR-850) calculated the probability of occurrence of downstream temperatures under "typical" conditions and "extreme" ambient river temperature and flows (assuming the Station was operating at baseload output), and then compared these downstream temperatures to three temperature thresholds identified as being within the avoidance or upper incipient lethal temperature range of resident important species (RIS): 86°F, 90°F, and 95°F. *See* AR-10 at 14-16. EPA has considered, but not ultimately relied on, the probabilistic model and subsequent updates in developing the limits for the Final Permit. As the comment and Hickey Report correctly recognize, the model does not accurately predict temperatures in Merrimack Station's thermal plume.

Normandeau's model predicts that while the temperature as Station S0 (at the end of the discharge canal) would exceed the temperature thresholds under typical (*i.e.*, 1 in 4 years) and extreme (*i.e.*, 1 in 100 years) conditions, the downstream temperature of Station S4 would exceed only the 86°F threshold and only under extreme conditions. EPA evaluated these predictions in comparison to daily river temperatures from May 1 through September 30 for the years 2004 through 2010, when the Station's operating capacity during the summer was typical of a baseload plant. On average, the mean daily temperature at Station S0 exceeded the 86°F threshold about 60% of the time on an annual basis and the 90°F threshold about 37% of the time. The temperature exceeded the 95°F threshold about 12% of the time. In 2007 and 2010, which are representative of warmer years, the 95°F threshold was exceeded on more than 30 days and in both years the maximum duration was about 2 weeks. In addition, the mean daily river temperature at Station S4 exceeded the 86°F threshold nearly every year between 2004 and 2010 (except for 2009), and exceeded the 90°F threshold in 2005, 2007, 2008, and 2010. The maximum daily S4 temperature exceeded the 90°F threshold in every year except for 2006 and exceeded the 95°F threshold in 2007, 2009, and 2010.

EPA's review supports the comment's argument that the actual daily temperature data representative of the thermal plume when the Station is operating as a baseload facility does not support either the predictions of the probabilistic thermal model or Normandeau's conclusion that river temperatures do not exceed selected in-river, RIS-specific threshold temperatures under typical conditions. Under the conditions of the model (representative of baseload operations), the

[12] https://ampd.epa.gov/ampd/

temperature at Stations S0 and S4 exceed avoidance temperatures for certain RIS species in most years and exceed the upper incipient lethal temperature (UILT) for certain RIS species in some years. *See also* AR-1575 p. 13-14; Response to Comment II.3.1.3. That said, recent temperature data, which reflects the Station's transition from a baseload to a peaking-like plant, demonstrates a substantial decline in the occurrence of extreme temperatures that could cause avoidance or mortality of RIS species and life stages. *See* Response to Comments II.3.3.1 and 3.4.7. The Final Permit establishes both protective temperature limits based on the thermal tolerance of RIS species and operational limits that ensure continued operation like a peaking plant during the summer.

3.2 Analyses of Shorter and Longer-Term Exposure Temperatures

Comment II.3.2(i)	**AR-1548, PSNH, pp. 56-60**
See also AR-1554, LWB, pp. 3-5	

In its Statement, EPA invites comment on the question of how shorter term and longer thermal data should be factored into EPA's evaluation under § 316(a) and New Hampshire's water quality standards of the effects of Merrimack Station's thermal discharge on Hooksett Pool and the development of thermal discharge limits for the Merrimack Station permit. The Statement includes the following rationale for considering temperatures reached on only a single day out of a 21-year time series as being relevant to the permit:

> While considering long-term averages has utility for evaluating thermal discharge impacts, looking *only* at long-term averages would obscure more extreme conditions that fish and other aquatic life might be exposed to over shorter, but still biologically significant periods of time. For example, such shorter, but impactful periods could occur during the summer when the plant is in full operation during low river flow and high ambient temperature conditions. Such temperature and flow extremes would be masked by only considering the data averaged over the full 21-year period. Consequently, in response to PSNH's clarification of the data it had submitted, EPA is now also reevaluating the effects of shorter-term thermal conditions, particularly on species that may be especially sensitive to such temperature excursions in relation to their ability to survive and compete with more thermally-tolerant species.[260]

Because over forty-five years of analysis of the fish, shellfish and wildlife in Hooksett Pool demonstrates an absence of prior appreciable harm, analysis of the river temperatures, long or short term, can only provide a theoretical explanation for why Merrimack Station's thermal discharge has not caused appreciable harm to the Hooksett Pool BIP. Short term temperatures are even less relevant to a permitting decision for a number of reasons.

First, as explained in Dr. Barnthouse's Comments to EPA's Statement, for an exposure duration of only 24 hours, "the chronic thermal tolerance data relied on in most of EPA's thermal effects analyses are not relevant. Only data on acute lethality related to short-term exposures would be relevant to such an evaluation."[261] Dr. Barnthouse explains that "Upper Incipient Lethal Temperature (UILT) values have historically been the most common measures of acute thermal effects in fish"[262] and those values for the RIS are provided in Appendix C of Normandeau 2007a.[263] Dr. Barnthouse continues:

> None of the other values provided in Appendix C or other sources utilized by EPA would be relevant to an analysis of short-term exposures. Even the UILT values are of questionable relevance, for two reasons. First, the exposure durations in thermal mortality experiments are typically 4-7 days (EPRI 2011) and most likely understate temperatures that could be tolerated for a period of only 24 hours. Second, the values themselves are strongly influenced by experimental conditions, especially acclimation temperature. EPRI (2011) found that UILT estimates for the same species can vary by 10°C or more depending on acclimation temperature. Evaluating the potential exceedance of these highly uncertain UILT values during rare, high-temperature events would not provide credible evidence for appreciable harm.[264]

Second, EPA ignores the fact that fish (except eggs and larvae) detect and simply avoid regions where temperatures are elevated to potentially harmful levels.[265] Dr. Barnthouse references EPRI's explicit recognition of this reality: "'It is important to note that none of the laboratory methods accurately reproduces what happens in the field where fish are exposed to spatially and temporally varying thermal fields and have the ability to select specific locations.'"[266] In fact, "'fish kills from heat are rare in nature and generally occur only when escapement is blocked or when the coolest water available to fish exceeds the lethal temperature or is deficient in oxygen.'"[267] These are not the conditions present in the vicinity of the Merrimack Station discharge, according to Dr. Barnthouse.[268] And, given the listed avoidance temperatures for the species at issue are equal to or lower than the corresponding UILTs,[269] it is safe to assume fish simply avoid the affected water during these rare events until the temperature declines to a more suitable level.[270]

Third, as discussed above with respect to the CORMIX modeling performed by Enercon and Dr. Barnthouse's analysis of the plume's effect on RIS, only a small fraction of the fish present in the Hooksett Pool would be exposed to the thermal plume from Merrimack Station. Even with respect to the mid-summer period—the one most relevant for addressing EPA's contention that "shorter, but impactful periods could occur . . . when the plant is in full operation during low river flow and high ambient temperature conditions"[271]—the plume affects only a minimal portion of Hooksett Pool where fish theoretically might be affected. As explained by Dr. Barnthouse:

> Enercon (2016) calculated the percent of the river area and volume between the mouth of the discharge canal (Station S0) and Hooksett Dam within which the plume temperature would exceed 80°F, 83°F, and 87°F. The two lower temperatures, 80°F and 83° would not have exceeded the UILT of any of the

> relevant species listed in Appendix C of Normandeau (2007b). The highest temperature, 87°F, exceeds the listed UILT for yellow perch, however at this temperature the plume includes only 0.02% of the area and 0.01% of the volume of the river between the discharge canal and Hooksett Dam. Since 87°F is within the range of avoidance temperatures listed for this species (79° F - 88°F), any yellow perch encountering this plume temperature would be expected simply to avoid it.[272]

Finally, any speculation that short-term high temperature exposures might impair the ability of thermally-sensitive species to survive and compete with more thermally tolerant species is disproven by the actual data from over many years of study of the fish communities present in the Hooksett, Garvins, and Amoskeag Pools of the Merrimack River. The actual data shows "there is no evidence that species with low thermal tolerances have been replaced by species with higher thermal tolerances."[273]

[260] AR-1534 at 39-40. It was EPA's misinterpretation of the Normandeau data set that led to its incorrect application of the temperature data. EPA was not actually advancing such a conservative analysis in its 2011 Fact Sheet. In fact, in its Statement, EPA states that it "did not think that such single-day data would be particularly useful for assessing the effects of thermal discharges on the aquatic community." *Id.* at 39. Nevertheless, the agency has specifically sought comment in its Statement regarding whether such single-data can provide a useful metric in the § 316(a) analysis. *See id.* at 39-40. It does not.

[261] LWB 2017 Response at 3.

[262] *Id.* (referencing a report from the Electric Power Research Institute ("EPRI"), Thermal Toxicity Literature Evaluation, Report No. 1023095, Palo Alto, CA (2011) (hereinafter ("EPRI (2011)"). This 2011 EPRI report is attached hereto as Exhibit 10.

[263] AR-11, Appendix C.

[264] LWB 2017 Response at 3-4.

[265] *Id.* at 4.

[266] *Id.* (quoting EPRI (2011)).

[267] *Id.* (quoting K.E.F., Hokanson, *Temperature Requirements of Some Percids and Adaptations to the Seasonal Temperature Cycle*, JOURNAL OF THE FISHERIES RESEARCH BOARD OF CANADA 34, 1524-1550 (1977)).

[268] *Id.*

[269] *See* AR-11, Appendix C.

[270] LWB 2017 Response at 4.

[271] AR-1534 at 39-40.

[272] LWB 2017 Response at 5. The reference to Normandeau 2007b in the LWB 2017 Response refers to the report identified as Normandeau 2007a in these comments. Dr. Barnthouse identifies a report by its year of publication and, as necessary, the "a," "b," etc. nomenclature for reports authored in the same year. Whichever report appears first in his report receives the "a" designation, the second is designated as "b," and so forth. This designation method may not always match how PSNH has identified the same reports in these or previous comments submitted to EPA.

[273] *Id.*

EPA Response:

EPA addresses this and the related comment from LWB in a single response below.

Comment II.3.2(ii)	**AR-1554, LWB, pp. 2-5**

On page 39 of its Statement, EPA provides its rationale for considering temperatures reached on only a single day out of a 21-year time series as being relevant to the permit:

> "While considering long-term averages has utility for evaluating thermal discharge impacts, looking only at long-term averages would obscure more extreme conditions that fish and other aquatic life might be exposed to over shorter, but still biologically significant periods of time. For example, such shorter, but impactful periods could occur during the summer when the plant is in full operation during low river flow and high ambient temperature conditions. Such temperature and flow extremes would be masked by only considering the data averaged over the full 21-year period. Consequently, in response to PSNH's clarification of the data it had submitted, EPA is now also reevaluating the effects of shorter-term thermal conditions, particularly on species that may be especially sensitive to such temperature excursions in relation to their ability to survive and compete with more thermally-tolerant species."

There are four reasons why EPA's proposed reevaluation will not provide useful information relevant to a permitting decision.

<u>Acute lethality is the only endpoint that is relevant to exposure periods as short as a single day, and laboratory-derived lethal temperatures may not be relevant to field conditions</u>

EPA's proposed reevaluation is based on the highest 24-hour average temperature observed on each date from April through October over the 21-years of data provided in Appendix A to Normandeau (2007a). For an exposure duration of only 24 hours, the chronic thermal tolerance data relied on in most of EPA's thermal effects analyses are not relevant. Only data on acute lethality related to short-term exposures would be relevant to such an evaluation. Upper Incipient Lethal Temperature (UILT) values have historically been the most common measures of acute thermal effects in fish (EPRI 2011). UILT values for the species addressed in EPA's §316 Determination are provided in Appendix C of Normandeau (2007b). None of the other values provided in Appendix C or other sources utilized by EPA would be relevant to an analysis of short-term exposures. Even the UILT values are of questionable relevance, for two reasons. First, the exposure durations in thermal mortality experiments are typically 4-7 days (EPRI 2011) and most likely understate temperatures that could be tolerated for a period of only 24 hours. Second, the values themselves are strongly influenced by experimental conditions, especially acclimation temperature. EPRI (2011) found that UILT estimates for the same species can vary by 10°C or more depending on acclimation temperature. Evaluating the potential exceedance of these highly uncertain UILT values during rare, high-temperature events would not provide credible evidence for appreciable harm.

<u>Fish can detect and avoid regions with potentially harmful temperatures</u>

Except in the case of eggs and larvae, fish can detect and avoid regions where temperatures are elevated to potentially harmful levels. EPRI (2011) stated that: "It is important to note that none of the laboratory methods accurately reproduces what happens in the field where fish are exposed to spatially and temporally varying thermal fields and have the ability to select specific locations." Moreover, Hokanson (1977) stated that "fish kills from heat are rare in nature and generally occur only when escapement is blocked or when the coolest water available to fish exceeds the lethal temperature or is deficient in oxygen." These are not the conditions present in the vicinity of the Merrimack Station discharge. As shown in Figures 3-5 of Enercon (2016) the station's thermal plume is confined to the right (when facing downstream) bank of the river, leaving ample habitat available for fish to escape regions with elevated temperatures. Appendix C of Normandeau (2007b) provides avoidance temperatures for all of the species addressed in EPA's §316 Determination. In all relevant cases the listed avoidance temperatures are equal to or lower than the corresponding UILTs[2]. During the rare events that EPA has proposed to evaluate, fish would simply avoid the affected water until the temperature declined to a more suitable level.

<u>Only a small fraction of the fish present in the Hooksett Pool are exposed to the thermal plume from Merrimack Station</u>

Enercon (2016) performed an analysis of the behavior of Merrimack Station's thermal plume over three representative seasonal periods: early spring, when river flows are high and ambient river temperatures are relatively low; late spring, when ambient river temperatures are rising and flows are falling, and mid-summer, when ambient river temperatures are high and flows are low. LWB (2016b) evaluated the impacts of these three plume scenarios on the fish species present in Hooksett Pool. The mid-summer period is the most relevant for addressing EPA's contention that "…shorter, but impactful periods could occur during the summer when the plant is in full operation during low river flow and high ambient temperature conditions." Enercon's calculations were made based on average ambient river conditions and plant operational parameters for the years 2006-2015. The analysis for the mid-summer period was performed using average ambient conditions and plant operations over the week of July 29-August 4.

Enercon (2016) calculated the percent of the river area and volume between the mouth of the discharge canal (Station S0) and Hooksett Dam within which the plume temperature would exceed 80°F, 83°F, and 87°F. The two lower temperatures, 80°F and 83° would not have exceeded the UILT of any of the relevant species listed in Appendix C of Normandeau (2007b). The highest temperature, 87°F, exceeds the listed UILT for yellow perch, however at this temperature the plume includes only 0.02% of the area and 0.01% of the volume of the river between the discharge canal and Hooksett Dam. Since 87° F is within the range of avoidance temperatures listed for this species (79° F - 88°F), any yellow perch encountering this plume temperature would be expected simply to avoid it.

<u>There is no evidence that "thermally sensitive" species have been or are being replaced by more thermally tolerant species</u>

EPA justified its proposed evaluation of short-term high-temperature exposures in part by speculating that such exposures might impair the ability of temperature-sensitive species to survive and compete with more thermally tolerant species. However, as discussed below, intensive biological study spanning 40+ years of the fish communities present in the Hooksett, Garvins, and Amoskeag pools of the Merrimack River show that there is no evidence that species with low thermal tolerances have been replaced by species with higher thermal tolerances.

2 No avoidance temperature was listed for Atlantic salmon, however, this species is not relevant to the permit because Atlantic salmon are not currently being stocked in the Merrimack River.

EPA Response to Comment II.3.2(i) and II.3.2.(ii):

In response to EPA's invitation to comment on the question of how long-term and short-term thermal data should be factored into EPA's evaluation under §316(a), the commenter asserts that temperatures reached on only a single day out of a 21-year time series are not relevant to the permit and provides four reasons why the "proposed re-evaluation" will not be useful.

At the outset, the comment misconstrues the referenced passage from EPA's 2017 statement (AR-1534) as a "rationale for considering temperatures reached on only a single day out of a 21-year time series as being relevant to the permit." That is not what EPA said or meant. The Statement explains that temperature and flow extremes over shorter, but impactful periods, can impact fish and other aquatic life. See AR-1534 p. 39-40. PSNH argues (in footnote 260) that the 2017 Statement recognized that single-day data would not be particularly useful for assessing the effects of thermal discharges and agrees that single-day data does not provide a useful metric. EPA maintains that while a single exceedance of protective temperatures on a single date in 21 years may not be a meaningful metric for assessing the impact of the plume on the BIP, exceeding protective temperatures on multiple, consecutive days and in sequential years may indicate that, at a minimum, there may be areas of the river habitat that the thermal discharge has made unsuitable for certain species and life stages during particular time periods. EPA has explained in responses to comments above that river temperatures at Stations S0 and S4 have reached or exceeded temperatures that could cause avoidance or mortality for some species and life stages. *See, e.g*., Response to Comment II.3.1.3. In fact, the daily monitoring data demonstrate that, contrary to the commenter's conclusions based on the long-term, average temperature data, extreme temperature events were observed in most years that the Station was operating as a baseload plant and often for days or weeks at a time. The long-term averages presented by LWB and Normandeau effectively obscure these extreme temperature events and the commenters conclude, based on such a 21-year average, that the thermal plume has a negligible impact on the river. EPA maintains that review of observed mean daily and maximum daily temperature data during the years 2004 through 2019 is a more appropriate means of evaluating the impact of the thermal plume on the BIP than relying on long-term (21-year) averages.[13] *See also, e.g*., Response to Comment 3.1.2 and 3.1.3. (As noted above, EPA

[13] There can be impacts from exposure to high temperatures beyond the acutely lethal effects, even, for instance, for mobile organisms that may be able to avoid the plume. The 2011 Draft Determinations Document explains that water temperature affects fish in many ways, including their metabolic rate, energy reserves, growth, reproduction, migration, egg maturation, incubation success, inter- and intraspecific competitive ability and resistance to parasites, diseases, and pollutants. *See* AR-618 at 29. Therefore, exposure to elevated temperatures can cause adverse effects to fish at the sub-lethal level if they disrupt one or more of the many requirements critical to fish growth, survival, spawning success, migration, etc. As an example, if elevated temperatures in the nearshore shallows cause juvenile

also requested daily temperature data for the years 1984 to 2004 – having reviewed the averaged data for those years in the 2007 Normandeau report submitted by PSNH – but PSNH did not provide the requested data, stating that it did not have it electronically and it was therefore very difficult to compile.)

LWB first asserts that only the upper incipient lethal temperatures (UILTs) in the Normandeau (AR-3 Appendix C) are "relevant to an analysis of short-term exposures." EPA addresses additional comments on the derivation of protective temperatures in Response to Comment II.3.4.7. LWB also argues that laboratory studies of UILTs are based on exposure durations of 4-7 days (citing EPRI 2011) and most likely understate temperatures that could be tolerated for shorter periods (e.g., 24 hours). *See* AR-1554 at 3. The protective temperatures proposed in the 2011 Determinations Document were derived consistent with EPA's 1986 Water Quality Criteria ("Gold Book"), which establishes a maximum protective temperature for short exposures based on species-specific equations. EPA used this method to derive protective short-term temperatures for species in the Merrimack River considering that the time period when the organisms would be exposed to temperatures that may cause acute lethality is likely to be considerably shorter than 24 hours.[14] *See e.g.*, AR-618 p. 190. EPA looked to a wide range of studies to determine appropriate temperatures for protecting the BIP. Several of the studies referenced in the 2011 Determinations Document (*e.g.*, Wismer and Christie, AR-196) observed lethality at exposures of as little as 10-30 minutes, not 24 hours or 4-7 days, as LWB suggests. *See* AR-618 at 187, 203. The agency realizes that it may not be possible to accurately predict acclimation temperature or exposure time for organisms in Hooksett Pool and, as such, we cannot be certain how closely the critical temperatures identified in laboratory studies would be mirrored in Hooksett Pool. Nevertheless, the studies referenced in the 2011 Determinations Document suggest that mortality and/or sub-lethal effects to early life stages of yellow perch and American shad could occur at temperatures that have been observed in the thermal plume. In light of the available data, EPA derived protective temperatures for thermally sensitive species and life stages consistent with the methods described for setting water quality criteria in EPA's Gold Book.

EPA's review of recent, observed daily temperature data highlights the value of evaluating all of the available temperature data and refutes LWB's comment that exceedances of UILT values as a result of the thermal plume are rare. Between 2004 and 2011, the mean daily temperature at Station S0 exceeded 33.5°C (the temperature at which Klauda et al. (AR-62) observed significant mortality of larval American shad after an exposure of 15 minutes) in six of the years and at durations up to 12 days. This data undermines LWB's characterization that exceedances occur during "rare, high-temperature events" or that the UILT values are not relevant to this permitting decision. Since 2012, the mean daily temperature at Station S0 exceeded 33.5°C in 2012, 2013, and 2018 at shorter durations.

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fish to abandon the relative safety of their preferred habitat for cooler, deeper water they will likely be exposed to more predators. AR-618 p. 82. Such temperature excursions would likely not be captured with data summaries presenting average temperatures over a 21-year period.

[14] EPA also based the long-term protective limits on the Gold Book recommended weekly average temperature, which may be calculated one of several ways. In the 2011 Draft Determinations Document, EPA determined this value by adding to the physiological optimum temperature a factor calculated as one-third of the difference between the UILT and the optimum temperature. See, e.g., AR-618 p. 186.

The recent temperature data indicates that the shift from baseload to operating like a peaking plant has changed the thermal plume by decreasing both the magnitude and duration of peak temperatures. Exceedances of UILTs at Station S0 occur less often now that Merrimack Station operates like a peaking plant. *See* Response to Comment II.3.1.3. EPA also recognizes that Station S0 is located in the discharge canal (just prior to the confluence with the River) and the thermal plume will experience some mixing once it combines with the Merrimack River. The observed daily Station S4 temperatures representative of recent operations at the plant indicate that temperatures at this location and downstream will not cause mortality of juvenile fish. A review of the daily temperature data indicates that the maximum daily temperature at Station S4 exceeded 30.9°C between August 1 and September 30 nearly every year between 2004 and 2011 but, since 2012, has been exceeded on just 8 days in 2012 and 3 days in 2018, and at no time was the mean daily S4 temperature greater than 30.9°C. *See* AR-1715.

In addition, LWB comments that mobile organisms can detect and avoid regions where temperatures are elevated to potentially harmful levels and that a thermal review by EPRI recognized that "none of the laboratory methods accurately reproduces what happens in the field where fish are exposed to spatially and temporally varying thermal fields and have the ability to select specific locations." AR-1554 at 4 (referencing AR-1558). EPA reviewed the EPRI Report (AR-1558) and recognizes that laboratory-derived temperature criteria may not necessarily represent precisely the conditions that fish encounter in the field. However, neither the commenters nor EPRI specify how protective temperatures for fish should be derived if not with thermal tolerance data. Moreover, both EPRI and LWB, as well as Normandeau and PSNH, continue to reference thermal tolerance data in their comments on the Draft Permit and in the supporting analyses. EPRI observed that the upper incipient lethal temperature (UILT) is among the most conservative of the laboratory methods reviewed. Given that the Final Permit imposes acute (maximum daily) limits downstream of the discharge, and in light of the unavoidable uncertainty involved in predicting the exact temperature of the discharge when it meets the river, how warm ambient temperatures will be, how fast the river is flowing, and the duration of heated discharge on any given day, a conservative approach based on the UILT is warranted recognizing that the statutory standard in 316(a) is to provide reasonable *assurance* of the protection and propagation of the BIP.

Mobile organisms like juvenile and adult fish are likely able to limit exposure to elevated or potentially lethal temperatures in the thermal plume either by remaining in cooler areas of the Hooksett Pool for the relatively short periods when the plume is present or, in this case, by staying at depth beneath the relatively shallow, surface-oriented plume. The ability to avoid the thermal plume should ensure that juvenile and adult fish can avoid exposures to potentially lethal temperatures. However, it is important to consider the size and duration of the thermal plume. If a thermal plume forces extensive avoidance of an area it can mean that the value of the habitat has been degraded, as organisms that should inhabit the area are unable to. Moreover, while a fish that can exhibit a behavioral response to a thermal plume may avoid lethal temperatures, not all organisms can avoid a plume. Drifting and sessile organisms, for instance, will not be able to avoid the plume and adults of nest guarding species may be unable to avoid a plume during spawning or rearing. *See* AR-1589, Chapter 15. EPA agrees that fish kills from heat are relatively infrequent, likely to occur only when escape to cooler water is blocked, and have not been documented to have occurred at Merrimack Station. *See* Responses to Comments II.3.1.3, 3.4.7. The recent operational changes discussed in the comment result in a thermal plume that is limited in duration, allows river temperatures to return to ambient levels, and ensures that habitat downstream from Merrimack Station is not unsuitable for fish for long periods of time during the summer. *See* Response to Comment II.3.3.2.

LWB comments that only a small fraction of the fish present in the Hooksett Pool would be exposed to the thermal plume from Merrimack Station based on CORMIX modeling performed by Enercon in 2016. The model and supporting analysis (AR-1352) indicates that the plume affects only a minimal portion of Hooksett Pool where fish theoretically might be impacted. EPA addresses comments on the CORMIX model in Responses to Comments II.3.3.3, 3.3.4, and 3.3.5. The CORMIX model and associated evaluation are not appropriate for demonstrating either the characteristics of the thermal plume or the potential impacts on aquatic life. In particular, the input values for effluent flow and temperature are not representative of any actual operating conditions at Merrimack Station. As such, EPA has not relied on either report either to decide whether to grant PSNH's request for a § 316(a) variance or to establish thermal limits in the Final Permit.

Finally, LWB comments that many years of study of the fish communities present in the Hooksett, Garvins, and Amoskeag Pools demonstrates there is no evidence that "thermally sensitive" species have been or are being replaced by more thermally tolerant species. Normandeau's 2007 fisheries report presents sampling data for the ambient and thermally-influenced sections of Hooksett Pool, and both electrofishing and trapnet sampling clearly demonstrate notably lower abundance levels in the thermally-influenced section for coolwater species such as yellow perch and white sucker. *See* AR-3, pp. 20, 22, 62, 63. This apparent avoidance of the thermally-influence section of Hooksett Pool during the summer months by these thermally-sensitive coolwater species factored into EPA's initial determination that Merrimack Station had caused, or contributed to, appreciable harm to the Hooksett Pool BIP. *See* Response to Comment II.4.4.1. During electrofish sampling in 2010 and 2011, Normandeau found generally that, within Hooksett Pool, the communities upstream and downstream of the discharge were fairly similar but the stations upstream of the discharge had a greater abundance of fallfish, white sucker, and yellow perch (coolwater species) and the thermally-influenced section downstream of the Facility had higher abundance of bluegill and largemouth bass (warmwater species). *See* AR-871, p. 20, 42. In 2012 and 2013, when the Facility was operating at less than 30% capacity in August and September, fallfish and white sucker (both coolwater species) were as abundant as or more abundant in the Hooksett Pool stations downstream of the discharge than in the northern stations, which supports EPA's conclusions that the thermal plume under peaking-like operations will not impede movement of fish in Hooksett Pool or exclude fish from certain areas. *See* AR-1551, p. 19.

In sum, the comment's arguments that analysis of short-term data is not relevant to the establishing thermal limits for the Final Permit are not persuasive. EPA agrees that a single exceedance of a protective temperature in a single year may not indicate that the thermal plume has an impact on the BIP, but this is not what EPA suggested and is not the case in the Merrimack River. EPA's review of daily temperature data from 2004 through 2019 indicates that, when operating as a baseload plant, the thermal plume from the Station frequently exceeded protective temperatures over multiple days and in consecutive years. This analysis highlights the importance of relying on the actual, observed temperature values and the shortcomings of summarizing temperature data over many years. Temperature data from more recent years when the Facility has operated like a peaking plant, shows lesser and less frequent instances of water temperatures exceeding protective levels.

3.2.1 No Further Analysis of Shorter-term or Longer-term Thermal Data is Necessary

Comment II.3.2.1	**AR-1552, Normandeau, p. 1**

In EPA's Substantial New Questions and Possible New Conditions, the agency invited public comment on the question of how shorter-term and longer-term thermal data should be factored into the evaluation under CWA 316(a) and New Hampshire's water quality standards of the effects of Merrimack Station's thermal discharges on the Hooksett Pool and the development of thermal discharge limits for the Merrimack Station permit.
It is Normandeau's position that there needs to be no further analysis of shorter-term or longer-term thermal data because numerous fish and aquatic community analysis conducted over 40 years of Merrimack Station operation have demonstrated there is no appreciable harm to the balanced, indigenous populations of shellfish, fish and wildlife in Hooksett Pool caused by the thermal discharge. An updated summary of these 316(a) studies and results will be presented in Section 2 and the 316(b) comments on the new wedgewire technology will be presented in Section 3.

EPA Response:

In response to the comment that 45 years of analysis of the fish, shellfish and wildlife in Hooksett Pool demonstrates an absence of prior appreciable harm, EPA does not agree that all the data provided point to a conclusion supporting the absence of prior appreciable harm. *See* Responses to Comments II.4.4 (and associated sub-comments). As explained in those responses, EPA maintains that the information available at the time of the Draft Permit demonstrates that the plant caused or contributed to prior appreciable harm as a result of the thermal discharge from the plant's baseload operations. EPA has since considered additional information in comments and supporting studies and, in particular, has re-examined the potential impacts of the thermal plume on river temperatures as a result of the substantial changes in the operation of the Station since the Draft Permit and initial § 316(a) demonstration were submitted. *See* Response to Comment II.3.1.3 and 3.2. EPA has not changed its prior conclusions on the basis of new information and analysis, but it has further assessed thermal discharge issues in light of the Facility's much reduced operations.

3.2.2 EPA's Evaluation of PSNH's Variance Request Should be Premised on the Last 10 Years of Data Because They More Accurately Reflect Plant Operations

Comment II.3.2.2	**AR-1548, PSNH, pp. 51-53**

To the extent EPA considers temperature data in its permitting analysis, use of the last 10 years of plant and Merrimack River data PSNH previously provided to EPA[239] is in accordance with EPA's standards for issuing NPDES permits. For example, the 2014 final § 316(b) rule and regulations provide that studies, analyses, and/or data from the most recent 10-year period are most relevant for NPDES permit determinations and older data may only be considered if the permittee is able to demonstrate the data remains relevant and representative of current conditions at the facility.[240] With respect to the latter consideration, the opposite is true. Data from beyond this 10-year period is no longer representative of current conditions at Merrimack Station.

Merrimack Station has also changed significantly over the past decade with the installation of a scrubber system for the facility's two coal-fired boilers. The station's Clean Air Project went into commercial service in 2011 and included the installation of a wet flue gas desulfurization treatment technology, wastewater treatment systems (including the secondary wastewater treatment system), limestone and gypsum handling and storage equipment, and chimney equipment. The total project cost exceeded $400 million and has substantially altered the layout of Merrimack Station. The 2002 through 2015 data set PSNH previously provided to EPA[241] includes several years both before and after completion of the Clean Air Project, and is more representative of current plant operations than other historical years, including but not limited to the 1984 to 2004 data set EPA requested from PSNH in 2015.[242]

Apart from using design intake flow ("DIF") to determine a facility's applicability to the overall rulemaking, the final § 316(b) rule principally relies upon the three-year and/or five-year average actual intake flow ("AIF") (i.e., the actual volume of water withdrawn) to determine which facilities subject to the rule must submit a number of comprehensive studies with an NPDES permit application.[243] EPA correctly utilizes data from the most recent, relevant actual operations of a facility (i.e., the last three to five years of operation) in this § 316(b) context to formulate its permit decisions.

EPA's own NPDES Permit Writers' Manual similarly supports use of recent historical, average effluent data (i.e., the last three to five years of data) when establishing technology- based limitations for other pollutants of concern.[244] This is corroborated by the agency's NPDES application Form 2C for wastewater discharges, which requires all sampling required by the Form to have been completed "no more than three years before submission" of the application.[245] Indeed, CWA § 402(b)(1)(B) provides that NPDES permits are to be issued "for fixed terms not exceeding five years,"[246] meaning any permittee seeking to renew its permit is required to submit new effluent data prior to the expiration of its current permit—giving permit writers an opportunity to regularly revisit this average effluent data. For all of these reasons, to the extent EPA considers temperature data at all—despite the 40+ years of biological studies demonstrating no prior appreciable harm to the BIP—EPA's standards and practices in the NPDES program make clear that this most recent dataset is the appropriate one for EPA's § 316(a) analysis.

[239] *See* AR-1305; AR-1306; AR-1307.

[240] *See* 40 C.F.R. §§ 122.21(r)(6)(ii)(A), (r)(7).

[241] *See* AR-1305; AR-1306; AR-1307.

[242] *See* AR-1298.

[243] *See, e.g.,* 79 Fed. Reg. 48,300, 48,308-09 (Aug. 15, 2014).

[244] *See, e.g.,* EPA, NPDES Permit Writers' Manual, § 5.2.2.5, at 5-30 (Sept. 2010) (providing that permit writers can establish permit conditions using data from the past 3 to 5 years and that the goal in selecting the relevant data set is for it to be "representative of the actual [permit conditions] likely to prevail during the next term of the permit"); *see also* 55 Fed. Reg. 47,990, 48,020 (Nov. 16, 1990) (codified at 40 CFR pts. 122, 123, and 124) (in responding to a public comment regarding NPDES permit application requirements, EPA agreed with the commenter that "any information requested [in the application] should be limited to a period of three years[.]").

[245] EPA, Application Form 2C–Wastewater Discharge Information, EPA Form 3510-2C, at 2C-1 (Aug. 1990), available at https://www3.epa.gov/npdes/pubs/3510-2C.pdf.

[246] 33 U.S.C. § 1342(b)(1)(B).

EPA Response:

Having carefully considered the above comments by Merrimack Station, EPA agrees with some of the points made and disagrees with others. The Facility comments that in developing thermal discharge limits, EPA should consider more recent thermal data associated with current plant operations. The Facility notes that EPA's Permit Writer's Manual (2010) suggests that permit writers should focus on data representative of operating conditions that will prevail during the permit term. More specifically, the comment urges that EPA focus on "[t]he 2002 through 2015 data set PSNH previously provided to EPA … [which] is more representative of current plant operations than other historical years."

EPA recognizes that Merrimack Station's operational profile has changed over the last five to ten years, going from a baseload facility to one that operates only intermittently (*i.e*., "peaking"), primarily in the winter and summer. The Facility may operate at a high level when it is called upon to generate electricity, but this happens much less frequently now than when the 2011 Draft Permit was issued. While some winter and summer operations may be likely each year, how many and which days the facility will be called upon during those seasons is dependent upon weather and other factors that are unpredictable. The Facility also makes money by remaining available to provide electricity when it is needed. Not only is this Merrimack Station's current mode of operation, but it has been the Facility's operational profile for a number of years now and GSP has indicated to EPA that it plans and expects for the Station to continue in this manner for the foreseeable future.

EPA agrees that it should develop permit limits based on the Facility's planned for and likely operating profile, and based upon consideration of, among other relevant matters, recent data representative of current and anticipated future operating conditions. *See also* AR-1534 at 39. Writing permit limits based on current operating conditions makes sense as long as they address how the Facility plans to operate going forward and the Facility has indicated that it can accept a permit developed on that basis. (PSNH, conversely, requested permit limits based on baseload operations.) Writing permit limits based on current, reduced operations would be inappropriate and ineffectual if after the permit was issued the Facility could resume operating at a higher level and cause greater adverse effects. Therefore, EPA has designed permit limits that are consistent with Merrimack Station's current intermittent operations and will, where appropriate, prevent significantly greater operations that would cause significantly greater adverse environmental effects that have not been evaluated as the basis for the permit limits. These permit limits are intended to provide appropriate flexibility to the Facility while protecting the environment consistent with legal requirements. If the Facility wishes to change its operations in a way that requires different permit limits, it can always seek permit changes in the future.

Still, EPA does not agree that it is inappropriate in this case for EPA also to consider older thermal and biological data. Merrimack Station has requested renewal of its previous thermal discharge variance under CWA § 316(a). This request was submitted based upon the Facility's baseload operations. In assessing this request, EPA must assess whether the existing thermal discharge has caused "appreciable harm" to the BIP of the Hooksett Pool. *See* 40 CFR § 125.73(c)(1)(i).[15] This necessarily involves a look at historical data. *See* Permit Writers Manual, p. 5-43. Contrary to the Facility's comments, EPA found that thermal discharges associated with Merrimack Station's prior baseload operations did cause appreciable harm to the BIP. At the same time, however, EPA has concluded that permit limits allowing for the facility's current, intermittent operations will provide reasonable assurance of the protection and propagation of the BIP going forward. These two conclusions have both contributed to the thermal discharge permit conditions designed by EPA for the final Merrimack Station permit.

While the Facility points to EPA's regulations under CWA § 316(b) to support the idea that EPA should only consider data collected in the last 10 years, EPA disagrees. First, the regulations under CWA § 316(b) do not govern the review of thermal discharge limits. Second, even under the CWA § 316(b) regulations, EPA does not preclude consideration of older data. Rather, EPA's regulations allow for the consideration of older data if it is still representative or otherwise relevant to the assessment. As explained above, consideration of the older thermal and biological data is relevant to the inquiry under CWA § 316(a) in this case because this data is representative of continued, year-round operation of the Station and the requested variance reflected this operation. EPA has considered both new and old data in their appropriate context.

The Facility also comments that it has added significant additional air pollution control equipment in recent years – such as wet flue gas desulfurization scrubbers – and that the facility layout has changed as a result. EPA is aware of these changed conditions, but they are not relevant to the assessment under CWA § 316(a) of the effects on the BIP of the Hooksett Pool from the Facility's thermal discharges. The comment provides no justification as to why the changes should be considered in the context of thermal discharges.

Finally, while Merrimack Station points to EPA's Permit Writers Manual (p. 5-30) to support its argument that EPA should focus on the newer data and expected future operational conditions, EPA notes first that the discussion cited by the Facility addresses technology-based limits not CWA § 316(a) variance-based limits, which are discussed in a different part of the Manual. *See id.*, at pp. 5-42 – 5-43. Furthermore, as discussed above, EPA has considered the newer data and

[15] If there has been prior appreciable harm from an existing thermal discharge, EPA still considers whether proposed thermal discharge variance-based limits will assure the protection and propagation of the BIP. 40 C.F.R. § 125.73(c)(1)(ii).

anticipated future operating conditions in developing the new thermal discharge limits for the permit. Indeed, EPA has developed permit limits that reflect the anticipated reduced operations which is consistent with the Permit Writers Manual. *See id*., at pp. 5-30, 5-37 – 5-39 (development of variable, “tiered” permit limits to address variable production levels).

3.2.3 EPA must not consider any drop in output at Merrimack Station

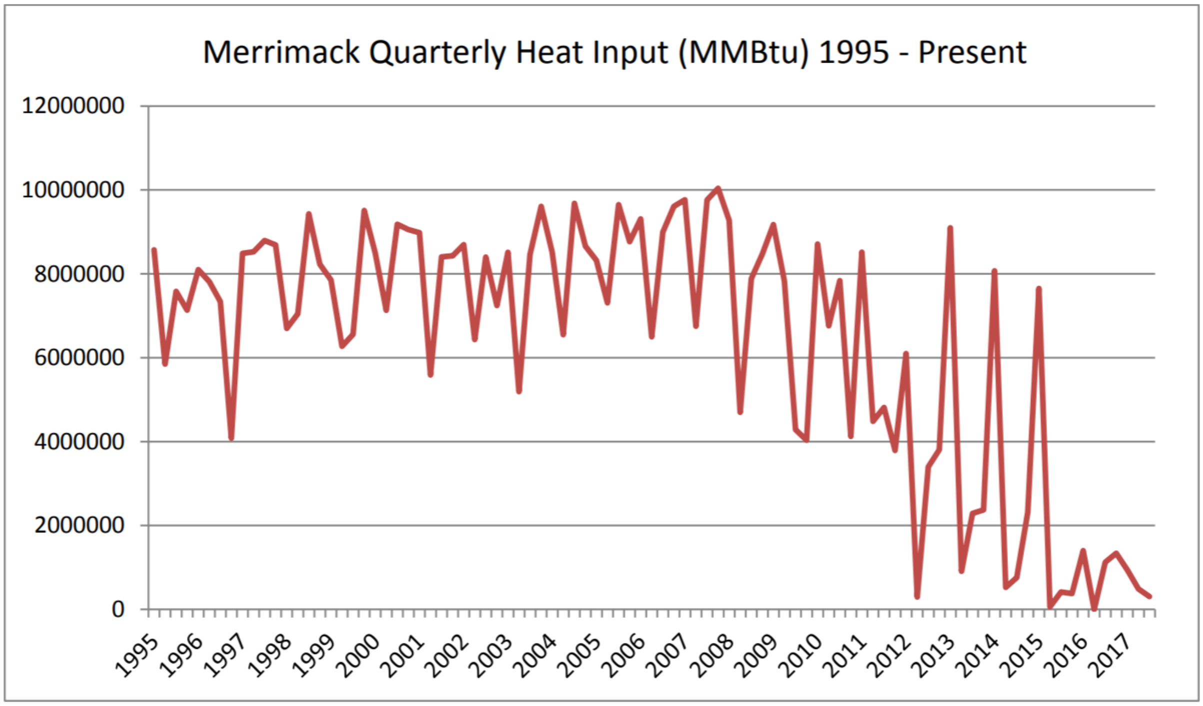
Comment II.3.2.3	**AR-1573, Sierra Club et al., pp. 25-27**

EPA must not give any consideration for any current “substantial drop” in Merrimack’s operation in determining NPDES permit limits for the facility, for three main reasons.
First, NPDES permits are set based on the facility’s potential pollution, not historical performance. Unless coupled with operation restrictions, discharge limits may not be set based on what level of operation EPA suspects Merrimack might engage in, but only on what level of operation it is allowed.

Second, as EPA implicitly recognizes, while Merrimack’s annual capacity factor may be lower in recent years than in years further back, it still operates quite heavily for short periods of time in the winter and in the summer. Setting limits based on annual output would improperly ignore Merrimack’s high level of operations, and concomitant environmental impacts, during those periods of time. This would be particularly troublesome given the seasonality of the thermal impacts described above, where it is precisely the thermal pollution Merrimack causes during the winter that provides a toehold for invasive species and threatens the balanced indigenous population of aquatic species in the Merrimack river.

Third, the unfortunate fact is that EPA is extremely slow in issuing NPDES permits for large facilities in New Hampshire, and for Merrimack in particular. These comments are submitted as part of the third round of comments solicited by EPA on this one permit, in a process that started over five years ago. Indeed, Merrimack has been operating under a permit that expired two decades ago, and was issued a quarter-century ago. Although Commenters certainly hope that EPA will finalize this permit soon, and will thereafter hew to the five-year permit review cycle mandated by Congress, the history of this permit and this plant raises the possibility that whatever permit EPA does finalize for Merrimack may govern the plant’s operation for many years to come. Just as Merrimack’s operation has changed considerably in the past, it is possible that it will vary considerably in the future.

Figure 1: Merrimack Quarterly Heat Input, 1995-Present[21]



As such, it would be both irresponsible and contrary to law for EPA to set NPDES permit limits for Merrimack based on an assumption that, because the facility currently operates at a relatively low capacity utilization, certain wastestreams and pollution levels are unlikely to be relatively high in the future and therefore need not be limited.

Further, even an enforceable permit mechanism to "lock in" Merrimack's operation levels from 2016 and 2017 would be insufficient to prevent adverse impacts on the river's ecosystem. The only way for EPA to take into consideration any "substantial drop" in Merrimack's operations would be to ensure that such reduced operations are written into the permit itself through operation restrictions. However, Merrimack's current relatively low annual capacity factor is coupled with significant swings in operation, including quarterly heat inputs characteristic of operations when Merrimack operated more continuously. Restricting Merrimack to operate in the future as it does currently would do little to nothing to address the negative environmental impacts the plant poses to the receiving waters discussed elsewhere in these comments. Accordingly, EPA should not give consideration to Merrimack's current overall capacity utilization as it finalizes the plant's long-overdue NPDES permit.

[21] Data taken from EPA's Air Markets Program Data, *available at* https://ampd.epa.gov/ampd/.

EPA Response:

The commenter expresses opposition to permit limits that consider Merrimack Station's reduced operations, but also suggests that such limits should not be used "[u]nless coupled with operation restrictions …." The commenter also states that limits should not be based on how much the facility "might" operate, but on how much it is allowed to operate. The commenter notes that even if the Facility's overall operations are reduced, it can still operate at high levels during the winter and summer, which the commenter states are both seasons of concern (in winter, due to invasive species that favor warmer water, and in summer, due to inhospitably warm temperatures for fish in the river). The commenter also expresses concern that development of permits for facilities like Merrimack Station have taken a long time and that a permit taking into account the Facility's reduced operations could become inappropriate and problematic if those operations become more frequent again in the future but the permit was not adjusted quickly in response. The commenter states that it would inappropriate and unlawful to fail to limit the Facility's discharges based on the assumption that it does not operate much when it could then operate more again in the future but would not be addressed by the permit. Finally, the commenter states that "[t]he only way for EPA to take into consideration any 'substantial drop' in Merrimack's operations would be to ensure that such reduced operations are written into the permit itself through operation restrictions." The commenter further states that basing limits on the annual capacity factor would not help environmentally due to the significant swings in operations that have happened over the course of a year on a shorter-term basis.

EPA agrees with this comment in certain respects, but not in others. Ultimately, the Agency believes the Final Permit's limits are consistent with the comment. The Agency's response follows.

EPA has considered the option of limiting thermal discharges based on operational restrictions since the 2011 Draft Permit. *See* AR 618, pp. 144-45. Ultimately, EPA rejected this option because, at that time, Merrimack Station provided electricity to the grid as a baseload operator and there were technologies available to limit the Facility's thermal discharges, as needed, without adversely affecting electrical output. *Id.* In 2017, EPA explained that one of the reasons that it reopened the comment period was that the Facility was no longer a baseload operator and, instead, operated more like peaking plant, and the Agency was considering, and invited public comment regarding, whether thermal discharge limits should be developed that took account of the Facility's much reduced operations. AR 1534, pp. 5, 8, 39, 40, 68-69. EPA requested comments on the subject but indicated that it was not currently planning changes on this basis because Merrimack Station was still seeking "permit limits based on the Facility operating at full capacity," as a baseload generator, and because the Facility still operated at full capacity at times, albeit infrequently. *Id*., p. 69.

Later still, however, as discussed in these Responses to Comments, the new owners of Merrimack Station, GSP, indicated a willingness to accept permit limits based on the current (and anticipated future) reduced operations. EPA agrees with the commenter that this does not obviate the need for permit limits on thermal discharges. Instead, it is a reason for limits that will reflect the reduced operations and limit the Facility to future operations consistent with these operations going forward to the extent they will satisfy the CWA. Such limits are appropriate in this case because EPA's analysis has concluded that thermal discharge limits reflecting this type of operation will satisfy the conditions of CWA § 316(a). Namely, limits based on CWA § 301, 33 U.S.C. § 1311, will be more stringent than needed to assure the protection and propagation of the BIP in the Hooksett Pool, and the Final Permit's limits based on critical temperatures to protect fish species and reflecting reduced operations will assure the protection and propagation of the BIP.

Consistent with the comment, EPA's permit will not allow the Facility to simply shift to higher level operations, such as baseload operations, at will. The Facility could not meet the limits operating in that manner. To increase operations, the Facility would either have to install treatment equipment to enable it to meet the thermal discharge limits while increasing generation or apply for and obtain new permit conditions. Also consistent with the comment, EPA recognizes that the Facility can experience significant swings in operations over a short period of time. EPA has written permit limits that allow these swings up to a point, but then restrict them to assure protection and propagation of the BIP. Again, the commenter states that that "[t]he only way for EPA to take into consideration any 'substantial drop' in Merrimack's operations would be to ensure that such reduced operations are written into the permit itself through operation restrictions." This is what EPA's Final Permit does.

3.3 Thermal Models

3.3.1 ASA Comments on EPA's Evaluation of 2010 Thermal Study

Comment II.3.3.1	AR-848, ASA, pp. 1-4

[*In the Determination Document at 83 (paragraph 2)*] The purpose of the modeling described in Crowley et al. (2010) was to document model calibration and verification of a three-dimensional, hydrothermal computer model applied to the Hooksett Pool in the Merrimack River. A significant field program conducted by Normandeau Associates, Inc. in 2009 acquired an extensive data set which provided the most complete information on the thermal structure of the River. For that reason, the 2009 period was chosen for model calibration and verification. Before any hydrothermal model can be used to predict extreme events it must be shown to accurately reflect observations, which the 2010 report successfully showed. Additional model runs using the validated model for average and extreme years (higher water temperature, lower river flow) for different periods of combined biological and environmental significance were subsequently performed (Crowley, et al., 2012). Furthermore, EPA's rejection of NAIs 2007 report was in reference to the use of A0 as a monitoring station, not a rejection of the thermal characterization of the Hooksett Pool which was the subject of the ASA statement of agreement between ASA's 2010 report and Normandeau's 2007 report.

[*In the Determination Document at 84 (paragraph 1)*] USEPA fundamentally misinterpreted the purpose of the 2009 model simulations. As stated in the previous response, the purpose of the modeling described in Crowley et al. (2010) was to document successful model calibration and verification of a three-dimensional, hydrothermal computer model applied to the Hooksett Pool in the Merrimack River using the most extensive data set available (2009). ASA did not propose that the 2009 period was typical, only that the most extensive data set available for model calibration and verification was taken in 2009. Additional model runs for average and extreme years were subsequently performed (Crowley et al., 2012).

[*In the Determination Document at 84 paragraph 2)*] Again, USEPA misinterpreted the purpose of using the 2009 data set, i.e., to successfully calibrate and verify the model. ASA did not propose that the 2009 period was typical, only that an extensive data set was available for model calibration and verification. Again, average and extreme years were subsequently modeled.

[*In the Determination Document at 85 (paragraph 1)*] ASA did not imply that the 2009 period was the warmest period only that the most extensive data set was used, typical of good modeling practice. In 2009 the plume was somewhat smaller and typically was oriented more to the west side of the Pool. As above, the purpose of the modeling described in Crowley et al. (2010) was to document model calibration and verification. A joint probability analysis was subsequently conducted to identify average and extreme years based on river temperature and flow (Crowley et al., 2012).

[*In the Determination Document at 85 (paragraph 2)*] USEPA fundamentally misinterpreted the goal of the study as noted above. The subsequent study analyzed environmental conditions to determine years with typical and extreme periods.

[*In the Determination Document at 85 (paragraph 3)*] ASA's modeling successfully captured the magnitude of temperature change and spatial extent of the plume's influence in 2009 as documented by its report. ASA did not seek to imply that 2009 period was a typical year, as stated above. Additional model runs using the validated model for average and extreme years for difference periods of combined biological and environmental significance were subsequently performed (Crowley et al., 2012).

EPA Response:

In its comment ASA responds to EPA's analysis of the 2010 thermal model (AR-99) indicating that EPA fundamentally misinterpreted the purpose of this study, which the comment states was to document successful model calibration and verification of a three-dimensional, hydrothermal computer model applied to the Hooksett Pool in the Merrimack River using the most extensive data set available. EPA explained in the 2011 Draft Determinations Document that the predictions from the 2010 model, including that the plume is largely confined to the western side of the Hooksett Pool and tends to stratify in the upper half of the water column is inconsistent with the five-year study of the plume from the 1970's. *See* AR-618, p. 83. ASA's comment does not address this inconsistency.

ASA repeatedly comments that EPA "fundamentally misinterpreted the goal of the study" which was to document successful model calibration and verification. The 2010 model explains that modeling calibration and validation time periods are chosen that "best represent the conditions for which further use of the model is planned." In this case, ASA explains that the model was calibrated for summer conditions when the largest plant impact occur, and river is at low flow, high water, and air temperatures. *See* AR-99 p. 31. The 2010 model was validated using a dataset from July 2009 when ambient temperatures were more than 2°C cooler than average July ambient temperatures from 1984 through 2004 and river flows that were about 3 times higher than the 15-year average. *See* AR-618 pp. 84-85. ASA explains that the time period was chosen because the necessary data (river temperature and current data) was available and not because it was representative of a typical year. In addition, EPA agrees that comparisons show the model's predicted temperatures are relatively consistent with the observed temperatures during the calibration period (AR-99 pp. 51-54) and validation period (AR-99 pp. 51-54), suggesting that the model was able to accurately reflect observations during this time period.

The comment claims that the purpose of the modeling was to document successful model calibration and verification, which the Report demonstrates was accomplished. *See* AR-99 pp. 86-87. That was not, however, the sole purpose of the Report. The calibrated model was used to simulate an extreme case scenario reflective of the greatest impact of the Station at a time representative of low river flow, high ambient river and air temperatures, and maximum Station heat rejection. *See* AR-99 pp. 72-88. ASA concluded that in the extreme case scenario, the temperature rise above background due to the Station ranged from 7°C at Station S0 West, down to approximately 2°C (3.6°F) at Station A0. See *Id*. p. 88. The model supports Normandeau's assessment from its Thermal Plume Study that Station A0 represents the location where the plume is fully mixed.[16]

In response to the comment, EPA evaluated how accurately the 2010 model predicts observed values based on reported temperature data from 2004 through 2018. The extreme case scenario timeframe selected was from July 24 through August 3, 2007. The rise in temperature from Station N10 and S0, based on the daily mean observed values from July 24 through August 3, 2007, ranged from 8.6°C to 11.1°C with a weekly average of 9.3°C. This is 2-4°C higher than the 2010 model predicted. The 2010 model also predicted a maximum increase of 10°C at Station S0 along the west side of the River (AR-99 p. 79), but reported values in July and August from 2004 through 2018 indicate that the rise in temperature at Station S0 frequently exceeds 10°C. *See* AR-1715. The mean rise in temperature for the entire month of August was 10.4°C in 2004 and 10.5°C in 2008. The reported values for Station S0 are collected inside the discharge canal and do not account for any mixing that may occur prior to the location of the modeled temperature S0 at the western side of the Merrimack River. The model does predict a rise in temperature of over 9.5°C in the discharge canal based on Figure 8-7. AR-99 p. 79. The 2010 model predicts an average rise in temperature of 3.5°C to 4°C at Station S4 along the western side of the River under the extreme scenario. *See* AR-99 at 80. The daily mean observed rise in temperature at Station S4 values from July 24 through August 3, 2007, ranged from 4.2°C to 5.7°C with a weekly average of 4.7°C, suggesting that the 2010 model slightly underpredicts the observed temperatures downstream. *See* AR-1715. However, since 2012, which is reflective of current observations, the mean monthly rise in temperature for July and August has ranged from 0°C (no rise in temperature) to 2.5°C. *See id*.

EPA considered the 2010 ASA Model in response to the comment and recognizes that the modeling accurately predicts observed temperatures in 2009. Comparing the model results from the "extreme scenario" to observed daily temperature data from 2004 to 2018 suggests that the

[16] The comment correctly asserts that EPA rejected Normandeau's proposal (in AR-10) that Station A0 should be the compliance point for ambient temperatures because it is representative of fully mixed conditions. *See* AR-618 at 83. It is unsurprising that the plume is fully mixed at Station A0, which is located in the tailrace of the Hooksett Dam and benefits from mixing as it flows over the dam. However, the impacts of the thermal plume on the BIP occur before it is fully mixed and, in this case, allowing the thermal plume to persist for the length of the Merrimack River from the discharge canal to Station A0 is not acceptable.

"extreme" conditions modeled frequently occur during July and August. In other words, the "worst-case" conditions in the model are actually typical of the impact from the plume in summer when the Station is operating at full capacity. More recent data, however, indicates that the thermal plume's impacts (the rise in temperature at Stations S0 and S4) are substantially less than the model predicts based on current, infrequent summer operation of the plant.

3.3.2 Adequate Fish Passage as Evidence of No Appreciable Harm

Comment II.3.3.2	**AR-872, Normandeau, pp. 35-43**

A joint probability was developed using Hooksett Pool river flow and water temperature for each of four one-week biological periods of interest using a 21-year data set (ASA 2012). These biological periods were defined as early-spring (May 7-14), late-spring (June 1-7), summer (August 7-13) and fall (September 24-30). For each biological period, a single year representative of average (approximately 50th percentile of temperature-flow occurrence) and extreme (approximately 90th percentile of temperature-flow occurrence) conditions was selected for modeling (ASA 2012). The previously calibrated and validated hydrothermal model was run for both maximum plant and no plant conditions to estimate the temperature rise in the river from the plant. Figures of the results showing surface temperatures and cross sections at previously established stations S0 (located just downstream of the confluence of the plant discharge canal and the River) and S4 (located approximately 2,000 ft. downstream from S0) were provided by ASA to Normandeau at times reflecting the median environmental condition for the biological period. The median environmental condition was characterized as the time at which the upstream temperatures were at the 50th percentile for that period.

- Visual representations of the modeled temperature rise above ambient conditions (ΔT) at an instance that reflects the median environmental condition from the seven day simulated period during the early-spring and late-spring biological periods at Monitoring Stations S-0 and S-4 are presented in Figures 2-2, 2-3, 2-6 and 2-7 for an average year (approximately 50th percentile of temperature-flow occurrence) and Figures 2-4, 2-5, 2-8 and 2-9 for an extreme year (approximately 90th percentile of temperature-flow occurrence). As evidenced by these figures, an adequate zone of passage exists for both resident and transient anadromous fish species moving between the portions of Hooksett Pool upstream and downstream of Merrimack Station's cooling canal.
- Visual representations of the modeled temperature rise above ambient conditions (ΔT) at an instance that reflects the median environmental condition from the seven day simulated period during the summer (August 7-13) biological period at Monitoring Stations S-0 and S-4 is presented in Figures 2-10 and 2-11 for an average year (approximately 50th percentile of temperature-flow occurrence) and Figures 2-12 and 2-13 for an extreme year (approximately 90th percentile of temperature-flow occurrence). As evidenced by these figures, a zone of passage within 6°C to 10°C of ambient exists for resident fish species moving between the portions of Hooksett Pool upstream and downstream of the thermal discharge.
- Visual representations of the modeled temperature rise above ambient conditions (ΔT) at an instance that reflects the median environmental condition from the seven day

> simulated period during the fall (September 24-30) biological period at Monitoring Stations S-0 and S-4 is presented in Figures 2-14 and 2-15 for an average year (approximately 50th percentile of temperature-flow occurrence) and Figures 2-16 and 2-17 for an extreme year (approximately 90th percentile of temperature-flow occurrence). As evidenced by these figures, an adequate zone of passage exists for resident fish species moving between the portions of Hooksett Pool upstream and downstream of the thermal discharge. During the average year (approximately 50th percentile of temperature-flow occurrence), an adequate zone of passage is evident from the ambient or near ambient water temperatures throughout much of the river cross sections at S-0 and S-4. In an extreme year (approximately 90th percentile of temperature-flow occurrence), temperatures at S-0 and S-4 ranged from approximately 6°C to 10°C above the ambient water temperature.

In sum, evidence for the ability of fish species to move around and past the thermal plume associated with the Merrimack Station discharge is supported by radio-telemetry studies as well as thermal modeling data, both of which indicate that an adequate zone of passage exists for resident and migratory fish under the majority of conditions present in Hooksett Pool.

EPA Response:

The comment argues that modeling of the thermal plume demonstrates there is adequate zone of passage for resident and migratory fish under the "majority" of conditions in Hooksett Pool. The modeling data submitted by ASA in 2012 (AR-850) is built on the three-dimensional, hydrothermal computer model developed by ASA in 2010 (AR-99) to predict the behavior of the thermal plume at baseload operation under "average" and "extreme" conditions based on flow and upstream river temperatures.

The model predicts that impacts from the thermal plume during the early spring (May 7-14) and late spring (June 7-14) are relatively limited in both average and extreme (high ambient temperature and low flow) years. The model's predictions are similar to the 2010 scenarios in that the predicted rise in temperature within the discharge canal is high (more than 10°C) but the plume mixes rapidly once it joins the Merrimack River. *See* AR-850 pp. 14-18. Under both average and extreme conditions, the model predicts that the plume is most evident on the western side of the river near the discharge canal and appears to be mixed at the Station S4 transect with temperatures typically no more than 4°C above ambient.[17] The plume is not predicted to reach the river bank on the opposite shore at the S0 transect under conditions representative of early or late spring.

During the summer period (August 13-20), the model predicts a higher rise in temperature at Station S0 in an average year, with a detectable bank-to-bank rise in temperature as high as 10°C on the western bank and about 6°C above ambient on the eastern bank. *Id*. p. 18. The model again predicts that the plume is fully mixed at the Station S4 transect with temperatures about 6-

[17] EPA notes that the 2012 ASA model did not present any tabular data and the figures used a blue-gray gradient scale that is very difficult to differentiate at lower temperature increments. The values in the response are estimated from the figures and text. EPA wonders why ASA did not replicate the same blue-to-red gradient scale used in the 2010 Report (AR-99) which depicted the thermal plume and temperature increments more clearly.

7°C above ambient. *Id*. p. 19. The model predictions for the extreme year resemble the average year predictions but the predicted rise in temperature at the S0 and S4 transects is curiously lower. Neither ASA nor Normandeau offer any explanation as to why the predicted temperatures under extreme environmental conditions (lower flows, higher ambient temperatures) would be lower in August when ambient data demonstrates that temperatures rise as river flows decrease. *Id*. p. 10.

During the fall period (Sep 24-30) in an average year, the model predicts the rise in temperature from the plume woud be limited to the western side of the river and fully mixed at transect S4 with temperatures less than 4°C above ambient. *Id*. at 20-21. In an extreme year, the model predicts the thermal plume could be 12°C or higher than ambient near the discharge canal and extend bank-to-bank at transect S0 with temperatures on the eastern bank 10°C above ambient. *Id*. at 22. The model predicts the plume is fully mixed at transect S4 with temperatures from bank-to-bank as high as 10°C above ambient under extreme conditions. *Id*. at 23. Normandeau argues that the model demonstrates an adequate zone of passage for resident and migratory fish to pass Merrimack Station, but the average summer scenario and the extreme fall scenario show that fish will be exposed to temperatures as high as 10°C above ambient from bank-to-bank and surface to bottom at Station S0 and 6-7°C at Station S4. The model does not predict an adequate zone of passage under all conditions (*e.g.*, in summer and fall) because fish would likely avoid such extreme temperature differences.

EPA reviewed daily temperature during the four periods identified by Normandeau over the years 2004 through 2018 (2019 for May) to determine if the model accurately predicts temperatures at Stations S0 and S4. In early spring (May 7-14), the average rise in temperature (based on maximum daily observed temperatures) at Station S0 was 6°C to 11°C when the Station was operating but has not exceeded 5°C since 2012. The maximum average rise in temperature at Station S4 reached as high as 6°C (in 2010) but since 2012 has not exceeded 1°C. Similarly, in late spring (June 7-14), the average rise in temperature (based on maximum daily observed temperatures) at Station S0 was 8°C to 11°C when the Station was operating, while the temperature rise at Station S4 remained less than 4°C in the same period. Since 2012, the rise in temperature at Station S0 reached 6°C (in 2017) but the temperature at Station S4 has consistently been less than 1°C above ambient. The observed rise in temperature due to the thermal effluent from Merrimack Station in late spring is, on some occasions, higher than the model predicts, but the relatively high flows during this period likely facilitates mixing to ensure that Station S4 temperatures remain protective. In summer (August 13-20), the average rise in temperature (based on maximum daily observed temperatures) at Station S0 was about 6°C to 11°C when the Station under baseload operations with temperatures at Station S4 typically 2° to almost 7°C above ambient. Since 2012, however, the maximum average 7-day rise in temperature reached 5°C (in 2016) but the maximum rise in temperature at Station S4 remained at or below 1°C. The observed, average 7-day temperature at Station S0 in fall (Sep 24-30) tended to be within 6° to 9°C of ambient under baseload conditions, though the maximum rise in temperature reached 11°C in 2008. The maximum rise in temperature at Station S4 reached 5°C in 2004 and 2005 but was typically less than 2°C. Merrimack Station has not operated during this week in September and the temperature difference at Stations S0 and S4 from ambient is negligible.

EPA's review of the average, 7-day rise in temperature suggests that, when operating as a baseload plant, Station S0 and/or S4 temperatures can reach or exceed the temperatures the model predicts during all of the time periods that Normandeau evaluated. Temperature data and thermal modeling indicate that in spring, when certain anadromous species, such as American shad, may be moving past the Facility, low ambient temperatures and higher river flows combine to ensure that an adequate zone of passage is likely available beneath the surface-oriented plume and on the eastern side of the river. Similarly, an adequate zone of passage exists under most conditions in fall when juvenile alewives may be migrating past the Facility. Under current, operations (*i.e.*, more like a peaking plant), the Facility operates at low capacity during spring and fall. However, neither the thermal modeling nor the actual temperature data clearly demonstrate that an adequate zone of passage is available under conditions when the Facility is operating at full capacity and ambient temperatures are highest (e.g., summer), particularly during years with low river flow. If temperatures are at or above avoidance levels across the river in July and August, it may impede movement of resident fish past the Facility and exclude fish from available foraging and refuge habitat near the discharge canal. If these conditions persist for weeks or even months, as can occur under baseload operations, there may be sub-lethal impacts on growth, competition, and survival. Since 2012, however, the Facility operates infrequently in July and August and, when it does operate, it is typically for short durations (one week or less). If the Facility operates at high capacity during July and August in years with low flow and high ambient temperatures, resident fish may avoid moving past the Facility due to temperatures in the thermal plume. However, the Final Permit's operational limits will ensure that the duration of the event is limited such that protection and propagation of the BIP is assured.

3.3.3 Application of CORMIX Provides Further Evidence That No Appreciable Harm Has or Will Occur Due to Merrimack Station's Thermal Discharge

Comment II.3.3.3	**AR-1548, PSNH, pp. 53-56**
See also AR-1554, LWB, pp. 6-7; AR-1352, Enercon, Attachment 2; AR-1352, LWB, Attachment 3	

Compounding its erroneous interpretation of the data and resulting analyses, EPA also failed to consider that the thermal plume impacts only a negligible percentage of the surface area and habitat volume where the RIS can be expected to be found. In December 2016, PSNH submitted two reports that, in combination, demonstrate the thermal plume from Merrimack Station does not affect more than a negligible fraction of the fish habitat present downriver from the Station's thermal discharge and has had no measurable impacts on the fish community in Hooksett Pool.[247] Using CORMIX modeling software long supported by EPA and used as a tool in EPA's NPDES permit writing process, Enercon modeled the thermal plume within the Merrimack River, and characterized the area and volume the plume occupies within the waterbody.[248] Enercon's CORMIX modeling utilizes for its inputs fish species-specific temperature criteria (*i.e.*, thermal limits) provided in Tables 1 through 3 of Dr. Barnthouse's report entitled "Influence of Merrimack Station's Thermal Plume on Habitat Utilization by Fish Species Present in Lower Hooksett Pool" ("Habitat Report"),[249] as well as plant operational data and Merrimack River flow rate, temperature, and relevant wind speed data from the last ten years (2006-2015).[250] The CORMIX thermal plume model was used to calculate average plume characteristics over the period 2006-2015 for three representative time periods: early spring (May 2 – May 8), late spring (June 9 – June 15), and mid-summer (July 29 – August 4).[251]

Utilizing the CORMIX outputs from the modeling and considering the thermal effects data compiled in Normandeau 2007a, Dr. Barnthouse identified regions within the river that would be excluded from use by one or more of the RIS due to the presence of the plume.[252] Species chosen for the analysis consisted of those discussed in Normandeau 2007a and in EPA's § 316(a) Determination, including Alewife, American Shad, smallmouth bass, largemouth bass, pumpkinseed, yellow perch, fallfish and white sucker.[253] Thermal benchmarks and lifestages expected to be present in lower Hooksett Pool during the above-referenced three time periods were considered. In EPA's § 316(a) determination, it did not address whether the amount of habitat exposed to elevated temperatures is large enough to adversely affect the population to which these species belong. In contrast, Dr. Barnthouse explicitly addressed the quantity of habitat that would be denied to each RIS population by exposure to a thermal plume (consistent with the pertinent inquiry—the effect on the BIP).[254]

Based on a conservative analysis of the CORMIX output, Dr. Barnthouse concluded that "the thermal plume from the Merrimack Station [does not] affect more than a negligible fraction of the fish habitat present downriver from the cooling water discharge" and, thus, "that Merrimack Station's thermal discharge has had no measurable impacts on the fish community in the Hooksett Pool."[255] As would be expected, the temperature of the water within the plume is highest at the point of discharge (Station S0) and declines as the plume dissipates and diffuses outward as it moves downriver. The overwhelming majority of Hooksett Pool remains at temperatures below the thermal tolerances of the RIS. Specifically, Dr. Barnthouse concluded:

> In none of the cases examined using the CORMIX model would the thermal plume from the Merrimack Station affect more than a negligible fraction of the fish habitat present downriver from the cooling water discharge. On average, 0.48% of the surface area and 0.19% of the habitat volume present between Station S0 and Hooksett Dam would be affected during the early spring period. For the late spring period, at most 0.27% of the surface area and 0.09% of the habitat volume present between Station S0 and Hooksett Dam would be affected. For the mid-summer period, at most 3.47% of the area and 0.88% of the volume present between Station S0 and Hooksett Dam would be affected.[256]

As a result of the small proportion of the available habitat within the Pool that is influenced by the thermal plume, "measurable impacts on the fish community would not be expected and none have, in fact, been found."[257] As such, the thermal plume analysis supports the conclusion from the fish surveys reported by Normandeau[258] and analyzed by Dr. Barnthouse.[259] It would be improper for EPA to deny PSNH's request for a variance based on isolated temperature data points that cannot reasonably signify appreciable harm to the BIP.

[247] *See generally* AR-1352, Attachment 2 & Attachment 3.

[248] *See id.*, Attachment 2.

[249] *See id.*, Attachment 3 at 9-12.

[250] *See generally id.*, Attachment 2.

[251] These three periods were chosen as representative of the early spring period when river flows are high and ambient temperatures are relatively low, the late spring period when ambient temperatures are rising rapidly, and the mid-summer period when river temperatures are high and flows are low. *See id.* at 2-4.

[252] *See id.*, Attachment 3 at 2-8.

[253] *See id.* Atlantic salmon was not included because the Merrimack River Atlantic salmon restoration program has been terminated. *See id.* at 1.

[254] *See id.* at 5-8.

[255] *Id.* at 7-8.

[256] *Id.* at 7.

[257] *Id.* at 8.

[258] *See* AR-11; AR-871.

[259] *See* AR-1300.

EPA Response:

EPA addresses this and the related comment from LWB in a single response below.

3.3.4 The Area of Habitat Affected by the Thermal Plume is Negligible

Comment II.3.3.4	AR-1352 Attachment 3, LWB, pp. 3, 7-8

This approach to thermal effects analysis is substantially different from, and more ecologically realistic than the approach taken by EPA in its §316 Determination for Merrimack Station. EPA's approach relied on comparisons between thermal effect criteria for the most sensitive life stage of each species expected to be present in the river on a given date and the measured or predicted temperatures at Stations S0 (the end of the Merrimack Station discharge canal) and S4 (downriver from the discharge point)[1]. EPA did not estimate the area or volume of habitat within which these temperatures would be exceeded, or whether the habitat present at these stations would still be suitable for use by other life stages or species. EPA's approach considers only whether the most thermally sensitive organisms expected to be exposed to the discharge at stations S0 and S4 might be affected. It does not address whether the amount of habitat exposed to elevated temperatures is large enough to adversely affect the populations to which these organisms belong. In contrast, the approach utilized in this report explicitly addresses the quantity of habitat that would be denied to each RIS population by exposure to the thermal plume. This focus on populations rather than on individual organisms is consistent with the "balanced indigenous population" concept embodied in §316a of the Clean Water Act.

These [calculated] values of habitat area affected by the thermal plume (AR-1352 attachment 3 p. 7) does not account for the fact that approximately half of the available fish habitat present in Hooksett Pool is upriver from the plant and unaffected by the station's thermal discharge. They also do not account for the fact that a substantial fraction (of the negligible fraction) of the habitat influenced by the plume is of low quality and not extensively used by many fish species.

Habitat mapping performed by Normandeau (AR-871) showed that most of the river bottom between Station S0 and Hooksett Dam consists of sand, silt, and clay. This type of substrate is not suitable spawning habitat for vegetation-oriented species like yellow perch, or for nest-building species like bass and pumpkinseed.

[1] Barnthouse (2016) identified numerous errors in EPA's thermal effects analysis; even if all those errors were corrected EPA's general approach would still be inadequate for addressing the impact of the thermal discharge on RIS populations.

EPA Response to Comments 3.3.3 and 3.3.4:

Since the issuance of the Draft Permit in 2011, PSNH, in addition to supplementing thermal models provided for the Draft Permit (*see* AR-99, AR-805), also submitted an entirely new technical report (AR-1352 Attachment 2) that uses CORMIX modeling software to quantify the size and location of the thermal plume for three sets of biologically relevant time periods identified by LWB: early spring, late spring, and mid-summer. PSNH also submitted an additional report from LWB (AR-1352 Attachment 3) that evaluated the results of the CORMIX model to characterize the influence of the thermal plume on habitat utilization by fish in Hooksett Pool. Based on these reports, PSNH comments that only a small proportion of the available habitat within the Pool is influenced by the thermal plume, which supports fisheries data and analysis submitted by Normandeau (AR-11, AR-871) and LWB (AR-1300) indicating that the thermal impacts from Merrimack Station have not caused, and would not in the future cause, appreciable harm to the BIP. EPA has reviewed each of these studies and, as explained below, finds that neither the CORMIX model nor the analysis provided by LWB present an accurate representation of the thermal conditions that can affect the biological community of the Hooksett Pool and that can occur, particularly during low flow, high temperature conditions during the summer when the plan is operating at or near full capacity.

To assess thermal impacts during the three selected time periods, Enercon used historical plant and ambient data from the years 2006 – 2015 averaged over the 10-year time frame and over the time period of each case. In this way, the input values in the CORMIX model have been averaged three times: 1) as a mean daily average calculated from 15-minute observations; 2) as a ten-year average daily value for each day; and 3) as a weekly average value of the three, weekly time periods of interest (May 2 – May 8, June 9 – June 15, and July 29 – August 4). The result of all this averaging is that temperature conditions associated with critical periods of low river flow, high ambient temperatures, and full plant operation are blended in with higher flow, lower ambient temperatures, and periods when one or neither units are operating.[18] The CORMIX model output does not reflect worst-case or extreme temperature events that can and do occur in Hooksett Pool. Periods of acute thermal conditions may last several days or even weeks and can adversely affect fish and other organisms sensitive to those temperatures for the duration of the

[18] EPA recognizes it may be appropriate to use historical average values to represent ambient environmental conditions like wind speed and air temperature, but inputs representative of the thermal discharge (*e.g.*, effluent temperature, effluent flow) should be based on worst-case conditions because this most accurately reflects actual conditions that organisms could experience in any given year. EPA consistently requires model inputs to include worst-case conditions in other permitting decisions based on CORMIX. *See, e.g.*, Northeast Gateway MA0040266 and University of Massachusetts MA0040304.

high temperature event. As noted in Begon et al. (AR-1453), for many species, distributions are accounted for not so much by average temperatures as by occasional extremes, especially occasional lethal temperatures that preclude its survival.

Moreover, the CORMIX model's inputs for the effluent temperature (based on average data from 2006-2016) are not representative of the actual thermal impacts from the Station's effluent. In each of the three time periods, the effluent temperature value is below the actual observed effluent temperature when the Station is operating. When the Station was not operating, which was most of the time in the years 2012 through 2016, the effluent temperature is below the average effluent temperature value used as the CORMIX input. In other words, the input values for the CORMIX model are based on long-term averages not representative of conditions when the Station is either operating or not operating, but instead are representative of some relative effluent temperature in between what is actually occurring. As a result, the model results are not helpful for calculating the dimensions of the thermal plume or evaluating the potential impacts of the plume on the BIP. A better demonstration would have used actual, observed effluent and ambient temperature data for a single time period representative of the Station's thermal plume while generating electricity and the thermal plume representative of the current operations (limited or no electrical generation).

Beyond the fundamental flaw in the model as a result of using average data not representative of the actual thermal effluent from the Station, EPA identified additional problems and/or questions related to the CORMIX model, including the following:

- only the summary file was provided for review, not the more detailed and informative prediction file;
- the model seems to mix ºC and ºF in calculations (for example, the ambient and discharge temperatures are given in °C but the water quality standard specified for the mixing zone parameter is given in °F (*See* AR-1352 Attachment 3, Case 1);
- does not appear to account for the fraction of river flow that is redirected into the plant and used for cooling the condensers when calculating dilution; discharge dimensions used in the model do not come close to reflecting the actual dimensions;
- the discharge angle used (90º) may not reflect the actual discharge angle because the discharge canal is not perpendicular to the river;
- important shallow areas near shoreline (<6' deep) are not captured in crude geometry of model; and
- actual in-river temperature data collected downstream from the plant shows a distinct plume remaining well beyond the distance identified in the model results.

For the reasons described above, the CORMIX Modeling Technical Report (AR-1352 Attachment 2) and the biological evaluation of the results (AR-1352 Attachment 3) do not demonstrate that the plume does not affect "more than a negligible fraction of the fish habitat present downriver" from the Station's thermal discharge and "has had no measurable impacts on the fish community in Hooksett Pool."

Finally, LWB criticizes EPA's evaluation in the Determination Document because EPA did not estimate the area or volume of habitat within which these temperatures would be exceeded, or whether the habitat present at these stations would still be suitable for use by other life stages or species. The applicant for a CWA § 316(a) variance (in this case of the 2011 Draft Permit, PSNH) bears the burden of demonstrating "to the satisfaction of the Administrator" that the effluent limits in the absence of the variance would be more stringent that necessary to assure the protection and propagation of the BIP, and that the requested less stringent limits "will assure" the protection and propagation of the BIP. 33 U.S.C. § 1326(a); 40 CFR § 125.73(a). If such a showing is made, then the statute provides that EPA "may" grant a variance with alternative thermal discharge limits. 33 U.S.C. § 1326(a); 40 CFR § 125.70(a). To the extent that the comment identifies deficiencies in EPA's evaluation, the burden for estimating the area or volume of the thermal plume and impacts on habitat lies with the applicant. PSNH submitted two thermal models of the plume: a probabilistic thermal model (AR-10) and a three-dimensional hydrothermal model of the study area (AR-99). Neither study established the area or volume of the plume nor did ASA and/or Normandeau identify the impacts of the thermal plume of fish habitat. LWB comments that most of the habitat influenced by the plume is of low quality and not extensively used by many fish species, but electrofish maps from the 2010 and 2011 Normandeau study demonstrate that, while much of the nearshore between Station S0 and Station S4is sand/silt/clay, there was woody debris and submerged aquatic vegetation present, particularly on the eastern bank. AR-871, p. 235. Downstream of Station S4, nearshore habitat was again dominated by silt/sand/clay but also had small areas of submerged aquatic vegetation and woody debris, as well as areas of rip-rap (particularly along the eastern bank). *Id*., p. 236. These recent surveys suggest that there is suitable nearshore habitat for juvenile fish downstream of the discharge in areas that, under certain conditions, could be impacted by the thermal plume. LWB's comment makes very specific claims about how much habitat area is affected by the thermal plume, but these estimates are based on the CORMIX modeling results, which, as EPA has explained above, are not persuasive because they do not represent actual conditions at the Station.

3.3.5 CORMIX Thermal Plume Modeling Technical Report

Comment II.3.3.5	**AR-1573, Sierra Club et al., pp. 7-8**
See Also AR-1575, pp. 3, 6-13.	

EPA also invited comments on a CORMIX thermal plume modeling report submitted to EPA on December 22, 2016. The CORMIX modeling application in the report used the far-field component of the CORMIX model to predict the extent of the thermal plume in Hooksett Pool resulting from the Merrimack Station's thermal discharge. Based on this model, the CORMIX report asserts that the model "results are valid to inform the biological evaluations" of the "influence of Merrimack Station's thermal plume on habitat utilization by fish species present in lower Hooksett Pool." Hickey at 11.

After a preliminary review of the CORMIX model, the Hickey Report concluded that the thermal plume modeling application is "inadequate for delineating the thermal discharge plume in

Hooksett Pool" for a number of reasons. Hickey Report at 10. These reasons include, but are not limited to: the model relies on averaged data over a 10-year period; CORMIX is a steady-state model and is incapable of simulating dynamic conditions; the model relies on assumptions regarding the river's characteristics that are not representative of Hooksett Pool; and the model was not calibrated to field data. Hickey at 10. Similar to Eversource's use of the probabilistic modeling in the Normandeau Report, a CORMIX thermal plume modeling analysis was unnecessary in light of the fact that Eversource has relevant temperature data taken from the Merrimack River. Instead of a model, Eversource need only present a "clear and compelling presentation of available Merrimack River temperature measurements" in order to map and analyze the thermal plume at the Merrimack Station. Hickey at 11.

In sum, the Hickey Report "strongly disagree[d] that the results of this modeling analysis are appropriate or sufficient to support a biological impact analysis [and found] that the CORMIX analysis did not contribute to thermal plume characterization." Hickey at 11. Therefore, EPA should disregard the CORMIX analysis and not alter its decision to deny Eversource's request for a 316(a) variance.

EPA Response:

In the comment, CLF presents a summary of conclusions from its evaluation (AR-1575, the "Hickey Report) of the 2016 CORMIX model (AR-1352 Attachment 2) and accompanying biological evaluation of the impact of the thermal plume in Hooksett Pool (AR-1352 Attachment 3). CLF concludes that the results of this modeling analysis are inappropriate or insufficient to support a biological impact analysis and that the CORMIX analysis did not contribute to thermal plume characterization. *See* AR-1575 p. 11.

As discussed in Response to Comments II.3.3.3 and 3.3.4, above, EPA generally agrees with CLF's assessment and has also concluded that the CORMIX model and associated evaluation are not appropriate for demonstrating either the characteristics of the thermal plume or the potential impacts on aquatic life. In particular, the input values for effluent flow and temperature are not representative of any actual operating conditions at Merrimack Station. As such, EPA has considered but not relied on either report either to decide whether to grant PSNH's request for a § 316(a) variance or to establish thermal limits in the Final Permit. For the Final Permit, as CLF suggests, EPA has looked primarily to the relevant daily temperature data from 2004 through 2019 rather than to the thermal plume modeling analyses.

3.4 NPDES Permit Limits for Temperature at Merrimack

3.4.1 Appropriateness of Technology for Point Source Category

Comment II.3.4.1	**AR-851, CLF, pp. 5, 11-16**

CLF supports EPA's denial of PSNH's request for a renewal of tis CWA Section 316(a) variance and EPA's determination that year-round use of wet or wet-dry hybrid mechanical draft cooling towers in closed cycle configuration is the best available technology ("BAT") for controlling thermal discharge at Merrimack Station.[23]

* * * * * *

CWA § 301 requires that thermal discharges be limited consistent with levels achievable using the "best available technology economically achievable ... which will result in reasonable further progress toward the national goal of eliminating the discharge of all pollutants." 33 U.S.C. §§ 1311(b)(2)(A) & (F). As set forth *supra* at 6, in the absence of a NELG governing the discharge of heat from steam-electric power plants, EPA correctly set technology-based permit limits based on a BPJ, facility-specific application of the BAT standard. *See* 33 U.S.C. § 1342(a)(l)(B); 40 C.F.R.§ 125.3(c)(2).

Applying the BAT standard, EPA must take into account (i) the age of the equipment and facilities involved; (ii) the process employed; (iii) the engineering aspects of the application of various types of control techniques; (iv) process changes; (v) the cost of achieving such effluent reduction; (vi) non-water quality environmental impact (including energy requirements); and (vii) such other factors as EPA deems appropriate. *See* 33 U.S.C. § 1314(b)(2)(B); 40 C.F.R. 125.3(d). EPA must also consider "(i) the appropriate technology for the category or class of point sources of which the applicant is a member, based upon all available information; and (ii) any unique factors relating to the applicant." 40 C.F.R. 125.3(c)(2).

EPA has broad discretion to determine which control technology is "the best available technology economically achievable." "To be technologically available, it is sufficient that the *best operating facilities* can achieve the limitation .... To demonstrate economic achievability, no formal balancing of costs and benefits is required; ... BAT should represent a commitment of the maximum resources economically possible to the ultimate goal of eliminating all polluting discharges." *Natural Res. Def. Council, Inc. v. U.S. E.PA*., 863 P.2d 1420, 1426 (9th Cir. 1988) (internal quotations and citations omitted) (emphasis supplied).

A technology is "available" where there is evidence that its use is practicable within the relevant industry, even if such technology is not yet in use in the relevant industry. *Hooker Chems. & Plastics Corp. v. Train*, 537 P.2d 620, 636 (2d Cir. 1976) ("That no plant in a given industry has adopted a pollution control device which could be installed does not mean that the device is not 'available.'"). The use of technology is "economically achievable" if it is affordable by other plants in the industry. *BP Exploration & Oil, Inc. v. EPA*, 66 P.3d 784, 790 (6th Cir. 1995); *NRDC v. EPA*, 863 F.2d 1420, 1426 (9th Cir. 1990).

To determine economic achievability under the BAT test, EPA must take into account a number of factors, one of which is "the cost of achieving such effluent reduction." 33 U.S.C. § 1314(b)(2)(B). For EPA to find that a particular technology is "economically achievable," it need only "consider" the potential costs involved. *Id*. EPA is not required to compare costs to benefits of the chosen BAT. *See, e.g., E.P.A. v. Nat'l Crushed Stone Ass'n*, 449 U.S. 64, 71 (1980); *Texas Oil & Gas Ass'n v. U.S. E.P.A*., 161 P.3d 923, 936 n.9 (5th Cir. 1998). EPA's consideration of costs is adequate so long as the determination based on that consideration is rational in light of the economic evidence in the administrative record. *Dominion Energy Brayton Point* at *17 (E.P.A. 2006); *Gov't of D.C. Mun. Separate Sewer Sys*., 10 E.A.D. 323, 348 (E.P.A. 2002).

* * * * * *

In addition to the BAT standard, to the extent more stringent requirements must be implemented in order to satisfy state water quality standards ("WQS"), such limits must be included in the NPDES permit. 33 U.S.C. § 1311(b)(l)(C).

In addition to the statutory BAT factors, EPA must consider "the appropriate technology for the category or class of point sources of which the applicant is a member, based upon all available information ... " 40 C.F.R. § 125.3(C)(2)(i). EPA has assembled ample evidence that CCC is an appropriately and widely used technology in the steam electricity generating sector.[76]

Merrimack Station applied to the New Hampshire Water Supply and Pollution Control Commission (WSPCC) for its first thermal permit in 1969.[77] That same year, before the first permit issued, PSNH conceded that "closed circuit" operation would be necessary during some seasons to ensure compliance with New Hampshire law.[78] Yet PSNH sought and obtained instead permission from WSPCC to rely on a system of spray modules and an elongated discharge canal.[79] After installation in 1972, NHFGD and the WSPCC warned several times that the spray and canal technology was inadequate.[80] During EPA's 1992 consideration of the most recent NPDES permit the agency had "significant concerns" about violations of thermal limitations.[81]

PSNH has evaded for far too long the requirement to install CCC as BAT with which many of its industry peers have already complied. In December 2009, EPA compiled a list of fifty-three coal-fired power plants that have already retrofitted with CCC.[82] A 2011 Electric Power Research Institute ("EPRI") study identified eighty-two such retrofits.[83] As EPA noted, only twenty-five percent of steam electric generating plants used CCC in 1955, but that number grew to seventy-five percent by 1997.[84] CCC is an appropriate, and highly successful, technology for reducing thermal pollution from coal-fired power plants.

[23] As discussed infra at pp. 23-31, the CWA's Best Technology Available Standard, see U.S.C. §§ 1326(a), (b), for Merrimack Station's cooling water intake structures also requires application of wet or wet-dry hybrid mechanical draft cooling towers operated in a closed cycle configuration.

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[76] *Id*. at 134-137.
[77] *Id*. at 9.
[78] *Id*.
[79] *Id*.
[80] *Id*. at 10-12.
[81] *Id*.
[82] AR 596, EPA, Power Plant Units with Closed-Cycle Cooling Retrofits (Dec. 8, 2009) (using 2005 data).
[83] See EPRI, National Cost Estimate for Retrofit of U.S. Power Plants with Closed-Cycle Cooling, Technical Brief, 1 (2011), http://my.epri.com/portal/server.pt?Abstract_id=000000000001022212.
[84] Attachment D at 136 n. 26.

EPA Response:

The above comment fairly summarizes CWA requirements for establishing technology-based effluent limitations based on best professional judgement in the absence of national effluent guidelines. EPA agrees with the comment's references to the permitting history and that retrofitting from open-cycle to closed-cycle cooling can be a viable technological approach for managing waste heat, or intake structure effects, at some power plants. *See* AR-618 p. 121-174. For the 2011 Draft Permit, EPA proposed on a site-specific, BPJ basis that mechanical draft wet or hybrid wet-dry cooling towers in a closed-cycle configuration constitutes the BAT for the control of thermal discharges by Merrimack Station. *See id*. pp. 169-74. EPA maintains that conclusion.

That said, EPA's Final Permit limits are different from those proposed in the 2011 Draft Permit because the Final Permit's limits are based on a CWA § 316(a) variance rather than technology and water quality standards. A CWA § 316(a) variance allows for thermal effluent limits less stringent than technology-based and/or water quality-based limits if the less stringent limits will assure the protection and propagation of the BIP of the receiving water. CWA § 316(a) decisions are based on site-specific facts and EPA's Final Permit sets thermal limits for Merrimack Station based on a CWA § 316(a) variance decision that is based on the relevant facts and science for this facility, after considering the record and public comments. Finally, the comment (footnote 23) also raises the issue of EPA's draft determination of closed-cycle cooling for the best technology available (BTA) under CWA § 316(b). EPA also responds in detail to comments on the determination of the BTA, including consideration of the relative costs and benefits of closed-cycle cooling and alternative technologies and other relevant factors required by the 2014 Final Regulations for Existing Cooling Water Intake Structures, in Responses to Comments III.5.2.1, 5.2.2, 5.2.3 and 5.3.

3.4.2 Water-quality Based Limits

Comment II.3.4.2	**AR-851, CLF, pp. 18-19**

New Hampshire's surface water quality regulations have as their purpose the protection of public health and welfare, enhancement of water quality, protection of fish, shellfish, and wildlife, and preservation of public uses, including drinking water, agriculture, recreation, and industry. *See* N.H. Code Admin. R. ("Env-Wq") 1701.01. The regulations apply to all point source dischargers, *see* Env-Wq 1701.02, and require that thermal discharges to Class B waters be regulated in accordance with RSA § 485-A:8. *See* Env-Wq 1703.13. RSA 485-A:8, II provides that "[a]ny stream temperature increase associated with the discharge of treated sewage, *waste or cooling water*, water diversions, or releases shall not be such *as to appreciably interfere with the uses assigned* to this class." RSA 485-A:8, II (emphasis supplied). The statute also provides that, "[i]n prescribing minimum treatment provisions for thermal wastes discharged to interstate waters, the department shall adhere to the water quality requirements and recommendations of the New Hampshire Fish and Game Department, the New England Interstate Water Pollution Control Commission, or the United States Environmental Protection Agency, *whichever requirements and recommendations provide the most effective level of thermal pollution control*." *Id*. at VIII (emphasis supplied). The New Hampshire regulations, therefore, require the "most effective" control of thermal pollution. Section 1703.19(a) also requires that "surface waters shall support and maintain a balanced, integrated, and adaptive community of organisms having a species composition, diversity, and functional organization comparable to that of similar natural habitats of a region." Taken together, these narrative water quality standards require the most effective control of thermal pollution sufficient to ensure that the receiving water will have a balanced, integrated community of organisms, comparable to that of similar habitats in the region-i.e., those not subject to thermal pollution discharges.

In order to ensure that the technology-based thermal discharge limits would also result in compliance with New Hampshire's Water Quality Standards, EPA developed water quality based thermal discharge limits for comparison.[92] The water quality-based limits were based on temperatures necessary to protect fish species in the Hooksett Pool at various stages of their lifecycle.[93] EPA analyzed resident and diadromous fish species separately.[94] EPA chose the most temperature sensitive species from each category as a way to ensure protection of the entire fish community. Put another way, if the temperature limits are sufficient to protect the most thermally sensitive species, at the most thermally-sensitive stage of its lifecycle, then the limits also will ensure protection of less sensitive fish species. EPA chose yellow perch as the most thermally sensitive resident fish species, and American shad, Atlantic salmon, and Alewife at various life stages as the most thermally sensitive diadromous species.[95]

For the most part, EPA's analysis and conclusions with respect to protective fish temperatures were reasonable and supportable. Normandeau reported that the salmon smolts were not inhibited in their downstream migration by Merrimack Station's thermal discharge. However, as the Henderson Report notes, EPA's decision to use the most temperature sensitive resident (yellow perch) and diadromous (American shad, Atlantic salmon, and alewife) species as a proxy for protectiveness of other less heat tolerant species was appropriate.[96] However, EPA's analysis is too limited to assure that its water quality-based temperature limits will assure the protection and propagation of the BIP in the Hooksett Pool. Specifically, EPA's analysis, while focusing on the physiological requirements of single fish species at their various life stages, did not adequately consider competitive interactions between species.[97] For example, EPA based its water quality-based temperature limit between October 1st and November 4th on the protective temperature for yellow perch juveniles set at 28.4°C (83.1°F). This temperature limit is above the upper bound of physiological optimum temperatures for maximum growth rates identified by EPA for yellow perch juveniles of 28°C (82.4°F).[98] A temperature above the physiological optimum for growth has the potential to alter the competitive outcomes between coolwater and warmwater species, such as yellow perch and bluegil1.[99] Accordingly, EPA has not demonstrated that the water quality-based temperature limits it chose would be sufficiently protective of cool water species that are in competition with increasing populations of more thermally tolerant species in the Hooksett Poo1.[100]

Additionally, PSNH's attempt to demonstrate Merrimack Station's thermal plume would not inhibit the migration of anadromous species like Atlantic salmon should be given no weight. In 2006, Normandeau conducted a salmon tagging study that involved radio-tagging salmon smolts released above the Merrimack Station and tracing their movement past the plant's discharge point. As the Henderson Report notes, the smolts "passage downstream and past the thermal discharge could have simply been the response of a disoriented and scared fish" as a result of their being anesthetized and having a radio tag inserted into their stomachs for the purposes of the study.[101] Such a study is far from the rigorous scientific study needed to show that migratory fish are not inhibited by Merrimack Station's thermal discharge, especially when the evidence is that in-River temperatures in the summer regularly reach levels that cold-water migratory fish are known to avoid.[102]

[92] Attachment D at 174.
[93] *Id* at 178-79.
[94] *Id* at 179.
[95] *Id* at 180, 198.
[96] Henderson Report at 10.
[97] *Id*.
[98] Attachment D at 192.
[99] Henderson Report at 11.
[100] *Id*.
[101] *Id* at 13.
[102] Henderson Report at 14 (concluding that Normandeau's salmon tagging study "is an unsuitable basis on which to support a claim that the thermal discharge will not interfere with salmon smolt migrations").

EPA Response:

EPA generally agrees with the comment's summary of applicable State water quality standards. EPA provided a detailed discussion of water quality-based temperature limits in the 2011 Draft Determinations Document. *See* AR-618, pp. 174-210. The 2011 Draft Determinations Document explains that New Hampshire water quality standards do not specify numeric temperature criteria but do specify narrative criteria for heat designed to be applied on a case-by-case basis to protect the existing and designated uses of the water body. EPA identified several criteria based on New Hampshire's water quality standards to guide its determination of water quality-based temperature limits:

(a) thermal discharges may not be "inimical to aquatic life;"

(b) thermal discharges must provide, wherever attainable, for the protection and propagation of fish, shellfish, and wildlife, and for recreation, in and on the receiving water;

(c) thermal discharges may not contribute to the failure of an aquatic ecosystem to support and maintain a balanced, integrated, adaptive community of organisms having a species composition, diversity, and functional organization comparable to, and with only non-detrimental differences in community structure and function from, that of similar natural habitats in the region; and

(d) [a]ny stream temperature increase associated with thermal discharge must not appreciably interfere with fishing, swimming and other recreational purposes.

See AR-618, pp. 177-78, 216. To determine thermal discharge limits necessary to satisfy State water quality standards, EPA identified the species most sensitive to elevated temperatures, identified protective temperatures for each life stage of selected sensitive species, and the time periods when these life stages are expected to be present in Hooksett Pool. By protecting the most temperature-sensitive species, the protection and propagation of the waterbody's community of aquatic organisms should be reasonably assured and water quality standards satisfied. *See id*. p. 178.

The commenter generally agrees with EPA's approach but asserts that focusing on the physiological requirements of single fish species at their various life stages may ignore competitive interactions between species. As an example, the comment argues that the protective temperature for yellow perch juveniles (28°C) is above the upper bound of physiological optimum for this species and has the potential to alter the competitive outcomes between yellow perch and warm water species, such as bluegill.

Yellow perch juveniles are the most thermally tolerant phase of the life cycle of yellow perch. McCormick (1976) found maximum growth rates at 28°C. Hokanson (1977) identifies 24.7°C as the physiological optimum for yellow perch based on studies using juveniles. EPA calculated an upper limiting temperature (28.4°C) using the method identified in the Gold Book. This upper limiting temperature is above the physiological optimum calculated in the 2011 Draft Determinations Document (26.4°C). EPA maintains that a weekly average limit of 28.4°C at Station S4 in October will be protective of yellow perch juveniles. Temperatures in the thermal plume are highest where the discharge canal meets the Merrimack River (Station S0) and decrease as the plume travels downstream. Under baseload operation during the month of October, the temperature decreased 3° to 10°C as the plume traveled from Station S0 to S4, which indicates that generally the plume will be quickly mixed when it joins the Merrimack River during October. River temperatures will continue to decrease downstream of Station S4 as the plume becomes fully mixed. Therefore, compliance with a weekly average temperature of 28.4°C at Station S4 ensures that the plume is at or better than the optimal range for yellow perch juveniles downstream of Station S4. Competitive interactions of yellow perch juveniles could be affected if the entire Hooksett Pool were at a temperature of 28.4°C because that is, as the comment points out, at the upper range for this species and might favor more thermally tolerant species. However, the thermal limits proposed in the 2011 Draft Determinations Document would ensure that, at most, only a small area of the river would be impacted by the plume and most of the Pool would be unaffected or at temperatures that are within the optimal range. Even water quality standards allow a limited area and volume of the river to be designated as a mixing zone within which water quality standards may be exceeded, but New Hampshire's water quality standards do not set specific instream temperature limits for the river.

Moreover, while EPA maintains that the proposed temperature would be protective of juvenile yellow perch, the effective temperature limit would be the most stringent water quality-based temperature limit proposed for the time period from October 1 through November 1, which would actually be 25.1°C (for adult yellow perch) and would also be sufficiently protective of juvenile perch. Finally, in recent years Merrimack Station has rarely operated in October (the highest average monthly capacity since 2012 was about 4% in 2015). Figure II.9 demonstrates the actual daily temperatures at Stations S0 and S4 in October 2015 which was the highest capacity year for the month of October since the Facility transitioned to operating like a peaking plant. Since 2012, the average rise in temperature at Station S4 as compared to Station N10 (ambient) was less than 0.5°C. Therefore, no problems are anticipated for yellow perch, or other species, during that time frame and EPA's limits for the Final Permit are sufficiently protective.

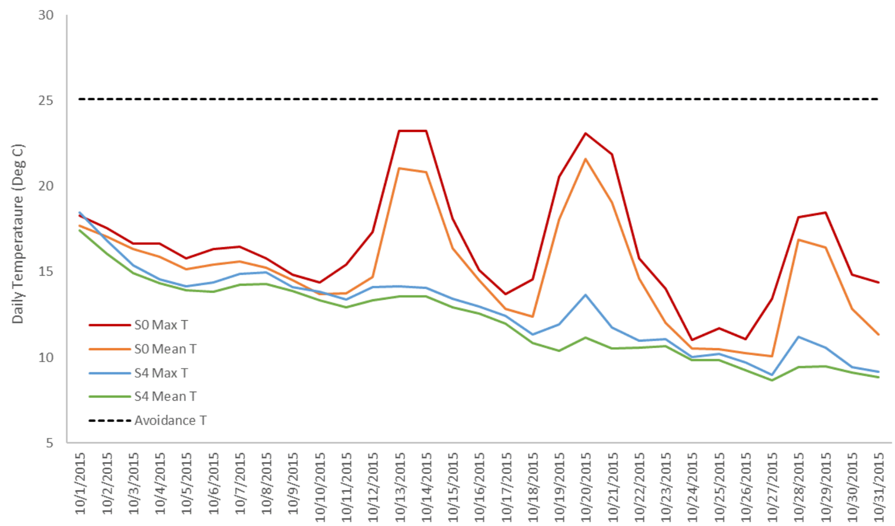

Figure II.9. Mean and maximum daily (24-hour average) temperature (deg C) at Stations S0 (discharge) and S4 (downstream) from October 1 through October 31, 2015 compared to the adult yellow perch avoidance temperature (28.9°C).

The comment also asserts that studies, particularly Normandeau's 2006 salmon tagging study, have not demonstrated that the thermal plume will not impede migration of anadromous species like Atlantic salmon past Merrimack Station. *See also* AR-852, p. 13-14. The 2011 Draft Determinations Document determined that Atlantic smolts, which remain near the surface during migration, could come into contact with the thermal plume. However, protective temperatures for yellow perch would be more stringent than those for Atlantic salmon smolts (22.5C) during the period when smolts would be migrating (May 1 to May 31). For this reason, EPA maintains that outmigrating smolts could be exposed to elevated temperatures in the plume but will be protected by the proposed water quality-based limits for yellow perch. In addition, current operations have been extremely limited during the month of May (the highest average monthly capacity is 4% in 2013) when Atlantic smolts would be migrating, suggesting that the potential to be impacted by the plume has substantially decreased since the 2011 Draft Permit was issued as a result of the current operating status of the Station. Finally, New Hampshire has ceased stocking Atlantic salmon in waters statewide.

In response to comments on the proposed water quality-based limits, EPA has reviewed and, in some cases, adjusted the protective temperatures proposed in the 2011 Draft Determinations Document. Response to Comment II.3.4.7 discusses the protective temperature limits in the Final Permit and explains any adjustments to protective temperatures proposed in the 2011 Draft Determinations Document. The protective temperatures derived for the Final Permit are based on a 316(a) variance and will assure the protection and propagation of the Hooksett Pool's BIP. While the Final Permit's thermal discharge limits are based on a CWA § 316(a) variance and require instream limits to be met at Station S4 downstream from the discharge canal, which effectively delineates an area for initial mixing of the thermal plume, the temperature limits that apply at the edge of this area are the same as the water quality-based temperature limits discussed in the 2011 Draft Determinations Document with the exception of three limits. *See* AR

618, pp. 213-16. EPA adjusted the 7-day average and the maximum daily limit for yellow perch larvae and the maximum daily limit for American shad larvae based on new information using the same approach as the derivation of limits in 2011. See Response to Comment II.3.4.7.

Comment	**AR-851, CLF, p. 21**
See also AR-852, Henderson, pp. 10-11	

In any event, the issue is academic here where the technology-based BAT limits EPA has proposed are, in fact, not more stringent than necessary to assure the protection and propagation of the BIP, and limits based solely on the applicable New Hampshire WQS would not be sufficient to assure the protection and propagation of the BIP.

EPA has established technology-based water temperature limits based on BAT and water quality-based protective fish temperatures.[115] In all but two instances where the temperature limits are the same, (American Shad Larva (acute) June 16-July 31 and Yellow Perch Adult Reproduction November 5-December 31), the technology-based standards are more stringent.[116] In three instances, the maximum mean temperature for current operations is lower than what would be permitted under the water quality-based limits:[117]

Time Period	Relevant Species and Lifestage	Water Quality-Based Max. Mean Protective Temp Degrees F	Current Operations Max. Mean Temp. Degrees F	No. of Degrees F Water Quality-Based Standard Is Warmer than Current Operations
May 9 – May 27	Yellow Perch Egg	64.4 (18°C)	62.8	1.6
May 28 – June 15	Yellow Perch Larva	70.3 (21.3°C)	70.2	0.1
Oct 1 – Nov 4	Yellow Perch Juvenile	83.1	65.8	17.3

Since the current water temperatures have been far too warm to assure the protection and propagation of the BIP, these facts strongly suggest that the water quality-based protective fish temperatures are not sufficiently protective. As the Henderson Report concludes, the fact that EPA's water quality-based temperature limits are set at levels above temperatures caused by current operations when there is strong evidence that the thermal plume caused by current operations has appreciably harmed the BIP in the Hooksett Pool demonstrates either that EPA's water quality-based temperatures are not sufficiently protective or that those limits, while they may satisfy New Hampshire's water quality standards, do not satisfy§ 316(a).[118] Either explanation is grounds for rejecting them as an alternative basis for a§ 316(a) variance. The Henderson Report gives one reason why EPA's water quality-based temperatures are not sufficiently protective: EPA's analysis did not adequately consider the temperature effects on competitive outcomes between coolwater and warmwater species.[119] Because there is direct field evidence that the current temperature regime is not sufficiently protective of the BIP, and EPA's water quality-based temperature limits in some cases are higher than the current regime, water quality-based limits cannot serve as an alternative basis for granting a§ 316(a) variance.

[113] See Attachment D at 121.
[114] *Id*. (emphasis added).
[115] Compare Attachment D, p. 215, Table 9-3 (technology-based temperature limits) with p. 213, Table 9-2 (NH water quality-based temperature limits).
[116] *Id*. at Table 9-3.
[117] *Id*. at Table 9-3.
[118] Henderson Report at 10-11.
[119] *Id*. at 11.

EPA Response:

The comment urges that instream temperature limits proposed by EPA based on New Hampshire WQS would be insufficient to assure the protection and propagation of the BIP and should not be used to set permit limits under CWA § 316(a). The commenter also states that technology-based limits are more stringent than the water quality-based limits in "all but two instances," though EPA notes that, in fact, the technology-based limits are more stringent than, or as stringent as, the water quality-based limits in each case. *See* AR 618, pp. 214-15.

The comment then goes on to compare the reported instream water temperatures resulting from the Facility's baseload operations, s*ee id.* at 215, to EPA's proposed protective, water quality-based temperatures (AR-618, p. 215) and concludes that the latter cannot be adequately protective to satisfy CWA § 316(a) because the BIP was not protected under past conditions and the baseload-based values are lower than the water quality-based values in some cases. *See id.* EPA disagrees.

The comment appears to misunderstand the information presented in Table 9-3 of EPA's 2011 Determinations Document. *See id.* at 215. First, Table 9-3 compares proposed water quality-based temperature limits with temperatures predicted to result from using closed-cycle cooling at both units. In all cases, the technology-based limits based on closed-cycle cooling values are as stringent as or more stringent than the water quality-based limits, which demonstrates that in the absence of a CWA § 316(a) variance, technology-based standards would govern the permit's thermal discharge limits.

In addition, Table 9-3 enables the reader to compare an estimate of existing thermal conditions (in 2011) based on full capacity generation using open-cycle cooling with the water quality-based and technology-based limits. Specifically, the table includes estimates of the temperatures that result from once-through operations, calculated as the highest 7-day average of reported mean daily temperatures over 21 years at Station S4. EPA did not reject the Facility's requested variance based on specifically on a finding that the maximum 7-day average temperatures at Station S4 under current operations would not protect the BIP, as the comment suggests.[19] EPA

[19] The interpretation of the data presented in Table 9-3 of the 2011 Draft Determinations Document suffers from the same limitations that CLF has leveled against PSNH – namely, that long-term averages are not adequate to evaluate the impacts of the thermal plume because extreme temperature events are masked when averaging data over many years. In this case, the "Max. Mean Temp. Current Operations" data was calculated based on the 21-year average values which masked years in which the average weekly water quality-based limits were exceeded. *See* Response to Comment II.3.1.3.

rejected PSNH's requested renewal of the existing CWA § 316(a) variance because, based on the Agency's analysis of the record, EPA concluded that PSNH had not shown that there was no prior appreciable harm to the BIP from thermal discharges under the existing variance, and because PSNH had not demonstrated that thermal discharge limits based on applicable water quality and technology requirements would be more stringent than necessary to assure protection of the BIP. AR-618, p. 121.

The commenter argues that because the water quality-based limits were set in some instances at levels higher than the temperatures predicted to have resulted from baseload operations, and because the BIP was not adequately protected in the past, then the water quality-based limits necessarily cannot be adequate to satisfy CWA § 316(a). EPA does not agree. It simply means that during some specific periods of time during the year, even the baseload open-cycle operations could satisfy water quality-based standards and would have satisfied the standard of CWA § 316(a). Nevertheless, EPA was correct to reject the requested variance renewal to allow baseload operations with open-cycle cooling throughout the year. Indeed, EPA found that when operating as a baseload plant with open-cycle cooling, the Facility's thermal discharges caused river temperatures at Station S4 to exceed protective temperatures, and even reach or exceed lethal temperatures, for multiple days in some years. Thus, under baseload, open-cycle cooling operations, the Facility could not meet all the water quality-based limits identified as necessary to assure protection and propagation of the BIP.

For the Final Permit, EPA has reassessed the water quality-based limits while also taking account of the Facility's much reduced operations and thermal discharges. From this, EPA has determined that, under Merrimack Station's current operation, effluent temperature limits less stringent than the 2011 Draft Permit's technology-based limits, but roughly equivalent to the water quality-based limits, are sufficiently stringent to ensure the protection and propagation of the BIP. The Final Permit's temperature limits, therefore, are set under a CWA § 316(a) variance and are largely consistent with the water quality-based limits proposed in the 2011 Draft Determinations Document, *see* AR 618, pp. 215-17, which, for some limits, allowed for initial mixing in a limited area of the river (*i.e.*, the distance from Station S0 to Station S4). For the period from October 1 through April 30 the Final Permit includes 7-day average temperature limits at Station S4 consistent with the water quality-based, protective temperatures derived in the 2011 Draft Determinations Document. From the period beginning May 1 through September 30, the Final Permit also includes a limitation on the capacity factor, which ensures that the current mode of operating the Facility continues during the next permit cycle and will enable the Permittee to meet the permit's temperature limits that are set to ensure the protection and propagation of the BIP but are less stringent than the technology-based limits proposed in the 2011 Draft Permit, which were based on closed-cycle cooling.

The Facility's change to operating like a peaking plant since issuance of the 2011 Draft Permit has reduced the occurrence of extreme temperature events, which in some years during baseload operations had caused temperatures to exceed protective levels for weeks or months at a time and led EPA to conclude that, under those conditions, the protection and propagation of the BIP would not be assured. With the limitation on capacity factor, the Station can operate at baseload (*i.e.*, 2 units), at most, 18 days in a row from May through September, after which the Facility could have no thermal discharges for approximately 30 days during which the river would have time to recover.[20] Under the worst-case scenario at which Merrimack Station was called upon to run at full capacity, the Facility could operate up to 68 total days from the period between May 1 through September 30, with about 30 days between each operational period. Alternatively, the Facility could operate Unit 1 (which is 25% of total capacity) continuously from May 1 through September 30 under the Final Permit. EPA reviewed available temperature data for days on which only Unit 1 was operating and found that temperatures at Station S4 are typically consistent with the water quality-based protective temperatures when only Unit 1 is operating. This limited operation is consistent with the Facility's current peaking-like operations and, in combination with acute (maximum daily), water quality-based temperature limits at Station S4, will ensure that the impacts of the thermal plume are limited in duration and severity such that protection and propagation of the BIP is assured. If the Station is called upon to operate more during this period such that it would exceed the above-discussed operational limits, the Final Permit would allow it only if the Facility also meets chronic (average weekly), water quality-based temperature limits at Station S4 that will protect the BIP from sub-lethal effects from the thermal plume. If the Facility's discharges raise water temperatures to the point that it would not meet these limits with full-scale operation, then it would have to reduce or stop generation in order to meet the limits and avoid permit violations.

3.4.3 § 316(a) Variance

Comment II.3.4.3	**AR-851, CLF, p. 21**

EPA specifically has requested comment on the question whether it should waive the inclusion of technology based thermal discharge limits in the final permit and instead establish water quality-based limits, approved via a 316(a) variance. EPA suggests that it may independently determine that the water quality-based limits satisfy the variance criteria of § 316(a), even though PSNH did not request a variance on such grounds. EPA does not interpret the law as requiring EPA to do so, however.

EPA lacks authority to establish such a variance in these circumstances, where PSNH has failed to satisfy its burden of proof that the proposed technology based thermal discharge limits are more stringent than necessary to assure the protection and propagation of the BIP. Consistent with CWA § 316(a), the EAB in *Dominion Energy Brayton Point* defined the predicate for EPA to, *sua sponte*, fashion and impose its own variance:

(1) the Agency must determine what the applicable technology and WQS-based limitations should be for a given permit;

[20] EPA calculated a 45-day rolling average beginning on May 31 (the last day of the first reporting period) assuming the Facility begins operating at 100% capacity on May 1 and including the output from April 17 to April 30 (assuming 0% capacity on these days). If the Facility begins operating at full capacity on May 1 it could continue to operate for 18 days and shutdown (0% capacity) for the following 27 days in order to meet a 45-day rolling average capacity of 40% on May 31. (If capacity was greater than 0% at the end of April, the Facility would be able to operate fewer consecutive days in May to meet the rolling average capacity factor.) EPA estimated that the Facility could operate at full capacity over four, separate 18-day events from May 1 through September 30 with an average of 27 days at 0% capacity separating each event.

(2) the *applicant* must demonstrate that these otherwise applicable effluent limitations are more stringent than necessary to assure the protection and propagation of the BIP;
(3) the *applicant* must demonstrate that its proposed variance will assure the protection and propagation of the BIP; and
(4) in those cases where the applicant *meets step 2 but not step 3*, the Agency may impose a variance it concludes does assure the protection and propagation of the BIP.

Dominion at 500 (emphasis supplied). Any EPA discretion independently to impose such a variance is plainly *contingent on the applicant's satisfaction of the burden of proof for the second step*. That makes sense, since the rationale here is to provide EPA with some discretion where an applicant successfully shows that proposed limits are too stringent, yet fails to demonstrate that its own proposed variance is adequately protective.

Finding that PSNH failed to meet its burden of proving that its thermal discharge has not caused prior appreciable harm to the BIP, EPA has properly rejected PSNH's request for a renewal of its existing 316(a) variance.[113] PSNH has therefore not satisfied Dominion's third step.

EPA has also determined that "PSNH has not demonstrated that thermal discharge limits based on applicable technology-based *and* water quality-based requirements (see Sections 7, 8 and 9, *supra*) would be more stringent than necessary to assure the protection and propagation of the balanced, indigenous population of shellfish, fish and wildlife in and on Hooksett Poo1."[114] Indeed, PSNH appears to have made no showing whatsoever that the proposed technology-based limits would be overly stringent; therefore, Dominion's second step is not satisfied, and EPA may not independently establish a variance.

Further, the Fourth Circuit Court of Appeals has rejected the argument that compliance with water quality standards is *prima facie* evidence of compliance with section 316(a). *Appalachian Power Co. v. Train*, 545 F.2d 1351, 1372 (1976). As well, EPA's first guidance document for 316(a) demonstrations explained that the 316(a) test "is distinct from the multiple statutory objectives of water quality standards ... [t]herefore, compliance or noncompliance with standards alone is not a sufficient demonstration." EPA, Draft 316(a) Technical Guidance Thermal Discharges 9 (Sep. 30, 1974).

EPA Response:

EPA agrees with certain aspects of the above comment. The statute and regulations place the "burden" of establishing qualification for alternative thermal discharge limitations under a CWA § 316(a) variance on the permit applicant. The permit applicant must demonstrate that the otherwise applicable technology-based and water quality-based thermal discharge limits are more stringent than necessary to assure the protection and propagation of the receiving water's BIP *and* that the applicant's requested alternative thermal discharge limits are sufficient to assure protection and propagation of the BIP. 33 U.S.C. § 1326(a). *See also* 40 CFR § 125.73(a). If the Agency agrees that the technology-based and water quality-based limitations are more stringent than necessary to protect the BIP, but determines that the applicant's proposed effluent limitations are not stringent enough, then EPA *may* decide to issue a variance based on a set of alternative limits different from those proposed by the applicant. *See Dominion*, 12 EAD at 500

n. 13, 552 n. 97. *See also id.* at 571-72. In such a case, EPA must demonstrate that *its* proposed variance-based limits will meet the CWA § 316(a) standard. *Id.* at 568, 572.

For the 2011 Draft Permit, EPA concluded, based on its review and analysis of the Facility's retrospective and prospective demonstrations and the available data and scientific information, that the Facility demonstrated neither that its past thermal discharges had not appreciably harmed the BIP of the Hooksett Pool (a retrospective demonstration) nor that its requested thermal limits – *i.e.*, renewal of the 1992 Permit's variance limits based on thermal discharges from baseload operations using open-cycle cooling technology – would assure the protection and propagation of the BIP in the future (a prospective demonstration). *See* AR 618, pp. 120-21. Thus, for the 2011 Draft Permit, EPA developed thermal discharge limits based on technology standards (with retrofitted closed-cycle cooling as the Best Available Technology (BAT)) and water quality standards. *Id*. at 214-16. *See* Responses to Comments III.5.2 and 5.3. At the same time, EPA indicated that it was still considering whether it could and should set instream thermal limits based on seasonal critical temperatures for fish species representative of the BIP. EPA explained such limits would be based on satisfying both state water quality standards and a CWA § 316(a) variance from technology standards. *See id.* at 215-17. EPA expressly invited public comment on this option and CLF has done so. Obviously, this approach involved a prospective assessment of whether the proposed limits would protect the BIP in the future despite having found that the applicant had not carried its burden in a retrospective analysis to establish that past discharges had not caused appreciable harm to the BIP. *See* 40 CFR § 125.73(c)(1)(ii).

Moving forward, and after considering public comment and new data and analysis, including the corrected understanding of earlier-submitted temperature data, EPA retains its conclusions about PSNH's retrospective demonstration. If the Agency *had* changed its view, it could simply have renewed the existing variance-based limits secure in the knowledge that the Facility discharged far less waste heat now than it did before. Since the Agency maintained its conclusions about the retrospective demonstration, however, it has now focused on a prospective assessment and, in particular, the questions raised by the alternative approach identified in the 2011 Draft Determinations Document and by the issues discussed in the 2017 Statement. EPA has assessed whether new thermal discharge limits could be set that would assure the protection and propagation of the BIP going forward considering both critical temperatures for fish species representative of the BIP *and* the Facility's much-reduced operations. *See* AR 618 at 212-17; AR 1534, pp. 39-41, 68. This is rational and reasonable given that the Facility's operational profile and the scope of its thermal discharges has been reduced so significantly since issuance of the 2011 Draft Permit for public review. It would have been irrational and unreasonable simply to ignore the facts regarding the Facility's altered operations and thermal discharges.

EPA reviewed a large volume of material in the record submitted from all parties, and now finds that the record establishes that the 2011 Draft Permit's thermal discharge limits based on technology and water quality standards *would* be more stringent than needed to assure the protection and propagation of the BIP. *See* Responses to Comments II.3.1.3, 3.4.7, 4.4.1, 6.3.4. In addition to reassessing the prior submitted data, EPA evaluated more than 10 years of actual, daily temperature data, comparing conditions at the time of the 2011 Draft Permit under baseload, open-cycle cooling operations to conditions under the current, reduced operations (still using open-cycle cooling). EPA again considered the thermal variance originally sought by

PSNH, which was based on continued baseload operations using open-cycle cooling under the 1992 Permit's CWA § 316(a) variance and continues to conclude that those limits would not be sufficient to assure protection of the BIP. Even though the Facility's operations are now much reduced, EPA could not grant the requested variance limits solely on that basis because the requested limits would allow the Station to resume baseload operations in the future. S*ee* AR 1534, p. 69.

After rejecting the requested variance limits, EPA did not decide simply to impose the technology-based and/or water quality-based effluent limits in the Final Permit. EPA, instead, elected to develop site-specific variance-based limits that it has determined *will* assure the protection and propagation of the BIP as required by CWA section 316(a). For the Final Permit, EPA has developed a stringent set of thermal discharge limits that grow out of the alternative water quality-based limits that EPA stated it was still considering in the 2011 Draft Determinations Document. AR 618, p. 216-17. EPA has determined that the Final Permit's limits will assure the protection and propagation of the BIP. These CWA § 316(a) variance-based limits set instream temperature limits based on critical temperatures for fish species representative of the Hooksett Pool's BIP and take into account the Facility's current and expected future operational mode similar to that of a peaking plant. From discussions with the GSP, EPA understands that the Facility is willing to accept these permit limits developed on this basis.

Merrimack Station's "capacity" to adversely impact the Hooksett Pool's fish community if operating as a baseload, open-cycle power plant remains essentially unchanged since the 2011 Draft Permit, but Merrimack Station no long longer operates in that manner. The Facility's precipitous reduction in operation over the past 10 years, particularly during the critical summer months, has much reduced the thermal plume's influent on Hooksett Pool. *See* Response to Comment II.3.1.3. The temperature and operational limits established in the Final Permit are designed to ensure that future operations reflect current conditions and do not cause excessive and prolonged thermal conditions in the pool that would result in appreciable harm to the BIP. Therefore, EPA expects Hooksett Pool's BIP to be protected going forward, but the Final Permit also requires fish studies to be continued to verify that the BIP remains protected.

Based on the *Dominion* decision by EPA's EAB, the commenter argues that EPA cannot set different CWA § 316(a) variance-based limits than those requested by the applicant because the applicant's application failed to persuade EPA that technology-based limits were more stringent than needed to assure the protection and propagation of the BIP. *See* 12 EAD at 500. EPA disagrees. While EPA continues to conclude that PSNH's retrospective demonstration does not convince EPA that the Facility's past discharges did not cause appreciable harm to the BIP or that renewal of the existing variance would satisfy CWA § 316(a), EPA has also considered the full record, including not only the original application but also public comments and additional data and analysis in the record, and the Agency now concludes that the record demonstrates that technology-based and water quality-based limits *would* be more stringent than necessary to assure the protection and propagation of the BIP. While EPA may not have been required to devise its own variance-based limits, *see Dominion,* 12 EAD at 500 n. 13, it is reasonable and appropriate for the Agency to have done so based on these facts. *Id.* at 572.

Indeed, decision-making in the present case follows the pattern upheld in *Dominion*. In both cases, EPA found that the applicant failed to establish that its prior variance-based discharges had not caused appreciable harm to the BIP. S*ee Dominion*, 12 EAD at 555, 572. Similarly, in both cases, the original variance applications alone did not establish that technology-based and water quality-based requirements would be more stringent than necessary, but the record before the Agency reviewed as a whole persuaded it that such requirements would be more stringent than necessary and the Agency then developed a different set of variance-based limits more stringent than the limits initially proposed by the applicant that would be sufficient to satisfy CWA § 316(a) and assure the protection and propagation of the BIP. The EAB upheld those EPA-generated variance-based limits in *Dominion*, and EPA's limits in the Final Permit are appropriate in this case as well.

Finally, the commenter points to *Appalachian Power*, 545 F.2d at 1372, and an EPA Draft Guidance document from 1974 to argue that compliance with water quality standards does not *necessarily* constitute compliance with CWA § 316(a). EPA does not suggest otherwise, but also notes that in some cases limits that satisfy state water quality standards may also satisfy CWA § 316(a). EPA has clearly explained that limits based on a CWA § 316(a) variance could be less stringent than the requirements of state water quality standards. EPA also explained in the 2011 Draft Determinations Document that New Hampshire's water quality standards included several biologically-oriented narrative criteria that, essentially, set standards similar to those under CWA § 316(a). *See* AR 618, pp. 216-17. Thus, the same limits that satisfy those narrative water quality standards could also satisfy CWA § 316(a). *Id*.

3.4.4 Merrimack's Prospective Analysis is Insufficient

Comment II.3.4.5	AR-1573, Sierra Club et al, pp. 10-13
See also AR-1575, Hickey and Shanahan	

Eversource has failed to show that, under a prospective analysis, the "alternative effluent limitation desired by the discharger, considering the cumulative impact of its thermal discharge together with all other significant impacts on the species affected, will assure the protection and propagation" of the BIP. 40 CFR § 125.75(a), (c)(1)(ii).

EPA has previously determined that Eversource has failed to demonstrate that BAT- or WQS-based discharge limits would be more stringent than necessary to assure protection of the BIP or that its suggested alternative thermal discharge limit would reasonably assure the protection of the BIP. Attachment D at 121. The evidence supporting EPA's conclusion is substantial and well documented. *See id.* at 116-121. As described above, Eversource's new information is not relevant to, and should not alter, EPA's previous determination.

Moreover, the Hickey Report details further failings in Eversource's 316(a) demonstrations. Hickey Report at 5-6. Significantly, contrary to EPA's Guidance Manual, Eversource has never submitted a complete 316(a) demonstration because Eversource has not created or submitted a "comprehensive document that pulls the thermal plume information together and presents it clearly." Hickey at 5. More specifically, Eversource failed to include or provide the following four components in its demonstration as required by EPA's Guidance: (1) the discharge vicinity in the study domain; (2) the impact of additive or synergistic effects of heat combined with other existing thermal or other pollutants in the receiving waters; (3) detailed graphs of the discharge plum under multiple conditions; (4) tables or illustrations of ambient river flows and velocities and river temperature and thermal gradients over time. Hickey at 6-7. Eversource has failed to provide any of this information in its 316(a) demonstration. *Id.*

"Instead, [Eversource] appears to have substituted complex statistical models . . . in place of temperature data presentations and thermal plume characterizations that are recommended by" EPA Guidance. Hickey at 7. Hickey notes that the "lack of available water temperature measurement data in the administrative record is so severe that EPA was forced to rely on 21-year averaged statistical summaries in assessing thermal impacts." *Id.* This is "wholly insufficient to support characterization of thermal plums as part of a 316(a) demonstration." *Id*

In addition, Eversource's reliance on the CORMIX model is insufficient as a prospective analysis of the future effects of a 316(a) variance. As described above, the CORMIX model is inadequate for delineating the thermal discharge plume in Hooksett Pool for multiple reasons. Hickey at 12. *Supra* at 7-8. The "CORMIX far-field model does not appear to be an appropriate modeling tool for simulating a thermal plume resulting from a time-varying thermal discharge into a river with time-varying flows and non-uniform dimensions (i.e., with bends and large variations in width and depth)." Hickey at 11. Thus, using the CORMIX model at the Merrimack Station, with its time-varying flows, discharges, and non-uniform dimensions, is insufficient and inappropriate to support a BIP analysis. *Id.*

The Nedeau Report provides additional evidence that Merrimack Station's thermal discharges, if allowed to continue, will further harm the Hooksett Pool BIP by continuing to provide Asian Clams with the warm waters they require to establish a significant foothold in the watershed from which they can spread to connected waterways. Nedeau Report at 3-4. Notably, the Asian Clam's strong source population in Merrimack Station's thermal plume "puts the entire region at risk of further invasion" by allowing the species to acclimate and spread. Nedeau Report at 4. This is important because the Asian Clam has a detrimental effect on native freshwater ecosystems and native freshwater mussels. Nedeau Report at 4. Native freshwater mussels are among the most endangered faunal groups in the world and the decline and loss of native bivalves has enormous implications for ecosystem health. *Id.* at 4. The Nedeau Report provides further evidence that granting Eversource a thermal variance would continue the changes in, and further erode, the BIP of Hooksett Pool and beyond.

With respect to prospective harm in and beyond the Hooksett Pool, we take this opportunity to draw EPA's attention to two more studies that further support EPA's concerns about the impact of Merrimack's thermal plume on the spread of invasive Asian clams in the Merrimack. The first study (Mitchell et al., 1996) is attached to this comment letter. It examines density of quagga and zebra mussels in the thermal plume of the Nanticoke Generating Station on the Canadian side of Lake Erie, concluding that the mussels are found in greater abundance in the plume, particularly along the bottom in the reach of the winter plume, and the authors hypothesize that invasive quagga mussels in Lake Erie benefit from the plume and that it appears that the Nanticoke plume was likely one of the first sites colonized by the mussels – that thermal plume may have been a major launching point for the quagga mussel invasion of North America.

Mitchell and his co-authors identified an even earlier study of invasive Asian Clams in Virginia. Graney et al., 1980. "The influence of thermal discharges and substrate composition on the population structure and distribution of the Asiatic clam, Corbicula fluminea, in the New River, Virginia." Nautilus, 94:130–135. This study observed that Asian clams reached higher densities in the thermally enriched waters of a thermal discharge in Virginia. Twenty-seven years ago, they suggested that plumes from such discharges may provide Asian Clams a warm water refuge from winter temperatures that allowed them to extend their northern range and acclimate to new conditions. Thus, EPA's concerns about the potential role of the Merrimack thermal plume in supporting the survival and spread of invasive species are well-supported by the literature.

Eversource also has failed to carry its burden by not addressing the thermal implications of its recent operating history as a "peaker" plant that runs intermittently. As EPA observed in 2011, abrupt shutdowns in the colder seasons could cause "cold shocks", i.e., a relatively rapid reduction in discharge temperature, which can lead to the physiological impairment of fish and even to death. Attachment D at 349. EPA noted that studies "show that acclimation to cooler temperatures, at least for fish, is considerably slower (e.g. days versus hours) than acclimation to warmer temperatures." *Id.* In this regard, Merrimack's practice of operating sporadically in the winter months poses a threat to the BIP.

Thermal shock is an important consideration and one that has been masked by Eversource's daily averaging of the continuous data set. Even with an averaged data set, however, there is evidence that Merrimack's sporadic operations greatly affect water temperatures in the Hooksett Pool. Hickey Report Figures 11-13 show sharp changes in water temperature that correspond with reduced discharge from Merrimack. And these figures are based on temperature changes in summer months, when the difference between discharge temperatures and ambient temperatures is much less that in winter. Eversource has not provided data for the winter months when the change in temperature from shutting down operations would likely be even greater than the average changes observed in the summer months. Again, Eversource has failed to provide adequate data – in this case, to determine whether its operating history causes thermal shocks that harm the BIP.

Eversource has failed to carry its burden with a prospective analysis that its alternative discharge limitations were reasonable to protect the BIP or that BAT and WQS standards would be more stringent than necessary to assure protection of the BIP. Indeed, not only has Eversource failed to carry its burden of showing that it can assure protection of a BIP, the preliminary comparison of river temperatures with known thermal tolerances for native species in the Hickey Report strongly suggests that the existing variance has degraded the BIP and will pose continuing and rising harms to the BIP. EPA should, again, reject Eversource's request for a § 316(a) thermal discharge variance.

EPA Response:

Sierra Club comments that PSNH failed to carry its burden to demonstrate that its alternative discharge limitations will protect the BIP and that BAT and WQS standards would be more stringent than necessary to assure protection of the BIP. The comment also asserts that a preliminary comparison of river temperatures with known thermal tolerances suggests that the existing variance has degraded the BIP and will pose continuing and rising harms to the BIP. See also AR-1575. Based on this analysis, Sierra Club concludes that EPA should reject the request for a § 316(a) thermal discharge variance.

According to the comment, PSNH's prospective analysis is inadequate because it failed to provide certain components in its demonstration "as required" by a 1977 Draft EPA's 316(a) Technical Guidance Manual. Neither statute nor regulations include criteria requiring that specific types of studies be provided in either a retrospective or prospective assessment under § 316(a). 40 CFR §§ 125.72, 125.73. The 1977 Draft 316(a) Guidance Manual referenced in the comment and the Hickey Report was never finalized and imposes no regulatory requirements for assessing completeness of a § 316(a) demonstration. This is not necessarily to say that the analyses identified in the comment would not be beneficial, and indeed other § 316(a) demonstrations have included such analyses. Rather, a § 316(a) demonstration would not be deemed incomplete or inadequate simply based on omission of these certain components because no specific types of documentation are mandated.

According to the comment, the Hickey Report notes that the "lack of available water temperature measurement data in the administrative record is so severe that EPA was forced to rely on 21-year averaged statistical summaries in assessing thermal impacts" which is "wholly insufficient" to support characterization of thermal plume. EPA used the 21-year dataset because, as it understood at the time, the Agency believed, based on evaluation of what it understood to be the average maximum daily temperature over 21 years, that the impacts of the thermal plume on thermally sensitive species and life stages could be severe and extensive during certain biologically important periods, particularly during larval development and during the warmest months. Since issuance of the 2011 Draft Permit, EPA has been informed that the data presented as the "daily average maximum" was the single highest average daily value over 21-years on any given date. As a result, EPA overestimated the extent of certain extreme temperature events in the 2011 Draft Determinations Document. *See* Response to Comment II.3.1.3. However, as the comment and Hickey Report point out, long-term average temperatures mask occurrences of daily temperatures that exceed protective temperatures on a given day in any year(s). The exceedance of protective temperatures over multiple days and/or in consecutive years represent conditions could harm the biological community. In responding to comments on thermal conditions in the Merrimack River, EPA evaluated available, daily temperature data from Stations N10, S0, and S4 over the period from April 2004 through May 2019 from Merrimack Station's Annual Monitoring Reports and daily generating data (MWh) for Merrimack Station Units 1 and 2 for the years 2004 through 2019 from EPA's Air Markets Program Database. *See* AR-1715.

EPA's review of the reported temperature data (instead of 21-year summaries) demonstrates that, when operating as a baseload plant at relatively high capacity year-round, the thermal plume can reach or exceed protective temperatures for resident and migratory species for extended periods of time and in consecutive years. EPA determined that continuing to allow Merrimack Station to habitually exceed the protective temperatures of species and life stages in the Hooksett Pool for extended periods of time, as is would if the requested variance was granted, will not ensure protection of the BIP. *See* Responses to Comments II.3.1.3 and 3.4.7.

The commenter asserts that the 2016 CORMIX model submitted by PSNH and prepared by Enercon is insufficient to assess the potential thermal impacts under a § 316(a) variance, as detailed in the Hickey Report. AR-1575. Hickey reviewed the 2016 CORMIX model and, consistent with EPA, concluded the model is inadequate for delineating the thermal discharge plume in Hooksett Pool. *See id*. p. 9. *See also* Responses to Comments II.3.3.3, 3.3.4, and 3.3.5. In particular, Hickey also recognized that the model used temperature data averaged over a 10-year period which is not reflective of "worst-case" conditions when the Station operates at baseload capacity. EPA has not based its evaluation of alternative effluent limitations under § 316(a) on the 2016 CORMIX model or LWB's assessment of the model results.

The comment also asserts that the Nedeau Report (AR-1574) demonstrates that thermal discharges from Merrimack Station will further harm the Hooksett Pool BIP by providing thermal refuge for Asian Clams. EPA agrees that the presence and, more importantly, the abundance of Asian clams downstream from Merrimack Station's thermal discharge appears to be directly related to the plant's discharge. However, abundance of Asian clam in the lower Hooksett Pool does not yet appear to be causing appreciable harm based on the available the data before EPA to date. EPA has determined that, based on the existing information, the Final Permit's chronic, average weekly temperature limit for the winter period will ensure protection of the BIP. EPA agrees that additional monitoring of Asian clams in Hooksett Pool is warranted. The continued monitoring and assessment of the clam's presence, prevalence, and impacts on the BIP will be required, as specified in the permit. EPA responds in detail to comments on Asian clams in Reponses to Comments in Section II.5 of this document.

According to the comment, thermal shock is an important consideration and one that has been masked by Eversource's daily averaging of the continuous data set. EPA agrees generally that fish species which have become acclimated to artificially elevated water temperatures and then subjected to a rapid decrease in temperature may suffer stress or shock related to that rapid change.

EPA raised concerns about the attractive influence of elevated water temperatures in Merrimack Station's discharge canal during winter months, particularly regarding their potential to adversely affect the spawning success of yellow perch. *See* AR-618, pp. 100-02. A fish's body temperature would increase in response to elevated water temperature and that, in turn, could raise a fish's metabolism and cause an increased feeding rate. AR-59, pp. 1533-1534). The ability to feed in the discharge canal may be constrained by the canal's small size relative to the habitat available in Hooksett Pool, to which it's connected. Therefore, fish might not find sufficient forage in the discharge canal were they to stay there for prolonged periods and they might need to leave the discharge canal in search of forage. It is also unclear, however, from the limited data that exist, whether fish enter the discharge canal and stay there throughout the winter. Also, the Final Permit limits discharge temperatures so that temperatures at Station S4 will not be greater than 8ºC throughout the winter (November 1 – April 1) to ensure that temperatures in Hooksett Pool remain protective of yellow perch reproduction requirements.

Finally, decreasing demands for Merrimack Station's electricity has resulted in minimal-to-no need for the Facility to operate during much of the Fall (October – early December). This allows resident species to adjust naturally to colder ambient temperatures throughout Hooksett Pool, and would prevent fish from maintaining an artificially high body temperature as they might if the plant was operating continuously from summer to winter. So, while some fish are likely to be attracted to the Facility's elevated water temperatures, the potential for cold shock to occur would be limited to only those fish within the canal and not the Hooksett Pool proper where the plume's temperature drops fairly quickly as it comes in contact with the ambient river water and dissipates. Therefore, going forward, even if the Facility shuts down abruptly during the winter months, EPA does not expect there to be more than minimal impacts associated with cold shock, and such impacts would not likely affect any species at the population level and would not harm the BIP.

For the Final Permit, EPA has determined that, under the current operation of Merrimack Station, specific alternative effluent temperature limits are sufficiently stringent to ensure the protection and propagation of the BIP. These temperature limits are being set under a CWA § 316(a) and are consistent with, and largely track, the water quality-based limits proposed in the 2011 Draft Determinations Document (AR 618, pp. 212-16) allowing for a limited area of the river for initial mixing (*i.e.*, the distance from Stations S0 to S4). The Final Permit also limits the Facility's capacity factor from May 1 to September 30, which ensures that the current operation of the Station continues during the next permit cycle. By limiting the capacity, the Permittee will be able to meet temperature limits that will ensure the protection of the BIP but are less stringent than the technology-based limits proposed in the 2011 Draft Permit, which required installing closed-cycle cooling. Of course, since the Facility is now operating like a peaking plant, rather than a baseload plant, it will operate far less than either set of limits might allow. During the warmest periods, the Final Permit's limits on operation, in combination with acute (maximum daily), water quality-based temperature limits at Station S4, will ensure that the impacts of the thermal plume are limited in duration and severity such that the BIP is protected. If the Station exceeds this capacity, causing it to operate more during this period, the Final Permit requires the Permittee to meet chronic (average weekly), water quality-based temperature limits at Station S4 that will protect the BIP from sub-lethal effects of the thermal plume.

3.4.5 Predictive Assessment: Assessing Thermal Exposures at Merrimack

Comment II.3.5.6	**AR-1577, EPRI, pp. 3-14 to 3-16**

The predictive assessment of Merrimack's thermal discharge begins with determining the magnitude and extent of potential exposures of the RIS to elevated temperatures from the discharge in the Merrimack River. EPRI believes that there are two important factors that should be considered in defining these exposures.

First, the potential thermal exposures should reflect likely operation of the Merrimack Station over the upcoming NPDES permit period (typically five years). As clearly demonstrated in ISO New England (2017), the Station no longer operates as a base-loaded facility as it had prior to

2010. Hence, temperature monitoring data collected prior to the draft NPDES permit (2011) does not reflect current conditions. The Merrimack Station operates principally as a peaking facility operating only when economic dispatch requires. A re-graphing of the generation data provided in ISO New England (2017) reveals a distinct seasonal pattern in operation (Figure 1). This graph clearly illustrates a substantial decline in the electrical generation at Merrimack since 2007 throughout the year except during winter. Hence, the magnitude and extent of thermal exposures to the aquatic community during most of the year are likely to be much lower than when Merrimack was operating as a baseload facility. During spring and summer, when biological productivity and potential for thermal stress is highest, Merrimack is typically operating at a capacity factor of less than 20 percent. That is only a small fraction of generating capacity of this facility prior to the 2011 draft NPDES permit. Only during winter, when natural gas availability constraints limit operation at other generating facilities is Merrimack called to run often. However, biological stresses from elevated temperatures at this time of the year should be minimal owing to low river water temperatures.

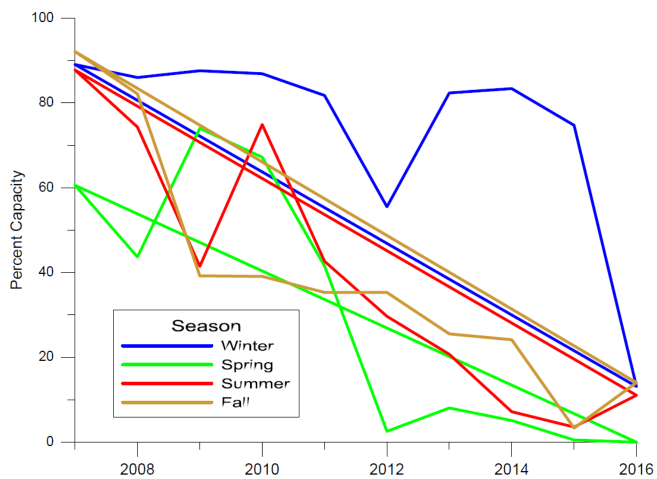

Figure 3-1. Trends in electrical generation by season at the Merrimack Station, 2007 - 2016.

Second, as in many states, NH Water Quality regulations allow for a mixing zone to all for discharged pollutants to mix with the receiving waters provided that the mixing zone:

"(a) Meets the criteria that surface waters shall be free from substances in kind or quantity that:

- *Settle to form harmful benthic deposits;*
- *Float as foam, debris, scum or other visible substances;*
- *Produce odor, color, taste or turbidity that is not naturally occurring and would render the surface water unsuitable for its designated uses;*
- *Result in the dominance of nuisance species; or*
- *Interfere with recreational activities;*

(b) Does not interfere with biological communities or populations of indigenous species;

(c) Does not result in the accumulation of pollutants in the sediments or biota;

(d) Allows a zone of passage for swimming and drifting organisms;

(e) Does not interfere with existing and designated uses of the surface water;

(f) Does not impinge upon spawning grounds or nursery areas, or both, of any indigenous aquatic species;

(g) Does not result in the mortality of any plants, animals, humans, or aquatic life within the mixing zone;

(h) Does not exceed the chronic toxicity value of 1.0 TUc at the mixing zone boundary; and

(i) Does not result in an overlap with another mixing zone.

[sic] *Within these designated mixing zones, water quality criteria do not apply. Use of mixing zones for thermal discharges is a very common practice and included in numerous NPDES permits at facilities nationwide.*

While it is unclear if a formal mixing zone has been incorporated within Merrimack's NPDES permit, it is reasonable that one could be requested and granted. If this is the case, all evaluations of the potential for thermal effects (other than acute mortality) should be based on temperatures outside the mixing zone.

The final step in the predictive assessment is comparison of the thermal exposures to thermal tolerance information for the RIS. Some key issues that EPRI believes need to be considered in applying thermal tolerance data include:

1. It is important to remember that most of the thermal tolerance data is based on laboratory studies. Numerous studies have found that laboratory-based studies do not accurately reflect effects observed in the real world (EPRI 2011).

2. Use of thermal tolerance information to predict thermal discharge effects do not consider the well-documented capability of motile organisms (e.g., fish) to avoid areas of thermal stress.

3. Predictive analyses presume that organisms are exposed to elevated temperatures continuously. Except for non-motile organisms, this is simply not the case. Aquatic organisms actively and passively move in and out of areas of higher temperatures. Hence, exposures to elevated temperatures are often short and can be substantially less than the durations used in thermal tolerance studies.

The peaking nature of Merrimack's current operation means that discharge temperatures can widely fluctuate following electrical demand, often over a 24-hour period. Hence, exposed organisms are afforded a recovery period between periods of thermal exposure. Bevelhimer and Fortner (2007) found: "Laboratory results suggest brief forays near critical temperatures are not necessarily harmful and recovery can be 100% after return to tolerable temperatures." Hence, the cycling nature of Merrimack's current operation might substantially reduce the biological effects of thermal discharges even though peak temperatures might approach those expected under baseline operation.

EPA Response:

CWA § 316(a) authorizes alternative thermal effluent limits when it is demonstrated to EPA that the technology- and water quality-based effluent limits are more stringent than necessary and that the alternative limits will assure the protection and propagation of the receiving water's BIP. 33 U.S.C. § 1326(a); 40 CFR 125.73(a). Thermal discharge limits based on a § 316(a) variance must assure that the receiving water's BIP will be safe from harm from the thermal discharge, and that the thermal discharge will not interfere with the BIP's ability to increase or spread naturally in the water. *See* AR-618 p. 18.

EPRI offers what it believes should be a "predictive assessment" of Merrimack's thermal discharge, including discussion of the current operating status of the Station, mixing zone regulations, and the magnitude and extent of potential exposures of Resident Important Species (RIS) to the thermal plume. EPRI continues that when applying thermal tolerance data, the evaluation should consider the limitations of laboratory-derived limits and the ability of organisms to actively or passively avoid exposure to the plume for durations that would result in stress and/or mortality.

EPA generally agrees with EPRI's characterization as one method of determining if the proposed limits would be protective of the balanced, indigenous population. Indeed, EPA essentially provided its own assessment consistent with this recommendation in the Draft Determination, including a comparison to protective temperatures of the most thermally-sensitive resident and migratory species, using data provided in PSNH's demonstration. *See* AR-618 p. 86-115. EPA notes that PSNH provided only an assessment based on predictive modeling of the thermal plume rather than an assessment of the temperatures in the Merrimack River in comparison to thermal tolerance for RIS species, despite having more than 20 years of daily data. *See* AR-618 p. 79-85. In response, EPA provided its own evaluation of the potential thermal exposures of RIS species to the thermal plume and EPRI points to no deficiency in EPA's assessment of the thermal tolerance data for the 2011 Draft Permit. However, as explained in Response to Comments above, EPA re-evaluated the potential exposures to the thermal plume for the Final Permit considering the actual daily mean and maximum temperature data (as opposed to long-term averages) at three continuous monitoring stations representative of both baseload operations (2004 through 2011) and more recent, peaking-like operations indicative of the substantial reduction in plant operations, particularly during the summer. *See* Response to Comment II.3.1.3.

EPRI comments that the predictive assessment of thermal exposures should reflect the current operation of the Merrimack Station and follows that the temperature monitoring data collected prior to the 2011 Draft Permit does not reflect current conditions. In particular, the Station currently operates relatively infrequently during the summer when the potential for severe thermal impacts was highest based on EPA's evaluation. *See* AR-618 at pp. 118-119. EPA considers the permit limits requested by the permittee and PSNH requested renewal of the existing CWA § 316(a) variance that is reflected in the 1992 Permit and would have allowed thermal discharges associated with baseload operations using open-cycle cooling. Therefore, for the 2011 Draft Permit, EPA reviewed and responded to this request and considered what limits would be needed to address a baseload operating scenario. EPA was aware that the Facility's operations were much reduced after 2012 and in the 2017 Statement, EPA identified that it was considering the implications of the change and invited public comment on the subject. AR 1534, pp. 4-5, 7-8, 34-36, 68-69. EPA also noted that, at that time, PSNH was still requesting permit limits to address baseload operations. *Id*. at 69.

This later changed when GSP purchased the Facility and indicated that it was currently operating like a peaking plant, expected to continue operating that way in the future, and was willing to accept appropriate permit limits based on such operations. Given GSP's willingness to accept permit limits on that basis, rather than seeking permit limits based on an unanticipated future baseload operations scenario, EPA agrees that it should develop limits that account for the Facility's likely operating profile and are based upon consideration of, among other relevant matters, recent data representative of current and anticipated future operating conditions. *See also* AR-1534 at 39, 69. *See also* Responses to Comments II.3.2.2, 3.2.3. Writing permit limits based on current operating conditions makes sense as long as they address how the Facility will operate going forward. Writing permit limits based on current, reduced operations would be inappropriate and ineffectual if after the permit was issued the Facility could simply resume operating at a higher level and cause greater adverse effects that were evaluated in developing the permit.

Therefore, EPA has designed permit limits consistent with Merrimack Station's current intermittent operations and will, where necessary, prevent significantly greater operations that would cause significantly greater adverse environmental effects. Such limits are appropriate because EPA's analysis has concluded that thermal discharge limits reflecting this type of operation will satisfy the conditions of CWA § 316(a). Namely, limits based on CWA § 301, 33 U.S.C. § 1311, will be more stringent than needed to assure the protection and propagation of the BIP in the Hooksett Pool, and the Final Permit's limits reflecting reduced operations and protective critical temperatures will assure the protection and propagation of the BIP. These permit limits are intended to provide appropriate flexibility to the Facility while also protecting the Merrimack River and the BIP consistent with legal requirements.

EPRI also comments that a predictive assessment should consider the concept of a mixing zone and, if a mixing zone is considered, thermal effects (other than acute mortality) should be assessed based on temperatures *outside* the mixing zone. EPRI correctly observes that New Hampshire Surface Water Quality Standards allow for designation of a limited area or volume of the surface water as a mixing zone. *See* Env-Wq 1707.01(b). In this case, however, the Facility has not requested a mixing zone from the state and the state has not formally delineated a mixing zone for the new permit.

Nevertheless, the concept of a "mixing zone" in the generic sense can be used "as a mechanism for dealing with thermal discharges pursuant to section 316(a) of the Act." *In Re Sierra Pac. Power Co.*, U.S. EPA, Decision of the Gen. Counsel No. 31, at 2 (Oct. 14, 1975). *See* AR-618 p. 23. A "mixing zone" is a term of art under the CWA that refers to a tool used in the application of state water quality standards. S*ee* 40 CFR § 131.13. A "mixing zone" under state water quality standards is designated by the State and, in New Hampshire, would be subject to specific state criteria listed at Env-Wq 1707.02, as referenced in the comment. At the same time, the legislative history of CWA § 316(a) indicates that allowing an area in which thermal mixing occurs was an idea that can be used in designing permit limits for a CWA § 316(a) variance. AR-618 p. 23. Using the concept of a mixing zone in the context of CWA § 316(a) is not defined in the Act or implementing regulations and is not subject to the specific criteria for "mixing zones" in the state regulations. Whether under CWA § 316(a) or state mixing zone requirements, the analysis would identify an initial zone of mixing within which certain temperatures may be exceeded, and also an additional zone where temperature limits may not be exceeded. In addition, if needed, temperature levels could be set not to be exceeded in *any* part of the receiving water.

To satisfy § 316(a), the limits and area of mixing must work together to assure the protection and propagation of the BIP. *See* 39 Fed. Reg. 36,178 (October 8, 1974). The 1992 Merrimack Station Permit, which includes thermal limits based on a 316(a) variance, already, in effect, allowed an area of mixing at Part I.A.11.b ("The power spray module system shall be operated, as necessary, to maintain either a mixing zone (station s-4) temperature not in excess of 69°F…"). In addition, the "weekly average" water quality-based protective temperatures developed for the 2011 Draft Determinations Document proposed a compliance point at Station S4. *See* AR-618 p. 212-215. This monitoring location is approximately 2,000 feet downstream from the end of the discharge canal and, as such, demonstrates that EPA considered the mixing concept at the time of the 2011 Draft Determinations Document. For the Final Permit, EPA also applied the concept of an initial mixing area in developing thermal discharge limits based on a 316(a) variance. Again, the compliance point is Station S4.

Finally, EPRI comments that application of the thermal tolerance data should consider the limitations of laboratory-derived estimates for real world conditions and the ability of organisms to avoid long exposures to the thermal plume either by actively avoiding the plume (for mobile organisms) or because organisms are not continuously exposed to elevated temperatures.[21] In its evaluation of the potential for exposure to the thermal plume for the Final Permit, EPA did consider that mobile organisms can avoid the plume and that, with appropriate discharge limits, the exposure time of drifting organisms will tend to be less than the duration that would result in mortality. *See* Responses to Comments II.3.1.3, 3.2(ii), 3.4.7. The protective temperatures proposed in the Determination Document were derived consistent with EPA's 1986 Water Quality Criteria ("Gold Book"), which establishes a maximum protective temperature for short exposures based on species-specific equations. EPA used this method to derive protective short-term temperatures for species in the Merrimack River considering that the time period when the organisms would be exposed to temperatures that could cause acute lethality is likely to be considerably shorter than 24 hours. *See e.g.*, AR-618 p. 190.

EPA looked to a wide range of studies to determine appropriate temperatures for protecting the BIP. Several of the studies referenced in the Determination Document (e.g., Wismer and Christie, AR-196) observed lethality at exposures of as little as 10-30 minutes, not 24 hours or 4-

[21] EPA does not agree that laboratory studies should be ignored in all cases, if that was the commenter's point. EPA believes that laboratory studies may provide useful information for assessing possible thermal effects on fish, but it is important to understand their limitations and limiting factors. EPA notes EPRI presents a quote from Bevelhimer and Fortner (2007) that itself relies on laboratory studies.

7 days, as LWB suggests. *See* AR-618 at 187, 203. The agency realizes that it may not be possible to accurately predict acclimation temperature or exposure time for organisms in Hooksett Pool and, as such, we cannot be certain how closely the critical temperatures identified in laboratory studies would be mirrored in Hooksett Pool. Nevertheless, the studies referenced in the Determination Document suggest that mortality and/or sub-lethal effects to early life stages of yellow perch and American shad could occur at temperatures that have been observed in the thermal plume. In light of the available data, EPA derived protective temperatures for thermally sensitive species and life stages consistent with the methods described for setting water quality criteria in EPA's Gold Book.

3.4.6 Setting Appropriate NPDES Permit Limits for Temperature at Merrimack

Comment II.3.4.6	AR-1577, EPRI, p. 3-17

In addition to determining the acceptability of a 316(a) variance for Merrimack, the draft 2011 NPDES permit sets limits to the thermal discharges from the Station as none had been included in previous permits. EPRI believes there are some key issues that should be considered:

1. The thermal limits should account for allowable mixing zones and ensure protection of the BIC at the edge of the mixing zone but necessarily at [sic] Permit limits should be designed to protect the aquatic community being exposed within the Hooksett Pool at the present time, not species that might have inhabited the Pool in the past or might occur in the area in the future. Significant and adverse changes in the aquatic community, if any, that might occur in the future requiring more stringent thermal discharge limits should be addressed in future NPDES permit modifications. EPRI believes that given the recent detection of Asian clam in Hooksett Pool upstream and downstream of the thermal discharge, EPA should consider monitoring the species as part of future facility NPDES permit modifications. Further, that EPA may wish to study the Asian clam upstream and downstream of the thermal discharge for its potential direct correlation with the facility discharge, and its presence quantitatively assessed for adverse impacts to the BIC.

2. EPA may wish to consider numeric water quality criteria and/or permit limits established at [sic] for other thermal discharges to receiving waters with similar aquatic communities when establishing limits for Merrimack.

There is a wealth of new information relative to the assessment and regulation of thermal discharges in addition to the items listed above that has become available since the development of the 2011 draft NPDES permit. Much of this is summarized in EPRI (2012, 2016). We encourage consideration of all of this new information when setting appropriate NPDES permit limits for the Merrimack Station.

EPA Response:

EPRI lists several issues that it believes should be considered when setting temperature limits for the Final Permit. EPA has considered these issues to the extent that they are relevant to setting permit limits that will be protective of the BIP. EPA has considered the application of a mixing area for the setting temperature limits in the Draft and Final Permits. *See* AR-618 p. 23. The Final Permit limits, which are based on a § 316(a) variance, require the Permittee to meet protective temperatures at Station S4 downstream from the Facility, which provides a limited area for thermal mixing based on EPA's assessment of critical temperatures and biological effects from the Facility's thermal discharge.

EPA has also considered the effect of the thermal plume on Asian clam populations in the Merrimack River. EPA has determined that, based on the existing information, the Final Permit's chronic, average weekly temperature limit for the winter period will ensure protection of the BIP. *See* Responses to Comments II.5.9.1 and II.5.9.2 (and associated sub-comments). The Final Permit requires monitoring and assessment of the clam's presence, prevalence, and impacts on the BIP. Finally, EPRI comments that EPA should consider temperature limits established for "other thermal discharges" and vaguely comments that EPA should consider new information relative to regulation of thermal discharges available in the Report attached to the comments. See, generally, AR-1589, AR-1596. 96. EPA has reviewed the attached Reports and considered effluent limitations established for other thermal discharges under § 316(a) in developing variance-based temperature limits for the Final Permit. *See, e.g.,* Responses to Comments II.6.3.1, 6.3.3.

For the Final Permit, EPA has determined that, under the current operation of Merrimack Station, the specified alternative effluent temperature limits are sufficiently stringent to ensure the protection and propagation of the BIP. The temperature limits set under a CWA § 316(a) variance for the Final Permit largely track the water quality-based limits proposed in the Draft Permit Determinations Document allowing for a limited area of the river for initial mixing (i.e., the distance from Stations S0 to S4). *See* AR 618, pp. 212-17. The Final Permit also includes a limitation on the capacity factor during the warmest months, which ensures that the current operation of the Station continues during the next permit cycle. Limiting the capacity will ensure that the Permittee is able to meet temperature limits that will ensure the protection of the BIP, although the limits are in some respects less stringent than the technology-based limits proposed in the 2011 Draft Permit, which required installing closed-cycle cooling. During the warmest periods, the Final Permit's limits on operation, in combination with acute (maximum daily), water quality-based temperature limits at Station S4, will ensure that the impacts of the thermal plume are limited in duration and severity such that the BIP is protected. If the Station exceeds this capacity, causing it to operate more during this period, the Final Permit requires the Permittee to meet chronic (average weekly), water quality-based temperature limits at Station S4 that will protect the BIP from sub-lethal effects of the thermal plume.

EPA disagrees with EPRI's comment temperature limits should be designed to protect whatever aquatic community is currently present, rather than the BIP that might have inhabited the Pool in the past or might occur in the area in the future. Moreover, EPRI does not elaborate on how its comment is relevant to the BIP at issue in this permitting decision, and it does not request any change to the permit based on this comment. The Draft Determination defined the BIP for the Merrimack River in detail. *See* AR-618 pp. 30-36. It is plain from this discussion that just any aquatic community present in the Hooksett Pool is not necessarily representative of the BIP. The Draft Determination explains that the BIP cannot be dominated by pollution-tolerant species or species whose presence or abundance is attributable to § 316(a) variance-based permit limits. *See id*. pp. 19-21. For example, § 316(a) cannot be read to mean that a balanced indigenous population is maintained where the species composition, for example, shifts from a thermally sensitive to thermally tolerant species. Such shifts would be "at war with the notion of 'restoring' and 'maintaining' the biological integrity of the Nation's waters." *Id*. p. 20 citing *In Re Pub. Serv. Co. of Ind., Wabash River Generating Station* 1979 EPA App. LEXIS 4, 1 E.A.D. 590 (EAB 1979). Thus, EPA also does not agree that "significant and adverse changes in the aquatic community" requiring more stringent thermal discharge limits should only be addressed in future.

EPA received and addressed a number of comments on what community constitutes the BIP for the Merrimack River. In light of the comments and supporting documents received, EPA considers that the appropriate BIP for evaluating a CWA § 316(a) variance for Merrimack Station is best reflected in the following communities: (i) the Hooksett Pool biotic community of the 1970s; (ii) the present Garvins Pool fish community, and (iii) the ambient section of Hooksett Pool for assessing the benthic invertebrate community in the thermally affected section downstream. EPA considered changes in historical trends *and* comparisons with adjacent, present-day fish communities uninfluenced by the thermal discharge in a comprehensive evaluation of the fish community. EPA addresses detailed comments on the BIP in Responses to Comments II.4.1 and 4.2 (and associated sub-comments).

3.4.7 EPA's Alternative Thermal Tolerance Limits

Comment II.3.4.7(i)	**AR-1548, PSNH, p. 51**

PSNH's submissions also demonstrate that the thermal tolerance limits EPA used to establish water-quality based thermal standards were in many cases incorrect or inappropriately applied.[236] Limits that are not supported by the literature cited by EPA include the winter limit for yellow perch maturity (8°C), yellow perch egg development (18°C), long-term exposure for yellow perch larvae (21.3°C), and long-term exposure for yellow perch juveniles and adults (25.1°C).[237] Dr. Barnthouse provides that limits EPA inappropriately applied include the short- term limit for yellow perch larvae, the short-term limit for yellow perch juveniles and adults, and both the short-term and long-term limits for American shad larvae and juveniles.[238]

[236] *See, e.g.,* AR-1300; LWB 2017 Response.

[237] *See* AR-1300 at 22-30.

[238] *See id.*

Comment II.3.4.7(ii)	**AR-1300, LWB pp. 21-32**

Among resident species, EPA identified yellow perch as the most sensitive and established limits for each of the following life stages: (1) adult reproductive condition, (2) spawning stage, (3) egg stage, (4) larval stage, (5) juvenile stage, and (6) adult stage (non-reproductive). Temperature limits were defined for each of these stages, to be applied during the period in which that life stage was present in the river.

Among anadromous species, EPA identified certain life stages of American shad and river herring as being potentially more sensitive than yellow perch, and established temperature limits for these species and life stages as well.

As discussed below, these limits are more restrictive than is necessary to protect the relevant populations present in the Hooksett Pool, given the wide range of thermal environments inhabited by all of these species, and especially given the limitations on test methodologies discussed by EPRI (2011a).

Comment II.3.4.7(iii)	**AR-872, Normandeau, pp. 95-101, 106-108, 112, 118-119**

[Responding to Determination Document p. 91] On page 12 of Stier and Crance (1985), the authors state that "[o]ptimal near-surface water temperatures for American shad egg and larval development range from 15 to 25º C. Temperatures below 10º C and above 30º C are unsuitable."

Responding to Determination Document p. 92] Rather than rely on flow data from the middle of August, which likely represents a low flow period when larval shad would not be drifting through Hooksett Pool, USEPA should use the more appropriate value it calculated for June (Section 8.3.1.4b of the §316 Determination Document). This value is 0.55 ft/second, which would result in a transit time of 60 minutes and 36 seconds. In addition, USEPA reported the incorrect value from Table 2 in the 1976 Normandeau report Merrimack River Anadromous Fisheries Investigations: Annual Report for 1975 (Normandeau 1976b). The correct surface current speed in the proximity of the Station's thermal discharge was 0.17 knots (0.29 ft/sec) and would produce an estimated transit time of less than two hours.

[Responding to Determination Document p. 93] A review of Klauda et al. (1991) reveals that the 50% mortality in 88.9° F (31.6° C) water was following 96 hours of continuous exposure. Klauda et al. (1991) cites Marcy (1976a) and states that "young American shad avoid effluent temperatures greater than 30º C by swimming below the power plant outflow." Based on this, it is reasonable to conclude that juvenile American shad in Hooksett Pool would behave in a similar fashion. Evidence for such behavior is provided by the successful spawning and growth of American shad in Hooksett Pool during 1978 and again in 2002.

[Responding to Determination Document p. 94] USEPA does not mention that Moss (1970) observed captive juvenile shad exposed to rapid temperature increases of 4ºC above acclimation in a tank study. In addition, Moss (1970) concluded that young shad are behaviorally capable of avoiding potentially lethal temperature changes. It is reasonable to conclude that juvenile shad in Hooksett Pool are capable of avoiding prolonged exposure to elevated thermal conditions, based on both tank (Moss 1970) and field (Marcy 1976a, Normandeau 1979c) observations, and the capture of juvenile shad in the pool in during August in 2010 and 2011.

[Responding to Determination Document p. 94] Massman (1963) suggests that juvenile American shad can readily feed on both terrestrial and aquatic insects. Ross et al. (1997) observed juvenile American shad in riverine nursery habitat readily feed on a variety of prey from both aquatic and terrestrial origin. Based on these studies, it is reasonable to conclude that American shad in Hooksett Pool would not be limited to feeding on surface drift of terrestrial insects within only thermally influenced portions of Hooksett Pool when they could also consume aquatic insects below the surface or feed on surface drift in the upper half of Hooksett Pool. American shad are free to move about the entire 5.8 miles of Hooksett Pool and, as demonstrated by Moss (1970) and Marcy (1976a), are behaviorally capable of avoiding potentially lethal temperature changes.

[Responding to Determination Document p. 95] Atlantic salmon smolts typically move downstream at night (Hesthagen and Garnas 1986, McCormick et al. 1998, Moore et al. 1998) and as a result, foraging is most likely limited. Radiotelemetry equipment was deployed at the Hooksett Dam during 2003 and 2005 to monitor smolts following their passage at Merrimack Station, and there were no delays to downstream migration due to Hooksett Dam. The radio-tagged smolts released in upper Hooksett Pool moved successfully and rapidly past the Station's thermal discharge and lower Hooksett Pool (Normandeau 2006a).

[**Responding to Determination Document p. 119**] Normandeau questions USEPA's use of drift rates calculated using data from the middle of August, which is the lowest flow period time of the year, rather than the value it calculated for June (as discussed in Section 8.3.1.4b of the §316 Determination Document). Using the lower flows from August is inappropriate because yellow perch, white sucker and American shad larvae are not present in Hooksett Pool during August. Moreover, use of August data creates an artificially slow drift time for larvae between S0 and S4 and suggests longer exposures to elevated water temperatures than may be occurring. In addition, USEPA inexplicably makes little to no mention of the ΔT for river flow moving the 2,000 ft between Monitoring Station S0 and S4.

EPA Response to Comment II.3.4.7(i), (ii), and (iii):

PSNH comments that the thermal tolerance limits (also referred to in the Responses to Comments as "critical temperatures") EPA used to establish water-quality based thermal standards were in many cases incorrect or inappropriately applied, citing comments made by LWB (AR-1300), for specific life stages of yellow perch and American shad. *See* AR-618 at 174-210. Upon review of the comments made by LWB and a re-evaluation of the bases developed and presented in the Draft Determination, EPA concludes that some of the comments warranted revisions to certain temperature limits or compliance periods set in the draft permit, whereas other comments did not. EPA addresses PSNH's comment, as well as the related comments and analysis provided by LWB, (AR-1300) below.

Yellow perch - Maturation

PSNH and LWB (AR-1300) question EPA's selection of 8°C as the maximum winter temperature for proper gonadal development in yellow perch. EPA used data presented in Hokanson (1977) (AR-59) and the 21-year average of the daily mean from Normandeau 2007 (AR-3) for late October and early April to establish the appropriate temperature and chill duration for Hooksett Pool. The limited available data indicated ambient water temperatures dropped to 8°C in late October/early November and were typically at or below 8°C through April

20. Ambient temperature monitoring is not available for the period from November through early April because PSNH removed the monitoring equipment upstream from the thermal discharge during winter months due to icing concerns. EPA evaluated the limited available winter ambient data to establish 8°C as the appropriate temperature for yellow perch maturation. *See* AR-618 at 180-81. According to LWB, Hokanson is based on laboratory conditions and ignores that under natural conditions, fish would be exposed to temperatures much lower than 8°C for portions of the winter. Hokanson (1977) found that spawning success was maximized at temperatures of 4°C – 6°C. Yellow perch exposed to these temperatures reached 95% (6°C) to 100% (4°C) spawning success with an exposure of 160 days. *See* AR-59, Figure 1.

LWB's comments provide new information from monitoring at the Hooksett Dam during December through April indicating that winter temperatures drop to as low as 2°C in Hooksett Pool and remain at or below 5°C through mid-April. *See* AR-1300 at 22-3. LWB states that "[i]n the Merrimack River and other systems inhabited by yellow perch, temperatures are lower than 8.0°C for a large part of the winter." *Id*. This data, coupled with the results from Hokanson (1977) suggest that winter ambient temperatures in Hooksett Pool are less than 8°C for extended periods, which supports a conclusion that a somewhat shorter chill period duration and still be protective of yellow perch maturation.

LWB then urges that EPA's proposed limit of 8ºC is more stringent than necessary to protect yellow perch maturation. He suggests that Hokanson (AR-59) identified 10ºC as the maximum winter temperature for gonadal maturation and that EPA did not justify the need for a more stringent limit. LWB further suggests that a limit of 10°C from November 15 through April 1 would ensure that ambient downstream temperatures are "within the envelope" of temperatures in which yellow perch are known to successfully reproduce. AR-1300 at 23. As LWB points out, Hokanson identified 10ºC as the maximum winter temperature. EPA explained in the Determination Document that spawning was twice as successful at 8ºC as compared to 10ºC for the same chill duration. *See* AR-618 at 181. Furthermore, while the ambient winter temperatures yellow perch are exposed to throughout their range can reach 10ºC in lower latitudes, temperatures in Hooksett Pool are at or below 8ºC, and probably lower than 6ºC, for most of the winter period, as LWB recognizes in his comments. In other words, while the comments potentially support limiting the duration of the chill period (to something less than 166 days proposed in the Draft Determination) raising the temperature limit to 10ºC would be less protective of proper gonadal development for yellow perch in Hooksett Pool and, moreover, based on PSNH's own analysis, the proposed temperature limit of 8°F can be met in winter.

That said, EPA also concludes that the compliance period for the winter "chill period" limit protective of yellow perch maturation can be modified to better reflect updated ambient temperature data. The 2011 Draft Determination proposed a compliance period from November 1 to April 20, whereas the Final Permit includes a compliance period from November 1 through March 31. The Final Permit retains the average weekly temperature limit of 8ºC at Station S4, which is representative of ambient water temperatures. Despite a shorter chill period, the gonadal development in yellow perch should be enhanced by exposure to actual winter water temperatures considerably colder than 8ºC for much of the winter. As LWB comments, the ambient temperature typically drops below 8°C towards the end of October, but there may be some years where the ambient temperature in early November exceeds 8°C. The Final Permit includes a provision that limits the rise in temperature at Station S4 to no greater than 2°C as compared to the ambient temperature at Station N10 (or N5) when the ambient temperature is within 2°C of, or greater than, the effective weekly average temperature limit. Under there limited instances, the rise in temperature limit replaces the 7-day average temperature limit. This provision provides the Permittee with flexibility to meet the effective permit limits during transitional periods for ambient temperatures in the river.

Yellow perch spawning

LWB comments that "an upper temperature limit [of 12°C] that cannot be exceeded" for yellow perch spawning is not supported by the scientific literature; the comments cite additional sources not evaluated in the Determination Document suggesting that spawning is possible at temperatures as high as 18.5°C. *See* AR-1300 at 24. In response to the comments, EPA again reviewed Hokanson (1977) and Wismer and Christie (1987). *See* AR-59; AR-196. Hokanson (1977), referencing unpublished data by Jones et al., stated that although viable ova were produced at temperatures up to 18.6°C, 80% of all viable spawnings were produced between 6.2 and 16.0°C, and gamete viability was highest at 8-11°C. Wismer and Christie (1987) observed a spawning temperature range of 7-15°C and identified 12.0°C as the optimum spawning temperature. EPA finds neither of these two references to provide a compelling argument to raise the temperature limit above 12.0°C, but rather, to support EPA's conclusion that 12°C is an appropriate optimal temperature. Additionally, as EPA discussed in the 2011 Draft Determinations Document, Kreiger et al. (1983) found water temperature suitability for yellow perch spawning dropped dramatically at temperatures above 12ºC. *See* AR-618 at 182; AR-63. Moreover, LWB incorrectly identifies the proposed temperature limit of 12°C as an "upper temperature limit that cannot be exceeded." In fact, this limit is an average weekly temperature calculated as a 7-day average beginning on the first day of the reporting period (*i.e.*, calendar month) and is not an instantaneous limit that "cannot be exceeded." Given that the temperature limit is an average weekly value, an optimal, or preferred target, rather than a critical maximum, is a more appropriate value for the protection of yellow perch spawning.

LWB also comments that a temperature maximum at Station S4 is not necessary because this location is not suitable spawning habitat. Station S4 is located in an unvegetated area of the channel and my not be utilized as spawning habitat by yellow perch, which spawn predominantly in at least moderately vegetated near-shore areas. *See* AR-1300 at 24. The comment is not supported by data provided by Normandeau and several citations used by LWB. LWB comments that because Station S-4 is unvegetated it may not provide suitable habitat, however, spawning also occurs over submerged branches. According to the commenter, citing Krieger et al. (1983), and Carlander (1997), "… yellow perch spawn predominantly in at least moderately vegetated littoral (near-shore) areas, often over vegetation or submerged branches." While Normandeau's 2011 study (AR- 869) of the physical habitat in Hooksett and adjacent pools did not identify sub-aquatic vegetation close to Station S4 (though it is at S-0), woody debris is depicted along both the eastern and western shorelines extending from the plant's discharge canal south to the Hooksett Dam. Even if suitable habitat was not found right at Station S-4, the notion that applying a protective temperature there would be un-necessary reflects a misunderstanding of the compliance point. Station S4 was chosen as the compliance monitoring location in the Final Permit in part because it has been consistently monitored under the 1992

Permit, resulting in a long-term dataset suitable for establishing permit limits, and, importantly, because Station S4 is intended to be representative of ambient river temperatures in Hooksett Pool downstream of the temperature probe, including nearshore spawning habitat. In other words, even if the habitat right at Station S4 is not suitable for spawning, meeting the protective temperature limits at Station S4 will ensure that nearshore spawning habitat at and downstream from the Station S4 transect is also protected.

While EPA has not proposed altering the average weekly temperature for yellow perch spawning, EPA did reconsider the time periods identified in the Determination Document. *See* AR-618 at 209-10. EPA based the proposed biologically important time periods, in part, on the 2007 Normandeau data that, as explained above, was misinterpreted. *See*, *e.g*., Response to Comment II.3.1.1. In response to the misunderstanding about that data, EPA reviewed more recent observed daily temperature data from January 2004 - May 2019, which is reflective of current operations. See AR-1715. The review of the complete dataset, rather than just averages and ranges, indicates that the dates for biologically important periods could be adjusted to better reflect current ambient conditions. In addition, the end date for the "chill period" for yellow perch maturation has been adjusted from April 20 to March 31. Based on this period, the time period for yellow perch spawning begins on April 1. This increases the overall spawning period by 12 days, but both the start and finish dates of the period are earlier than in the 2011 Draft Determinations Document.

Yellow perch egg development

LWB (AR-1300, p. 24-25) references additional studies to assert that a higher temperature (21°C) than EPA proposed in the 2011 Determinations Document (18°C) would be protective of yellow perch eggs. LWB argues that the study EPA relied on (Koonce et al. (1977), AR-62) incubated eggs at a constant temperature, while under natural conditions eggs would be spawned at low temperatures which increase over time until hatching. Hokanson (1977) and Koonce et al. (1977) observed tolerances up to 21°C for early embryonic stages. EPA reviewed these studies and found they do not support increasing the temperature to 21°C. LWB comments that Hokanson reported a temperature tolerance range of 3.7 to 21°C, however, the study observed early stage yellow perch egg survival of 80% or greater at a temperature range from 6° to 18°C and a steep decline in survival from 60% to 0% at 21ºC. *See* AR-59 at 1531, Figure 4. Koonce et al. (1977) depicts daily mortality rates for various life stage phases. For the "cleavage egg" phase, mortality jumped from 16% at 18ºC to 70% at 21ºC. *See* AR-62 at 1904. EPA recognizes that river temperatures are not static during this time period but maintains that a temperature limit of 18ºC is appropriate and well-support by the scientific literature.

LWB then comments that, based on the 2007 Normandeau data, average daily temperatures at Station S4 were below 18°C until May 30 and did not exceed 21°C until June 11, well after the end of the yellow perch egg development period. According to LWB, the temperature data suggests that eggs would most likely be exposed to temperatures within the optimal range (*i.e.*, no greater than 18°C) for the entire development period. The 2007 Normandeau data and the updated data for the period from 2002 to 2015 both confirm that the average daily mean temperature at Station S4 was less than 18°C through May 30, which further supports maintaining this temperature as a permit limit because it is representative of natural conditions.

EPA also examined recent daily temperature data for the years 2012 through 2019. Observed mean daily temperatures at Station S4 did exceed 18°C at the end of May in some years. For example, in 2015 and 2016, the mean daily temperature at Station S4 exceeded 18°F on May 26 and remained above the limit, even reaching as high as 22.6°C on May 30, 2015. Merrimack Station was not operating during this period in either year, suggesting that the relatively higher temperatures were caused by naturally warmer conditions each year. As LWB suggests, during these naturally warm years it is likely that spawning would begin earlier and eggs would still be at optimal temperatures for the entire incubation period. *See* AR-1300 at 25; AR-59 at 1542. Finally, LWB comments that Station S4 is not located in spawning habitat and, as such, a limit for eggs at this location is unnecessarily conservative. As explained above, the monitoring location is a compliance point that is representative of downstream conditions and a limit met at this location will be protective of downstream habitat, not just at that monitoring location.

LWB's comments do not justify increasing the average weekly temperature limit deemed protective of yellow perch eggs from 18 to 21°C. Indeed, the references and data cited in his comments support maintaining the limit of 18°C.

Like the earlier lifestages discussed so far, EPA has also adjusted the time period for compliance with the protective limit for yellow perch egg development. Where the Draft Determination had proposed May 19-27 as the period for egg development, the Final Permit has adjusted the compliance period to May 1 – May 31 to reflect EPA's review of the complete temperature data under current conditions and to align with the changes to the time periods for earlier life stages, as explained above. In addition, the Final Permit includes a provision that limits the rise in temperature at Station S4 to no greater than 2°C as compared to the ambient temperature at Station N10 (or N5) when the ambient temperature is greater than, or within 2°C of, the effective weekly average temperature limit. This provision provides the Permittee with flexibility to meet the effective permit limits during transitional periods for ambient temperatures in the river, such as during the end of May when the temperature may naturally reach or exceed 18°C during warm years.

Yellow perch larval stage – chronic limit

PSNH and LWB comment that the value of 21.3°C for protecting yellow perch larvae from May 28 through June 15 is unrealistically low for several reasons: 1) ambient temperatures have exceeded 21.3°C and the maximum average daily temperature exceeded 21.3°C every date between May 25 and June 15 over the 21 year dataset; 2) the choice of optimal temperature is questionable; and 3) the proposed criterion was "not to be exceeded" but did not specify an averaging period, while the Gold Book, which informed calculation of the limit, states that the value is a weekly average temperature. *See* AR-1300 at 26-27.

Turning first to comments on the appropriate value for protecting yellow perch larvae, the commenter argues that 18°C (the temperature EPA selected to represent the physiological optimum in its formula for calculating the chronic temperature limit) is not a physiological optimum but a temperature at which no mortality was observed in a laboratory experiment. *See* AR-618 at 186; AR-62. LWB asserts based on Hokanson (1977) that 20°C would be a more reasonable physiological optimum temperature. *See* AR-1300 at 27, AR-59. Using 20°C as the optimum temperature in the Gold Book formula results in a chronic (weekly) limit of 22.7ºC. [22] Koonce et al. (1977) does not present 18°C as a physiological optimum temperature for larval growth and EPA agrees, therefore, that it may be more stringent than necessary for calculating the chronic limit. As LWB points out, Hokanson (1977) suggests that feeding and survival of "well-fed" percid larvae is optimal at 20°C. Therefore, for the Final Permit, EPA applied a physiological optimum temperature of 20°C and an upper incipient lethal temperature of 28°C to calculate a chronic limit of 22.7ºC for protecting yellow perch larvae.

The commenter also points out that the maximum average daily temperature exceeded 21.3°C under ambient conditions (*i.e.*, at Station N10) every day from May 25 – June 15 at least once in the 21 years covered in the 1984-2004 data set. *See* AR-3. As PSNH points out, however, this data point "represents the maximum average daily temperature that occurred on a given calendar day typically only one time during the 21 years monitoring data was collected between 1984 and 2004," and it does not demonstrate that this value was reached "on consecutive days in every year or even consecutively on any given days in any single year during this 21-year period." AR-846 at 43. That ambient daily mean temperatures reached or exceeded 21.3°C on a single date over 21 years does not establish that a less stringent temperature would be protective of larval yellow perch. Indeed, the mean daily S4 temperature averaged over the years 2002 through 2015 did not reach 21.3°C until June 19 based on the updated values provided by PSNH. *See* AR-1299. In most years, temperatures in early to mid-June appear to be within the preferred range for yellow perch larvae, especially since the Facility transitioned to operating like a peaking plant. However, under baseload operations, temperatures in early June could exceed this temperature. *See* Response to Comment 3.1.3.

The Determination Document (Table 8-5 at 209) indicates that the maximum protective temperature for yellow perch larvae from May 28 to June 15 is intended to be a weekly average, not, as LWB describes, a "value not to be exceeded." The Final Permit requires that the weekly average limit of 22.7°C shall be calculated as a 7-day average beginning on the first day of the calendar month. In addition, the Final Permit adjusts the compliance period to June 1 – June 21 to reflect EPA's review of the complete temperature data under current conditions, to align with the changes to the time periods for earlier life stages, and to be consistent with 2017 entrainment data submitted by Normandeau indicating that yellow perch larvae are present in Hooksett Pool through the week beginning June 19.[23] *See* AR-1550. The Final Permit also includes a provision

[22] Barnthouse also comments that even 22.7°C is more stringent than necessary to protect yellow perch larvae because Hokanson (1977) shows that water bodies in which the average temperature in mid-June exceeds both 21.3°C and 22.7°C are still "within the temperature envelope" that supports healthy yellow perch populations. AR-1300 at 27. The figure referenced by Barnthouse to support this statement (AR-59, Figure 9) does not speak to the presence of yellow perch larvae or the temperature's suitability to this most temperature-sensitive life stage. Instead, it demonstrates the seasonal temperature envelope describing temperature limits for adaptation of juvenile and adult yellow perch at 35 streams in the southern part of the native range of this species, many of which are likely to represent naturally higher temperatures than Hooksett Pool. It does not support a higher temperature for protection of yellow perch larvae. *See* AR-59 at 1541.

[23] The compliance period extends until June 21 to align with the 7-day averaging period for each weekly average temperature value.

that limits the rise in temperature at Station S4 to no greater than 2°C as compared to the ambient temperature at Station N10 (or N5) when the ambient temperature is more than, or within 2°C of, the effective weekly average temperature limit. This provision provides the Permittee with flexibility to meet the permit limits even when ambient temperatures in the river reach or exceed 22.7°C.

Yellow perch larval stage – acute limit

LWB generally argues that the acute, maximum protective temperature that EPA identified for yellow perch larvae (29.3°C) is overly stringent because EPA proposes Station S0 as the compliance point, which ignores that the thermal plume would be diluted and drifting larvae would be exposed to a decreasing temperature profile as they transit between Stations S0 and S4. *See* AR-1300 at 27-8. EPA agrees that there is a well-documented decrease in temperature between Station S0, where the temperature essentially reflects thermal effluent prior to mixing with the river, and S4, approximately 2,000 feet downstream from the mouth of the discharge canal. After carefully considering the intention of the acute limit for the protection of drifting larvae, EPA concluded that moving the compliance point for the acute limit from Station S0 to S4 is reasonable to account for mixing of the plume during the relatively short exposure period while continuing to provide protection for yellow perch larvae.

LWB also comments that the only larvae exposed to temperatures recorded at S0 are those which have been entrained through the plant's cooling water system, and they are already assumed to be dead. *See* AR-1300 at 28. EPA agrees that only larvae that have been entrained would literally be present *at* Station S0, which is located just inside the discharge canal, but larvae drifting near the surface along the western shoreline at the confluence of the discharge canal would be exposed to temperatures close to or equaling those recorded at S0. These larvae could be exposed briefly to temperatures exceeding the acute limit when drifting past Station S0 but would also experience declining temperatures as they drift downstream. The short-term exposure to relatively higher temperatures at Station S0 is one reason EPA has elected to maintain the proposed 2ºC buffer from temperatures that have been demonstrated to cause lethality to yellow perch larvae. *See* AR-618 at 190.

Considering these comments and reviewing the more current ambient temperature set (2004-May 2019) (AR-1715) for Hooksett Pool during May and June prompted EPA to re-examine the acute temperatures and compliance period for protecting larval yellow perch from acute lethality. Laboratory studies of temperature tolerance acclimate fish at a constant temperature, but under natural conditions fish are exposed to a range of temperatures and acclimation temperatures increase as the river naturally warms during May and June. *See* AR-1300 at 29-30. *See also* AR-59 at 1544. Beitenger and Bennett (2000) (AR-726) observed that higher acclimation temperatures typically correspond with higher temperature tolerances of fish species during controlled survival studies. *See* AR-618 at 187. The studies used to derive an acute protective temperature for yellow perch larvae in the 2011 Determinations Document had larvae acclimated at 15°C. *See* AR-618 at 187. Ambient conditions (as represented by Station N10) in Hooksett Pool during the month of May range from about 10°C (on May 1) to about 18°C (on May 31), but average ambient temperatures increase to 18°C in June and reach an average of 22.5°C by the end of June.

In the Merrimack River, larval yellow perch are acclimated to higher ambient temperatures in June than in May, which suggests that the thermal tolerance of larvae in June would also be higher. EPA determined, therefore, that it is appropriate to divide the yellow perch larval period (May 1 through June 21) into two segments: 1) May 1 to 31 with a maximum daily (acute) temperature limit of 29.3ºC representative of the lower acclimation temperature; and 2) June 1 through June 21 with a maximum daily (acute) temperature of 30.9°C representative of a higher acclimation temperature. As explained in the 2011 Determinations Document, the June acute temperature is derived using the methodology from EPA's Gold Book. *See* AR-618 at 190. EPA considers this small increase in the acute temperature limit warranted for the June compliance period since ambient temperatures at that time are generally at or above 20.0ºC. The derivation of both temperature limits includes a 2ºC buffer from temperatures that have been demonstrated to cause lethality to yellow perch larvae consistent with recommendations from the Gold Book and National Academy of Sciences (1973). *See* AR-175.

American shad larval stage – acute limit

LWB's comments regarding acute temperature limits for larval American shad were similar to those made for larval yellow perch (*i.e.*, that monitoring the temperature limit at Station S0 ignores that the thermal plume would be diluted and drifting larvae would be exposed to a decreasing temperature profile as they transit between Stations S0 and S4). *See* AR-1300 at 31-32. In consideration of those comments, EPA again concluded that moving the compliance point for acute temperature limits downstream to Station S4 was warranted. *See* discussion of short-term protective temperatures for yellow perch larvae, above.

EPA's consideration of public comments and more current and complete temperature data (2004-May 2019) (AR-1715) for Hooksett Pool from May through July prompted the Agency to re-examine the temperatures for protecting larval American shad from acute lethality. *See*, *e.g.*, AR-872, pp. 97-100. In calculating the acute limit for the 2011 Draft Determinations Document, EPA used 31.5°C as a temperature causing lethality but noted that American shad larvae survived short-term (15-minute) exposures at 31.5°C and the value could be revised upon further review. *See* AR-618 at 203. According to Klauda et al. (AR-61), American shad larvae acclimated to 20.5°C survived a 15-minute exposure to 31.5°C, but suffered significantly greater mortality when exposed to 33.5°C. Site-specific studies on American shad larvae conducted by Normandeau Associates for Merrimack Station in 1975 (AR-182) demonstrated that significant mortality occurs at temperatures greater than 33.3ºC, though the precise temperature that caused mortality was not identified.

EPA has concluded that temperatures causing lethality from Klauda et al. (1991) and Normandeau's 1975 study (AR-183) should be used to establish an appropriate lethal temperature for American shad larva. Therefore, 33.3°C has been selected as the lethal temperature and a 2ºC buffer was subtracted from that value to help prevent lethality to American shad larvae that come in contact with the plant's thermal plume as they drift past the mouth of the discharge canal. The Final Permit establishes a maximum daily (acute) temperature limit of 31.3°C for the protection of American shad larvae. American shad larvae are expected to be present in Hooksett Pool from May through July. *See* AR-618 at 202. However, the acute temperature limits established for yellow perch eggs (29.3°C) from May 1 to 31 and yellow perch larvae (30.9°C) from June 1 to June 22 are more stringent than, and therefore supplant, the acute temperature limit for American shad larvae during these periods. The compliance period for the acute temperature limit of 31.3°C begins on June 22 after the yellow perch larval period and extends through July 31. The compliance point for the acute limit for larval shad is Station S4 consistent with the other temperature limits in the Final Permit.

EPA has concluded that the CWA § 316(a) variance-based, maximum daily limits in the Final Permit are protective of the BIP. As explained above, the maximum daily temperature limits, which are effective from May 1 through July 31, are designed to protect drifting organisms like yellow perch and American shad larvae from mortality. The maximum daily limit at Station S4 is set 2°C lower than the estimated upper incipient lethal temperature on which the limit is based (yellow perch or American shad) and this provides a buffer for drifting organisms as they travel the 2,000 feet from Station S0 to Station S4. However, under certain conditions (*e.g.*, in a low flow year, when ambient temperatures are high and the Facility is operating both units or just Unit 2), there could be elevated temperatures from the end of the discharge canal (Station S0) 2,000 feet downstream to Station S4 (and potentially beyond) that could possibly result in some mortality (*i.e.*, at or above the upper incipient lethal temperature) to drifting organisms. Upper incipient lethal temperatures are based on laboratory studies in which aquatic organisms acclimated to a specific temperature are exposed to high temperatures for a certain duration. The maximum daily temperature limit for thermally-sensitive larval species was derived from conservative estimates of acclimation temperature and duration of exposure. In most cases, the combination of acclimation temperature, the maximum daily limit at Station S4 (including the 2°C buffer), and the duration of exposure for a drifting organism traveling from S0 to S4 will be sufficiently protective to prevent mortality and, as a result, will reasonably assure the protection of the BIP. However, there could possibly be certain limited circumstances where drifting organisms exposed to elevated temperatures between Stations S0 and S4 could suffer mortality. In the event that the maximum daily limit is exceeded at Station S4, the Final Permit requires that the Facility take action (*e.g.*, reduce electrical generation) to reduce its thermal discharge and come back into compliance with the maximum daily limit within 3 hours of the excursion. This lag-time is necessary to allow the Facility to take action and for the consequence of that action to be measurable in the river. EPA finds that occurrence of the combination of conditions under which lethality could potentially occur will be limited and unusual under the limits of the Final Permit and considering the recent operations at the Facility. These reduced operations, together with the acute temperature limits (set at 2°C less than the lethal limit) and the requirement to take action to come into compliance within 3 hours of excursion, will minimize lethality of drifting organisms and reasonably assure the protection of the BIP.

Yellow perch juvenile and adult stages – chronic limits

LWB (AR-1300, p. 28-30) comments that a thermal limit of 25.1°C during the summer months is not necessary to protect juvenile and adult yellow perch and that this temperature has often been exceeded at Station N10 (representative of ambient conditions). *See* AR-1300 at 28-30. LWB offers that, based on the 2007 Normandeau temperature data, the maximum daily average temperature at Station N10 equaled or exceeded 25.1ºC on 10 dates in June and every date in July and August. *See* AR-1300 at 28-29. As PSNH points out, however, this data point demonstrates only that the average daily temperature reached or exceeded 25.1°C in one of the 21 years of the dataset (from 1984 through 2004), and does not demonstrate that this value was reached "on consecutive days in every year or even consecutively on any given days in any single year during this 21-year period." As PSNH also explained, "the individual-day data tables in Appendix A do not offer any analyses with respect to the duration specific temperatures occurred on any given day, much less whether such durations spanned multiple days." AR-846 at 43. That ambient daily mean temperatures reached or exceeded 25.1°C on a single date over 21 years is not a persuasive basis for arguing that a less stringent temperature would be protective of adult yellow perch. The average daily mean temperature at Station N10 over the period from 1984 through 2004 (AR-3) never reached 25.1°C in June, July, or August (AR-3, Appendix A) and reached 25.1°C on only a single day (August 4) over the period from 2002 through 2015 (AR-1299).

Based on this comment, EPA reviewed the observed daily mean ambient temperatures from 2004 to 2018 (AR-1715). This data set is more refined than a summary of average data over many years and provides additional information on changes between months and years. Ambient conditions in Hooksett Pool remained below 25.1ºC for the month of June; however, the daily mean temperature at Station N10 exceeded 25.1ºC during July and August in all but two years between 2004 and 2018 (in 2014 and 2017). In four of those years, the ambient temperature was higher than 25.1°C more than 40% of the time during July and August and ambient temperatures remained above 25.1°C for more than one week. In 2010, ambient temperatures exceeded 25.1°C on 44 days, with the longest duration lasting 28 consecutive days. In 2011, the mean daily temperature at Station N10 exceeded 25.1°C for 30 consecutive days. Temperatures at this station are recorded approximately one foot beneath the surface but data collected in Hooksett Pool during electrofish sampling in 2004 and 2005 demonstrated relatively uniform water temperatures throughout the water column in ambient sections of the pool. *See* AR-3, Appendix B-1.

EPA calculated an upper limiting temperature for adult yellow perch of 25.1°C using the Gold Book method, an upper incipient lethal temperature of 32.2°C[24], and a physiological optimum temperature of 21.5°C (calculated as the mid-point of the reported range of optimal temperatures from 19°C to 24°C). See AR-618 at 194-95. LWB comments that Hokanson (AR-59, p. 1544) identified 25.1ºC as the physiological optimum for yellow perch. According to Hokanson (AR-59, p. 1535), however, laboratory studies used to derive the physiological optimum were typically based on *juvenile* perch, which is the most thermally tolerant life stage. *See* AR-618, pg. 192. The physiological optimum temperature used to derive the upper limiting temperature in the Draft Determination was the midpoint of the optimum temperature range for *adult* yellow perch identified in Krieger at al. (1983). See AR-63. The most recent daily temperature data suggests that typical summer temperatures in Hooksett Pool may exceed temperatures that EPA calculated as protective of adult yellow perch even in sections of the river not affected by the plant's thermal discharge. Yellow perch inhabit Hooksett Pool even with summer temperatures exceeding 25.1°C and EPA has decided it is not reasonable to establish a temperature limit that

[24] The 2011 Thermal Toxicity Literature Evaluation, submitted with EPRI's comments on the 2017 Statement, also recommended an upper incipient lethal temperature of 32.3°C, consistent with the value used in the 2011 Draft Determinations Document. See AR-1596 at 3-6.

cannot be met even under natural conditions. Therefore, the Final Permit establishes an additional limitation that requires the weekly average temperature at Station S4 to be no more than 2°C above the weekly average ambient temperature in the event that the ambient temperature is more than, or within 2°C from, the effective weekly average temperature limit. This provision provides the Permittee with flexibility to meet the effective permit limits when ambient temperatures in the river may reach or exceed 25.1°C under natural conditions and addresses LWB's comments that the upper limiting temperature for adult yellow perch in the Merrimack River may be higher than 25.1°C.

LWB, pointing to Figure 9 of Hokanson (1977), AR-59, comments that yellow perch are found in a wide range of temperature between 15°C and 30°C and indicates that 50% of yellow perch populations inhabit environments warmer than the daily average temperature (over 21 years) at Station N10. *See* AR-1300 at 29. Further, LWB comments that 5% of yellow perch populations inhabit environments warmer than the average daily temperature at Station S4.
Hokanson's Figure 9 (AR-59) describes the range of seasonal temperature limits for adaptation of yellow perch among 35 stations in the southern part of the native range of this species, primarily from the upper Mississippi River drainage and Atlantic coastal streams from Maine to North Carolina. *See* AR-59 at 1541. Many of the stations in the dataset were located south of Hooksett Pool where perch are likely acclimated to higher temperatures and resulting in a higher overall "seasonal temperature envelope." As Hokanson states, "fish stocks control their acclimatization temperature and optimize their physiological performance along a finite temperature gradient of each habitat." AR-59 at 1544. Yellow perch in Hooksett Pool are adapted to the natural conditions in the waterbody, whether or not there are populations of yellow perch that tolerate higher temperatures in other waterbodies. The intent of the temperature limits in the Final Permit are to ensure that ambient temperatures throughout Hooksett Pool are protective of yellow perch and that the thermal discharge from the Station does not limit access to habitat in the lower Hooksett Pool at certain times of year. As explained in the 2011 Draft Determinations Document, fisheries data from 2004 and 2005 suggested that "[a]dult yellow perch largely abandon the southern portion of Hooksett Pool during summer conditions. This suggests that adult yellow perch are being effectively precluded from habitat downstream of the discharge canal in summer." AR-618 at 194. While yellow perch abundance continues to be low in the section of Hooksett Pool downstream of the Station, based on data collected in 2012 and 2013 (*See* AR-1551 p. 16 and 19), total abundance in Hooksett Pool increased such that long term trends analysis no longer detects a significant decrease in abundance for yellow perch (*See* AR-1551, p. 35). The average weekly temperature limit of 25.1°C and option of complying with the rise in temperature limit if ambient temperatures exceed 25.1°C will protect yellow perch adults in the Hooksett Pool by maintaining ambient conditions.[25]

[25] Barnthouse comments that the range of temperatures reported as being optimal for American shad is broad, owing to the wide geographic range of this species. By using the mid-point of this optimal range to calculate a long-term, protective temperature of 26°C for American shad larvae, Barnthouse argues that the Permittee could be in violation of permit limits even when the observed temperature is within the range of optimal temperatures. *See* AR-1300 at 31. Barnthouse comments that Greene et al. (AR-56) lists three studies where 26°C was within the range identified as either optimal or suitable for American shad larvae. Indeed, Greene et al. reviewed one study with an upper optimal temperature of 26.5°C; the second observed an upper optimal temperature of 25°C. Three additional studies listed as having ranges "suitable" for shad larvae all include an upper temperature of 26.2°C up to 30°C. However,

Yellow Perch juvenile and adult stages – acute limits

LWB comments that a short-term temperature limit intended to protect juvenile yellow perch from acute lethality is not necessary because conditions that could cause such fish kills are not present in the vicinity of the Merrimack Station discharge. *See* AR-1300 at 29; AR-59 at 1544. LWB similarly comments that no short-term temperature limit is necessary to protect juvenile American shad because this life stage is capable of avoiding the thermal plume. *See* AR-1300 at 32; AR-68. EPA agrees that fish kills from heat are relatively infrequent, likely to occur only when escapement to cooler water is blocked and have not been documented to have occurred at Merrimack Station. In addition, the operational changes at the Station result in a thermal plume that is limited in duration, which allows river temperatures to return to ambient levels more rapidly. The observed daily Station S4 temperatures representative of recent operations at the plant indicate that temperatures at this location and downstream will not cause mortality of juvenile fish. A review of the recent daily temperature data indicates that the mean daily temperature at Station S4 exceeded 30.9°C between August 1 and September 30 as much as 20-30% of the time prior to 2012, but has not been exceeded once since 2012. *See* AR-1715. The maximum daily temperature at Station S4 exceeded 30.9°C in August and September nearly every year between 2004 and 2011 but has been exceeded in just two years since. *See id*. Finally, juveniles are mobile and can avoid the thermal plume either by remaining in cooler areas of the Hooksett Pool for the relatively short periods when the plume is present or by staying at depth beneath the relatively shallow, surface-oriented plume. Therefore, the Final Permit does not establish an acute temperature limit for juvenile yellow perch or American shad in August or September.

3.4.8 Climate Warming Impacts

Comment II.3.4.8	**AR-851, CLF, pp. 29-30**

Several studies have been done on the potential effects of climate warming on fish thermal habitat in streams, and they have recognized the potential for global warming to change the streams' thermal regimes.[159] For cold and cool water species, like many of the indigenous species in the Hooksett Pool, rising temperatures due to global warming will have the effect of reducing available habitat. One study, conducted by researchers from the University of Minnesota, predicted an eleven to twenty-two percent decrease in streams thermally suitable for cool water

this review also observed that "water temperatures above 27ºC are capable of causing abnormalities or a total cessation of larval American shad development" and "[f]ew larvae have been found living in temperatures above 28°C. AR-56 at 20. While EPA might have considered adjusting the long-term protective temperature for American shad larvae upwards by a few tenths of a degree (but still less than 27°C), any limit for this species and life stage is superseded by the long-term limits for yellow perch during the period when larval shad would be expected to be present in Hooksett Pool. The biologically relevant period for American shad larvae is from May 1 through July 31. The Final Permit establishes long-term (chronic), average weekly temperature limits for yellow perch eggs (18°C), larvae (22.7°C), and adults (25.1°C) during the entire period for American shad larvae that are more stringent than the proposed protective limit for American shad. For this reason, there are no chronic (average weekly) temperature limits established for American shad in the Final Permit.

fishes.[160] Not only will suitable habitat decrease for cool water fishes, rising stream temperatures will make the habitat more suitable for warm water fishes such as large mouth bass, which then compete with cool water fish such as yellow perch for available forage.

Rising temperatures, winter snowpack declines, increased frequency of spring/summer droughts, and changes in stream flow patterns could lead to decreases in water supply during the summer and fall.[161] Decreases in water supply would further exacerbate the present thermal impact that Merrimack Station's discharge has on Hooksett Pool that includes:

- Significant fraction of shallow water habitat in the lower pool affected by the [thermal] plume during summer months;
- High and persistent temperatures above ambient associated with the [thermal] plume under typical summer conditions;
- [Thermal] plume's tendency to extend across the entire width of the river; [Thermal] plume's demonstrated capacity to cause water column stratification, which can contribute to low dissolved oxygen events above Hooksett Dam; and,
- Low flows in Hooksett Pool typical during summer months (i.e., July, August, September).[162]

Further, Merrimack Station's large volumes of water withdrawal would likely exacerbate the problems associated with more frequent spring and summer droughts causing lower water levels. EPA found that "water withdrawal at a rate significant enough to cause water from the discharge canal to flow upstream clearly has the potential to affect the Hooksett Pool environment. ... Merrimack Station's current operations typically redirect up to 62 percent of the available flow under low-flow conditions. EPA regards this to be a large fraction of the available river flow."[163] If ambient river temperatures rise as a result of climate warming, Merrimack Station's thermal discharge limits will need to be adjusted downward to assure the protection and propagation of the BIP, especially cool water fish. EPA should take this into consideration in determining if its current protective fish temperatures will be protective enough under shifting thermal regimes.

[159] See, e.g., AR 735, Omid Mohseni, et al., Global Warming and Potential Changes in Fish Habitat in U.S. Streams, 59 Climatic Change 389-409 (2003).
[160] *Id*. at 398.
[161] Confronting Climate Change in the U.S. Northeast Science, Impacts, and Solutions report by Northeast Climate Impacts Assessment Synthesis Team, 63 (2007), http://www.climatechoices.org/assets/documents/climatechoices/confronting-climate-change-in-the-u-snortheast.pdf.
[162] Attachment D at 39.
[163] *Id*. at 38.

EPA Response:

The comment recommends that, when determining if current protective fish temperatures will be protective enough under shifting thermal regimes, EPA consider that thermal discharge limits may need to become more stringent to assure the protection and propagation of the BIP if ambient river temperatures rise as a result of climate warming. While EPA cannot anticipate the precise effects of rising temperatures on the Merrimack River, if ambient temperatures increase as the comment predicts, these changes will likely favor species with a greater tolerance to heat. Incremental changes would be expected to occur over long periods, and it is not known if and when changes will become apparent in Hooksett Pool. In addition, the effect of rising temperatures even on warmwater species is uncertain given that the effects may be cumulative (e.g., the combined effect of rising temperatures and changes in competition with other warmwater species). For example, the abundance of largemouth bass (a warmwater species) in Hooksett Pool has been relatively stable since the 1970s, but abundance of pumpkinseed, the most abundant warmwater species in Hooksett Pool during the 1970s, has declined. *See* AR-618 p. 59-61. Competition with bluegill, an introduced species first observed around 1995, may have contributed to the decline in pumpkinseed. This species is a direct competitor for spawning habitat and is more heat tolerant than pumpkinseed. *See id*. The §316(a) variance-based temperature limits in the Final Permit are sufficiently stringent to assure the protection of the BIP including the most thermally sensitive resident and migratory species and life stages. The Final Permit also requires continuous temperature monitoring and additional biological monitoring to ensure that the temperature limits are met and that the BIP continues to be protected, including under shifting thermal regimes. EPA will re-assess the § 316(a) variance for each permit renewal and, as appropriate, take any climate warming into account and adjust the temperature limits to ensure the BIP remains protected.

4.0 Status of the BIP

4.1 Standards of a CWA § 316(a) Variance

4.1.1 Studies PSNH and its Consultants Have Submitted from 1969 through 2017 Demonstrate the Absence of Appreciable Harm and Support PSNH's Request for Renewal of Its § 316(a) Variance

Comment II.4.1.1	**AR-1548, PSNH, pp. 13-21**
See also AR-1552, Normandeau, pp. 2-3; AR-872, Normandeau, pp. 8-10; AR-1577, EPRI, pp. 3-3 to 3-8; AR-841, UWAG, pp. 67-69	

To understand the context of the new submissions—which corroborate the absence of any appreciable harm to the Hooksett Pool BIP—it is important first to briefly consider PSNH's numerous submissions to EPA in support of its permit and renewal applications. Before issuance of the 2011 Draft Permit, PSNH provided EPA with the following comprehensive studies spanning from 1969 through 2010:

- The Effects of Thermal Releases on the Ecology of the Merrimack River (Normandeau 1969);[45]
- The Effects of Thermal Releases on the Ecology of the Merrimack River - Supplemental Report No. 1 (Normandeau 1970);[46]
- Merrimack River Monitoring Program: A Report for the Study Period 1971 (Normandeau 1972);[47]
- Merrimack River Monitoring Program: A Report for the Study Period 1972 (Normandeau 1973a);[48]
- Merrimack River: Temperature and Dissolved Oxygen Studies 1972 (Normandeau 1973b);[49]
- Merrimack River Monitoring Program: A Report for the Study Period 1973 (Normandeau 1974);[50]
- Merrimack River Monitoring Program 1974 (Normandeau 1975a);[51]
- Merrimack River Ecological Studies: Impacts Noted to Date; Current Status and Future Goals of Anadromous Fish Restoration Efforts; and Possible Interactions Between Merrimack Station and Anadromous Fishes (Normandeau 1975b);[52]
- Merrimack River Monitoring Program 1975 (Normandeau 1976a);[53]
- Merrimack River Anadromous Fisheries Investigations: Annual Report for 1976 (Normandeau 1976b);[54]
- Further Assessment of the Effectiveness of an Oil Containment Boom in Confining the Merrimack Generating Station Discharge to the West Bank of the River (Normandeau 1976c);[55]
- Merrimack River Monitoring Program 1976 (Normandeau 1977a);[56]
- Final Report: Merrimack River Anadromous Fisheries Investigations 1975-1976 (Normandeau 1977b);[57]
- Merrimack River Thermal Dilution Study 1978 (Normandeau 1978);[58]
- Merrimack River Monitoring Program 1978 (Normandeau 1979a);[59]
- Merrimack River Monitoring Program: Summary Report (Normandeau 1979b);[60]
- Merrimack River Anadromous Fisheries Investigation 1978 (Normandeau 1979c);[61]
- Phase I Preliminary Report – Information Available Related to Effects of Thermal Discharge at Merrimack Station on Anadromous and Indigenous Fish of the Merrimack River (Stetson-Harza 1993);[62]

- Merrimack Station: Thermal Discharge Modeling Study (Normandeau 1996);[63]
- Merrimack Station (Bow) Fisheries Study (Normandeau 1997);[64]
- Merrimack Station Thermal Discharge Effects on Downstream Salmon Smolt Migration (Normandeau 2006a);[65]
- Merrimack Station Fisheries Survey Analysis of 1967 through 2005 Catch and Habitat Data (Normandeau 2007a);[66]
- Entrainment and Impingement Studies Performed at Merrimack Generating Station from June 2005 through June 2007 (Normandeau 2007b);[67]
- A Probabilistic Thermal Model of the Merrimack River Downstream of Merrimack Station (Normandeau 2007c);[68]
- Biocharacteristics of Yellow Perch and White Sucker Populations in Hooksett Pool of the Merrimack River (Normandeau 2009a);[69]
- Biological Performance of Intake Screen Alternatives to Reduce Annual Impingement Mortality and Entrainment at Merrimack Station (Normandeau 2009b); and
- Modeling the Thermal Plume in the Merrimack River from the Merrimack Station Discharge (ASA 2010)[71].

In 2012, in addition to PSNH's own comments concerning the 2011 Draft Permit, Normandeau Associates, Inc. ("Normandeau") submitted extensive Comments on the Draft Permit demonstrating the absence of appreciable harm to the BIP of Hooksett Pool and identifying numerous errors in EPA's § 316(a) determination.[72] Also, as part of PSNH's Comments to the 2011 Draft Permit, PSNH submitted the following reports and analyses related to the fish and macroinvertebrate communities and water quality of the Hooksett Pool substantiating this conclusion, including:

- Merrimack Station Fisheries Survey Analysis of the 1972-2011 Catch Data (Normandeau 2011a);[73]
- Historic Water Quality and Selected Biological Conditions of the Upper Merrimack River, New Hampshire (Normandeau 2011b);[74]
- Changes in the Composition of the Fish Aggregation in Black Rock Pool in the Vicinity of Cromby Generating Station from 1970 to 2007 (Normandeau 2011c);[75]
- Quantification of the Physical Habitat within Garvins, Hooksett, and Amoskeag Pools of the Merrimack River (Normandeau 2011d);[76] and
- Comparison of Benthic Macroinvertebrate Data Collected from the Merrimack River near Merrimack Station (Normandeau 2012a).[77]

As explained in PSNH's 2012 Comments, these studies demonstrate through multiple, different methods that Hooksett Pool is a BIP and the thermal discharge of Merrimack Station has not caused appreciable harm.[78] They include a comparison of fish species in Hooksett Pool for an over forty year period, an analysis of the biocharacteristics of fish species in Hooksett, Garvins, and Amoskoeg Pools, and examination of the benthic macroinvertebrate communities in Hooksett and Garvins Pools. These studies were performed consistent with EPA's own guidance[79] and often at the direction and under the oversight of EPA, New Hampshire Department of Environmental Services ("NHDES"), the Federal Energy Regulatory Commission, the U.S. Fish and Wildlife Service, the New Hampshire Department of Fish and Game, and the Merrimack Station Technical Advisory Committee ("TAC").[80] These studies demonstrate the current aquatic community in the Hooksett Pool meets all the characteristics of a BIP—namely, Hooksett Pool is characterized by (1) diversity at all trophic levels, (2) the capacity to sustain itself through cyclic seasonal changes, (3) the presence of necessary food chain species, and (4) non-domination by pollution-tolerant species.[81] Further, PSNH has met its burden of showing the operation of Merrimack Station has not caused appreciable harm to the Hooksett Pool BIP.[82]

After submitting its 2012 Comments, PSNH continued its analyses and supplied additional technical documentation and temperature data supporting its § 316(a) variance request, including the following:

- Letter from Linda T. Landis to Mr. Eric P. Nelson dated February 29, 2016 re: Response to November 30, 2015 EPA Region 1 CWA Section 308 Information Request Merrimack Station Temperature Data (including more recent and more detailed temperature data from 2002 through 2015, including the period after PSNH's completion of the Clean Air Project that is more representative of current plant operations);[83]
- Review of technical documents related to NPDES Permitting Determinations for the Thermal Discharge and Cooling Water Intake Structures at Merrimack Station, Lawrence W. Barnthouse, Ph. D., LWB Environmental Services, Inc. (LWB Feb. 2016);[84]
- Response to USEPA CWA § 308 Letter by Enercon and Normandeau (Enercon/Normandeau Feb. 2016);[85]
- CORMIX Thermal Plume Modeling Technical Report, PSNH Merrimack Station Units 1 & 2 Bow, New Hampshire, Enercon Services, Inc. (Dec. 2016);[86]
- Influence of Merrimack Station's Thermal Plume on Habitat Utilization by Fish Species Present in Lower Hooksett Pool, Lawrence W. Barnthouse, Ph. D., LWB Environmental Services, Inc. (Dec. 2016).[87]

These submissions included analyses from Dr. Lawrence W. Barnthouse, a highly regarded scientist with a wealth of experience in § 316(a) matters. Dr. Barnthouse reviewed EPA's § 316 determination as well as the extensive reports and analyses prepared by Enercon and Normandeau.[88] After identifying several flaws underlying EPA's § 316(a) determination that Dr. Barnthouse found invalidated its conclusions, Dr. Barnthouse determined that "operation of Merrimack Station has caused no appreciable harm to the BIP present in the Hooksett Pool."[89] Enercon and Normandeau also provided a comprehensive analysis of the detailed temperature data supplied by PSNH for the period 2002 through 2015. When comparing the average monthly mean temperatures between the 1984 through 2001 and 2002 through 2015 periods, the 2002 through 2015 data set (the period more representative of current plant operations) yielded "equivalent or lower downstream temperatures."[90]

PSNH's December 2016 submission included expert analysis of the relevant temperature data of Merrimack Station's thermal effluent, including CORMIX thermal plume modeling that calculated average plume characteristics over the period 2006-2015 for three representative time periods: early spring (May 2 – May 8), late spring (June 9 – June 15), and mid-summer (July 29-August 4).[91] Based on this analysis, in none of the cases examined would the thermal plume from Merrimack Station affect more than a negligible fraction of the fish habitat present downriver from the cooling water discharge.[92]

Now, with these comments, PSNH is submitting additional support for its § 316(a) variance request and in specific response to EPA's Statement, including the following:

- Normandeau Associates, Inc., 2012-2013 Data Supplement to the Merrimack Station Fisheries Survey Analysis of 1972-2011 Catch Data (Dec. 2017) ("Normandeau 2017a");[93]
- Normandeau Associates, Inc., Response to EPA's "Statement of Substantial New Questions and Possible New Conditions" (Nov. 2017) ("Normandeau 2017 Response");[94]
- Lawrence W. Barnthouse, Ph. D., LWB Environmental Services, Inc., Analysis of Merrimack Station Fisheries Survey Data for 2010-2013 (Dec. 2017) ("LWB 2017 Analysis");[95]
- Lawrence W. Barnthouse, Ph. D., LWB Environmental Services, Inc., Response to EPA's "Statement of Substantial New Questions for Public Comment" (Dec. 2017) ("LWB 2017 Response");[96]
- Enercon Services, Inc., Response to Environmental Protection Agency's Statement of Substantial New Questions for Public Comment (Dec. 2017) ("Enercon 2017 Comments");[97]
- Dr. Terry Richardson, AST Environmental, The Asian clam (Corbicula Fluminea) and its relationship to the balanced indigenous population ("BIP") in Hooksett Pool, Merrimack River, New Hampshire (Nov. 2017) ("AST Report");[98] and
- Dr. Robert F. McMahon, Review of the Asian clam (Corbicula Fluminea) and its relationship to the balanced indigenous population ("BIP") in Hooksett Pool, Merrimack River, New Hampshire (Dec. 2017) ("McMahon Review").[99]

Collectively, through decades of study and analysis, PSNH has submitted a comprehensive and scientific history of the Merrimack River and biota in the vicinity of Merrimack Station that conclusively demonstrates that Merrimack Station's thermal discharge has not caused prior appreciable harm to the fish or invertebrate communities or their representative populations. PSNH has satisfied its burden for renewal of its thermal variance. EPA has failed to meet its burden to "convincingly negate[] by outside evidence" PSNH's satisfaction of its § 316(a) burden.[100] Instead, contrary to Region 1's own previously stated practice,[101] EPA denied continuation of the 316(a) variance and proposed a permit that would require construction and installation of a cooling tower that cannot be economically justified by any rational cost-benefit analysis. This draconian requirement is based on speculation and error pointed out by PSNH and Normandeau in their 2012 Comments and attachments.[102] This error is further confirmed by the new data and analyses submitted by PSNH since 2012 and with these Comments—the Merrimack Station thermal discharge has not caused appreciable harm to the BIP of Hooksett Pool.

[44] *See, e.g., Wabash*, 1 E.A.D. at *7 (some level of harm to individual species is acceptable where community as whole remains relatively stable); *Brayton Point I*, 12 E.A.D. at 574 n.138, 139 (upholding EPA Region 1's analysis, which accommodates adverse effects but not to the extent that they would interfere with protection and propagation of BIP).

[45] AR-181.

[46] AR-285.

[47] AR-1141.

[48] AR-1150.

[49] AR-1149.

[50] AR-1148.

[51] AR-1147.

[52] AR-1146.

[53] AR-1145.

[54] AR-1155.

[55] AR-1151.

[56] AR-1159.

[57] AR-1156.

[58] AR-1184.

[59] AR-198.

[60] AR-364.

[61] AR-1203.

[62] AR-191.

[63] AR-184.

[64] AR-201.

[65] AR-7.

[66] AR-11.

[67] AR-2.

[68] AR-10.

[69] AR-12.

[70] AR-246.

[71] AR-99.

[72] AR-872.

[73] AR-1153.

[74] AR-1172.

[75] AR-1171.

[76] AR-1173.

[77] AR-1174. The majority of these reports focus on the Merrimack River fish community, in accordance with the well-established biological assessment approach of using fish assemblages as indicators of overall ecological condition. EPA's own technical framework document for the development and implementation of large river bioassessment programs describes the many advantages of using fish assemblages as a direct measure of biological condition relative to biological integrity, noting that fish are relatively long-lived, mobile, feed at every trophic level (*e.g.*, herbivores, omnivores, and predators), and can be relatively easy to identify to species. *See, e.g.,* AR-1164 at 3-4.

[78] *See* AR-846 at 7-60.

[79] *See* AR-1195 at 46-62.

[80] The TAC is the group of fish and ecosystem experts from various federal and state agencies established under the current NPDES permit to advise EPA and NHDES.

[81] *See* AR-846 at 17-34; 40 C.F.R. §125.71(c).

[82] *See* AR-846 at 36-59.

[83] *See* AR-1299 through 1307.

[84] AR-1300.

[85] AR-1305.

[86] AR-1352, Attachment 2.

[87] *Id.*, Attachment 3.

[88] *See* AR-1300.

[89] *Id.* at 44.

[90] AR-1305 at 3.

[91] *See* AR-1352, Attachment 3.

[92] AR-1352, Attachment 3 at i ("The survey data show that Merrimack Station's thermal discharge has had no measurable impacts on the fish community in the Hooksett Pool."). PSNH adopts and incorporates these February 2016 and December 2016 submissions as part of these comments as if fully set forth herein.

[93] This report is attached hereto as Exhibit 3.

[94] This report is attached hereto as Exhibit 4.

[95] This report is attached hereto as Exhibit 5.

[96] This report is attached hereto as Exhibit 6.

[97] This report is attached as Exhibit 1.

[98] This report is attached hereto as Exhibit 7.

[99] This report is attached hereto as Exhibit 8.

[100] *See* AR-1180 at 17.

[101] *See, e.g.*, U.S. EPA Region 1, Clean Water Act NPDES Permitting Decisions for Thermal Discharge and Cooling Water Intake from Kendall Station in Cambridge, MA, 316(a) and (b) Determination Document (June 8, 2004)

("Mirant Kendall Determination"), at 34-35 (question under § 316(a) is what informed scientific judgment would be without speculation about evidence not in record). This document is attached hereto as Exhibit 9.

EPA Response:

PSNH's comment largely serves as a list of the numerous studies, reports, and assessments submitted to EPA in support of its request for a CWA § 316(a) variance prior to the 2011 Draft Permit, during the public comment period for the Draft Permit, during the public comment period for the 2017 Statement, and in the interim period between 2012 and 2017. EPA has reviewed and considered each of the many submissions by PSNH and its consultants that are cited in this comment, primarily in Sections II.3, II.4, and II.5. The comment also states in conclusory fashion that its submissions (a) demonstrate that Merrimack Station's thermal discharges have not appreciably harmed the Hooksett Pool's BIP, and (b) reveal errors in EPA's analyses in support of the Agency's proposed denial of the Facility's request for renewal of its CWA § 316(a) variance. EPA disagrees. The Agency's responses to comments in this document address in detail the specific issues raised by PSNH, including issues related to the various studies and reports listed in the comment. These issues include, but are not limited to, the following: (i) alleged flaws underlying the draft § 316(a) determination invalidate its conclusions (Response to Comment II.3.1 and associated sub-comments); (ii) claims that the thermal plume from Merrimack Station affects a negligible fraction of the fish habitat present downriver from the cooling water discharge (Response to Comment II.3.3.3 and 3.3.4); (iii) arguments that the thermal discharge from Merrimack Station has not caused appreciable harm to the BIP (Response to Comment II.4.5 and associated sub-comments); and (iv) the suggestion that the current aquatic community in the Hooksett Pool meets all the characteristics of a BIP (Response to Comment II.4.2, 4.3, and associated sub-comments).

While PSNH concludes that EPA's denial of the requested § 316(a) variance was contrary to Region 1's own previously stated practice and that the proposed technology-based permit limits would require construction and installation of a cooling tower that cannot be economically justified by any rational cost-benefit analysis, EPA disagrees with PSNH's conclusions about EPA's analyses for the 2011 Draft Permit. At the same time, EPA also points out that it has prepared new analyses, building on the 2011 analyses, and revised the 2011 Draft Permit's thermal discharge limits to set the limits for the Final Permit. One significant reason for the changes reflected in the Final Permit's thermal discharge limits is the Facility's reduced operations and thermal discharges that are noted in the comment above.

Turning back to EPA's 2011 analysis, the Agency's denial of PSNH's proposed variance was based on a rigorous, but reasonable, analysis of the available information and a reasoned determination that the applicant's demonstration did not carry its burden to demonstrate that the requested "alternative" effluent limits would assure the protection and propagation of the Hooksett Pool's BIP. *See* AR-618, p. 39-121. EPA's analysis in the 2011 Draft Permit Determinations Document, AR 618, was not "contrary to prior practice." The comment's reference to EPA's permitting decision for Kendall Station (MA) (AR-1557) does not support the claimed inconsistency.

PSNH's comment attempts to convert *its* "burden" under CWA § 316(a) to demonstrate to the satisfaction of EPA that technology-based and water quality-based standards are more stringent than necessary to assure the protection and propagation of the BIP, *see* AR 618, p. 24, into an *EPA* burden to "convincingly negate[] by outside evidence" PSNH's conclusions. PSNH supports its attempt to shift the "burden of proof" onto EPA by citing to a 1977 Draft Guidance document by EPA, AR 1180, but this reference to the draft guidance is unavailing. First, in an August 6, 2019, memorandum, EPA's Office of Water retracted all draft guidance documents more than 2 years old that had not yet been finalized, so this draft guidance document is no longer a persuasive authority. Second, even if the draft guidance was still good authority, it states that an applicant has carried *its* burden, if "the Regional Administrator/Director concludes that the summary rationale is convincing, it is supported sufficiently by the other sections of the demonstration, and is not convincingly negated by outside evidence …," AR 1180, p. 17, but EPA did not find the summary rationale in PSNH's application to be convincing or supported sufficiently by other sections of the demonstration, and did find its claims to be convincingly negated by other information. EPA's assessment and analysis of the relevant issues is set forth in detail in the 2011 Draft Determinations Document, AR 619, Chapters 4 - 9. EPA has made adjustments to its analysis in light of public comments and new information and analysis and has presented its final conclusions here in these Responses to Comments. The Agency has well met its burden under the CWA and APA.

As to the issue of the amount of data that is needed to support a § 316(a) variance, there is no question that PSNH's demonstration was voluminous. EPA's decision to reject the variance was not based on a lack of information or any specific deficiency in the information – EPA reviewed and considered all the material cited in the comment. EPA rejected the requested variance because, after considering the body of evidence as a whole, EPA determined that Merrimack Station's thermal discharge had caused appreciable harm to the Hooksett Pool's BIP and had not shown that thermal discharge limits based on applicable technology-based and water quality-based requirements would be more stringent than necessary to assure the protection of the BIP. *See* AR-618, p. 120-121.

Finally, PSNH's argument that cooling towers "cannot be economically justified by any rational cost-benefit analysis" is not relevant in the context of CWA § 316(a) because neither the statute nor regulations make economic or technological considerations part of the decision or analytical criteria. Even with regard to setting technology-based effluent limits under the BAT standard, the courts, including the United States Supreme Court, have consistently read the statute and its legislative history to indicate that while Congress intended EPA to consider costs in setting BAT limit, it did not require the Agency to perform a cost-benefit analysis or any other type of economic balancing test when applying that standard. *See* AR-618, p. 128-130 (citing *Nat'l Crushed Stone Ass'n*, 449 U.S. at 71). Following long-standing Agency practice, EPA considered the cost of technology in its BPJ, case-by-case determination of the technology-based thermal discharge limits under BAT for Merrimack Station's Draft Permit but did not rely upon a comparative cost-benefit analysis. *See* AR-618, pp. 147-156.

4.1.2 What Is the Appropriate "Balanced Indigenous Community" for Merrimack?

Comment II.4.1.2	AR-1577, EPRI, pp. 3-8 to 3-10

Based on their analysis of temperature and biological data, EPA concluded that Merrimack's thermal discharge "…caused, or contributed to, appreciable harm to Hooksett Pool's balanced, indigenous community of fish." Their analysis is consistent with a Type III demonstration (USEPA 1974) consisting of addressing Absence of Prior Appreciable Harm (Retrospective Analysis) and the Protection of Representative Species (Predictive Assessment). EPRI's comments on each are discussed below.

A retrospective analysis is another term for the No Prior Appreciable Harm Demonstration as defined in EPA's draft Technical Guidance. Such an analysis involves comparison of the existing aquatic community in areas exposed to the thermal plume (but outside allowable mixing zone) to that expected to occur if there was no thermal discharge.

The New Hampshire water quality standards require that the discharge of waste (including heat) not *"…be inimical to aquatic life or to the maintenance of aquatic life in said receiving waters."* This appears to be similar to (albeit potentially less restrictive than) the requirement in a § 316(a) variance to assure the protection and propagation of balanced indigenous population/community. Thus, by meeting the requirements for a § 316(a) variance, the NH water quality standards are also being met.

Accordingly, EPA's regulations provide for issuance of alternative thermal effluent limitations if *"…a balanced indigenous community of shellfish, fish, and wildlife"* (not necessarily particular populations within the community) will be maintained.[3] These regulations define a balanced indigenous community as:

> *"…a biotic community typically characterized by diversity, the capacity to sustain itself through cyclic seasonal changes, presence of necessary food chain species, and non-domination of pollutant-tolerant species."*

"Indigenous" generally refers to species that would normally be found at the site, although it is not restricted to only truly native species, since managed, introduced species are often included. The meaning of the term "indigenous" was explained by Congressman Clausen during House consideration of the Conference Report on the Clean Water Act on 4 October 1972:

> *"Indigenous" shall be interpreted to mean growing or living in the body or stretch of water at the time such determination is made.*[4]

EPA has interpreted the term more restrictively, but also acknowledges that "indigenous" does not mean communities that would exist in a water body only if it were in a pristine condition. In the preamble to its proposed 316(a) rules, EPA said:

> *An "indigenous" population may contain species not historically native to the area which have resulted from major irreversible modifications to the water body (such as hydroelectric dams) or to the contiguous land area (such as deforestation attributable to urban or agricultural development) or from deliberate introduction in connection with a program of wildlife management. To*

> *qualify for an exemption under Section 316(a), it is therefore not necessary to show that the discharge is compatible with a population which may have existed in a pristine environment, but which has not persisted.*[5]

EPA thus would make reversibility of environmental modifications the test for determining what communities should be considered "indigenous" to the area. If modifications "cannot reasonably be removed or altered," then an "indigenous" community will include resulting "species not historically native to the area."[6] On the other hand, "an altered community which has resulted from pollution that will be corrected by compliance by all sources with Section 301(b)" [i.e., effluent limitations and standards] will not be considered "indigenous."[7]

The term "balanced" derives from long-standing knowledge that most natural aquatic communities are composed of many species of organisms without an overwhelming number of any one of them. Ecologists have developed several formal indices of this community structure (e.g., indices of diversity, evenness, or richness). To be balanced, USEPA has indicated that an aquatic community must not be "dominated by pollution-tolerant species whose dominance is attributable to polluted water conditions."[8] However, species diversity at each trophic level is not required,[9] and some changes in species composition and abundance are consistent with a balanced community.

In EPRI's opinion, this definition makes it clear that the BIC is that would exist at the present time in the receiving waterbody absent the thermal discharge and, thus, reflect whatever hydraulic, chemical, habitat and other conditions exist at the time the permit is being issued. The community may include species that are introduced (either purposefully or not) provided that the occurrence of these species is not solely a result of the heated effluent.

At the Merrimack Station, the appropriate BIC would be that expected to occur in the Hooksett Pool if the Station had never been constructed but containing all other natural and manmade alternations existing at present. For existing facilities like Merrimack, the BIC is clearly a hypothetical construct. However, it appears reasonable that one could look to other areas of the River not affected by the thermal plume (but containing similar habitat and water quality). Ideally, it would be best to look at the aquatic community in the immediately upstream pool, taking into account differences between the two pools, to define the BIC. It might also be possible look at the community within the Hooksett Pool unaffected by the thermal discharge to define the BIC. However, in this case care would need to be applied to ensure that the thermal plume was not affecting motile organisms and thus, potentially affecting upstream areas as well.

In addition, a "balanced, indigenous community" appears directly analogous to "biological integrity" as included in New Hampshire's Water Quality Standards definitions:

> *"Biological integrity" means the ability of an aquatic ecosystem to support and maintain a balanced, integrated, adaptive community of organisms having a species composition, diversity, and functional organization comparable to that of similar natural habitats of a region." (Env-Wq 1702.08).*

This definition refers to a comparison *"…to that of similar natural habitats of a region*". This further reinforces the idea that in assessing the potential for a BIC, the comparison should be to contemporaneous community from another location with all other habitat characteristics being the same.

The Asian clam (*Corbicula fluminea*) identified in Hooksett Pool in 2011 downstream of the Station's discharge canal (see AR-870) is a nonindigenous aquatic species and not "historically native to the area". However, this species has also been recently identified upstream of the discharge canal, in one case 12 miles upstream, in addition to being confirmed in seven freshwater ponds in southern New Hampshire. Thus, a thermal discharge like Merrimack's is not a prerequisite for the Asian clam to become established and its presence in Hooksett Pool not necessarily solely the result of the Station's heated effluent. Evidence from Normandeau 2012 (see AR-870 and AR-872) and Barnthouse 2016 (see AR-1300) indicates that a BIC is present in Hooksett Pool and the biological integrity of the aquatic system is intact.

3 40 C.F.R., 125.73(a); 44 Fed. Reg. 32,952 (7 June 1979).
4 Senate Comm. On Public Works, 93rd Cong., 1st Session, 1 A Legislative History of the Water Pollution Control Act Amendments of 1972 at 264 (Comm. Print 1973).
5 39 Fed. Reg. 11,435 (28 March 1974). See also USEPA, Proposed Guidelines for Administration of the 316(a) Regulations (Draft 18 April 1974)
6 USEPA, 316(a Technical Guidance - Thermal Discharges (Draft 30 September 1974)
7 39 Fed. Reg. 36,178 (8 October 1974)
8 39 Fed. Reg. 11,435 (28 March 1974). See also 40 C.F.R. 125.71(c), 44 Fed. Reg. 32,951-52 (7 June 1979).
9 See 39 Fed. Reg. 36,178 (8 October 1974), explaining that USEPA's final 316(a) regulations were modified from the proposed regulations "to delete the suggestion that diversity must be present at all trophic levels."

EPA Response:

EPRI's comment above summarizes its understanding of the definition of "balanced, indigenous population" (BIP) under CWA § 316(a) and its relationship to other similar terms under New Hampshire water quality standards. EPA discussed these issues in the 2011 Draft Determinations Document and maintains the views expressed there. *See* AR-618 pp. 18-23, 174-78, 216-17. EPA also points to its detailed responses to other, similar comments regarding the meaning of the term "balanced, indigenous population" under CWA § 316(a) and similar terms under state water quality standards. *See also, e.g.,* Response to Comment II.1.0 (and associated sub-comments).

EPA agrees with EPRI that New Hampshire's water quality standards contain narrative criteria related to controlling the effects of thermal discharges and protecting aquatic life that have similarities to the standard under CWA § 316(a).[26] Again, EPA discussed this in the 2011 Draft Determinations Document. *See* AR 618, pp. 174-78, 216-17.

[26] EPA notes that that EPRI suggests that the New Hampshire water quality criterion barring discharges of waste – which include waste heat – "inimical" to aquatic life is similar to, but "potentially less restrictive than," CWA § 316(a)'s standard for protecting a receiving water's BIP. EPA agrees that there are similarities between the two standards but also notes that the New Hampshire standard could potentially be even more stringent than the CWA § 316(a) standard and that, ultimately, EPA would look to New Hampshire if a definitive interpretation is needed. EPA also notes that other New Hampshire water quality criteria directed at maintaining the biological integrity of

EPRI also offers its views about how to characterize the appropriate BIP for Hooksett Pool under CWA § 316(a). The comment cites remarks by Representative Clausen from the legislative history of the CWA seem to support the idea that *whatever* community of organisms is living in the receiving water at the time a CWA § 316(a) variance application is being evaluated can be considered the "indigenous" community for the receiving water. EPA does not agree with that suggestion – and Representative Clausen may not have meant that – and the commenter correctly notes that EPA has not interpreted the term "indigenous" that way under CWA § 316(a). EPA's interpretation is evident in its regulations, *see* 40 CFR § 125.71(c), and past decisions and is consistent with the discussion in the Conference Committee report related to the enactment of CWA § 316(a), as discussed in the 2011 Draft Determinations Document. AR 618, pp. 18-23.[27] EPRI further states its opinion that under CWA § 316(a), the BIP is the community of organisms that would exist at the present time in the receiving waterbody *absent the thermal discharge* and may reflect the hydraulic, chemical, habitat and other conditions that exist at the time the permit is being issued. EPRI continues that the community may include species that are introduced (either purposefully or not) provided that the occurrence of these species is not solely a result of the heated effluent. EPA agrees with some aspects of this comment and again notes that it discussed how it defines the BIP in the 2011 Draft Determinations Document and it continues to hold the views expressed there. *See* AR 618, pp. 18-23. EPA again notes that the contours of a BIP under CWA § 316(a) are addressed in the definition of "balanced indigenous community" in 40 CFR § 125.71(c).

Consistent with the comment, EPA recognizes that the BIP can under some circumstances include introduced species. *See* AR-618, p. 20. EPRI comments that the Asian clam (*Corbicula fluminea*) has been identified in Hooksett Pool downstream of the Station's discharge canal, in one case 12 miles upstream of the discharge canal, and in seven freshwater ponds in southern New Hampshire. See AR-870. EPRI also states that, because this species has been identified in areas absent a thermal discharge, the heated effluent is "not a prerequisite for the Asian clam to become established" and its presence in Hooksett Pool not necessarily solely the result of the Station's heated effluent. EPRI does not explain if it thinks Asian clam should be included in the

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aquatic habitats also express requirements similar to the standard under CWA § 316(a). EPA discussed these in the 2011 Draft Determinations Document. *See* AR 618, pp. 175-76.

[27] The comment recognizes that CWA § 316(a) and EPA regulations allow for alternative thermal discharge limits if the balanced, indigenous community of organisms in the receiving water can be maintained, but the commenter emphasizes that this does "not necessarily [require that] particular populations within the community … be maintained." The intent of this comment is ambiguous, but EPA has considered it and responds here. While the Agency has clearly stated that CWA § 316(a) does not bar alternative limits that would cause *any* thermally-induced effects or mortality to individual organisms, it is difficult to see how under EPA regulations, 33 U.S.C. § 125.71(c), alternative limits would satisfy CWA § 316(a) despite *eradicating* a species that is part of the preexisting BIP. Indeed, the comment goes on to suggest that EPA's regulatory definition of BIC (which is synonymous with BIP), *see* 40 C.F.R. § 125.71(c), "makes it clear that the BIC is that would exist at the present time in the receiving waterbody absent the thermal discharge." Under that reading, alternative thermal limits could not wipe out a species and still satisfy CWA § 316(a). Perhaps the commenter only meant that CWA § 316(a) would not preclude alternative thermal discharge limits that caused some shift in relative abundance among species that made up the community preexisting the alternative limits. EPA agrees that this could possibly be so in a particular case but each CWA § 316(a) variance calls for careful case-by-case analysis and weighing of the effects to determine if the statutory standard is met. *See* AR 618, pp. 20-21.

BIP or not, but its statement that the presence of this invasive species is not solely the result of the discharge may indicate that the commenter thinks that it would not be excluded from the BIP. EPA notes, however, that under 40 CFR § 125.71(c), it is not just a matter of whether an organism could exist even without the alternative thermal discharge limits, it is also a question of whether the abundance of that species is promoted by the alternative limits. *See id.* (a BIC/BIP will exhibit "a lack of domination by pollution tolerant species," and "may not include species whose presence or abundance is attributable to alternative effluent limitations imposed pursuant to section 316(a)").

In any event, EPA does not think that Asian clam should properly be considered part of the BIP. New Hampshire regulations make it illegal to import, possess or release Asian clams in the state (Administrative rules NHFG FIS 803.04, NHFG FIS 804.03, NHFG FIS 805.01). In 2012, NHDES issued an Environmental Fact Sheet: Asian Clams in New Hampshire describing how to control or eradicate the spread of this species and how large populations of Asian clams can severely alter lake or riverine food webs by "directly competing with existing native fish and shellfish species for food and space." AR-1408. If true, this kind of impact clearly has the potential to adversely alter the BIP of Hooksett Pool. Because New Hampshire Fish and Game classifies Asian clam as an invasive species whose spread must be controlled or eradicated, and because populations of Asian clams have been observed to directly compete with, and potentially impact, native fish and shellfish, EPA does not consider this species part of the BIP for Hooksett Pool. Further analysis will be needed as to whether the presence or abundance of Asian clams in Hooksett Pool would be attributable to the Final Permit's thermal discharge limits set under a CWA § 316(a) variance and which reflect the Facility's reduced operations and thermal discharges in recent years and going forward.

The comment concludes that evidence from Normandeau 2012 (AR-870 and AR-872) and LWB 2016 (see AR-1300) indicate that a BIC is present in Hooksett Pool, the biological integrity of Hooksett Pool is intact, and the community within the Pool can be considered the BIP. EPRI comments that one could look to areas of the river not affected by the thermal plume and offers that another reference point could be the community upstream from the effluent or the community within areas of the Pool unaffected by this discharge. In light of comments and supporting documents received since the 2011 Draft Permit, EPA has made some adjustments to the reference points it has used to evaluate effects on the BIP and now considers that the proper BIP for evaluating Merrimack Station's § 316(a) variance request is best reflected in the following three communities: (1) the Hooksett Pool biotic community of the 1970s; (2) the current Garvins Pool fish community, and (3) the benthic invertebrate community in the ambient section of Hooksett Pool. Looking at both changes in historical trends and comparisons with an adjacent fish community not influenced by a thermal discharge provides a comprehensive approach for EPA's evaluation of the fish community.

4.1.3 What are the Appropriate Criteria to be used in Assessing Community Balance at Merrimack?

Comment II.4.1.3	AR-1577, EPRI, pp. 3-11 to 3-13

To demonstrate that a balanced indigenous community exists necessitates a case-by-case evaluation in the context of the waterbody and its biota. According to USEPA (1977), the following are evidence of community imbalance:

- Blocking or reversing short or long-term successional trends of community development.
- A flourishing of heat-tolerant species and an ensuing replacement of other species characteristic of the indigenous community.
- Simplification of the community and the resulting loss of stability.[10]

If a community is stable, not dominated by heat-tolerant species, and follows normal development patterns, it is balanced. In summary, a balanced, indigenous population (or community) is a stable, normally functioning community that is not dominated by heat-tolerant species and is consistent with the reasonably permanent environmental conditions of the water body, given potential water quality improvement.

Further, the legislative history of § 316(a) and the subsequent judicial and administrative decisions applying it make clear that the performance standard – the protection and propagation of a balanced, indigenous community – is not a complete lack of effects on that community. Some effects of added heat are to be expected. For example, EPA has recognized that "*[e]very thermal discharge will have some impact on the biological community of the receiving water,*" and therefore that "*[t]he issue is the magnitude of the impact and its significance in terms of the short-term and long-term stability and productivity of the biological community affected.*"[11] In general, EPA has determined that a community need not be protected from mere disturbance, but that communities will be adequately protected if "appreciable harm" is avoided.[12] [13]

According to USEPA, "appreciable harm" occurs if a thermal discharge causes such phenomena as the following:

- Substantial increase in abundance or distribution of nuisance species or heat-tolerant community not representative of the highest community development achievable in receiving waters of comparable quality.
- Substantial decrease of formerly indigenous[14] species, other than nuisance species.
- Changes in community structure to resemble a simpler successional stage than is natural for the locality and season in question.
- Unaesthetic appearance, odor, or taste of the waters.
- Elimination of an established or potential economic or recreational use of the waters.
- Reduction of the successful completion of life cycles of indigenous species, including those of migratory species.
- Substantial reduction of community heterogeneity or trophic structure.[15]

Finally, the standard of proof under § 316(a) is one of reasonable assurance, not scientific certitude, because there are seldom, if ever, cases where such certitude is achievable in the quantification of environmental effects or their significance to biological communities. USEPA has described this standard of proof as follows:

> *The study must provide reasonable assurance of protection and propagation of the indigenous community. Mathematical certainty regarding a dynamic biological situation is impossible to achieve, particularly where desirable information is not obtainable. Accordingly, the Regional Administrator (or Director) must make decisions on the basis of the best information reasonably attainable. At the same time, if he finds that the deficiencies in information are so critical as to preclude reasonable assurance, then alternative effluent limitations should be denied.*[16]

USEPA has applied the "reasonable assurance" standard in numerous decisions implementing §316(a).[17]

Again, the guidance provided by USEPA for defining lack of appreciable harm appears to be similar to that used in New Hampshire Water Quality Standards:

> *"Differences from naturally-occurring conditions shall be limited to non-detrimental differences in community structure and function. (Env-Wq 1703.19)"*

Again, implying that some changes are allowed without adversely affecting biological integrity provided that they lead to "*…non-detrimental differences in community structure and function."*

10 USEPA, 316(a)Technical Guidance - Thermal Discharges (Draft 30 September 1974) at 18-19.
11 Boston Edison Company (Pilgrim Station Units 1 and 2), NPDES Permit Determination No. MA0025135 (Decision of the Regional Administrator, 11 March 1977) at 17.
12 A draft 316(a) guidance document jointly prepared by USEPA, the Nuclear Regulatory Commission, and the U.S. Fish and Wildlife Service states: "The Regional Administrator (or Director) will find the demonstration successful if: 2. There is no convincing evidence that there will be damage to the balanced, indigenous community, or community components, resulting in such phenomena as those identified in the definition of appreciable harm." USEPA, NRC, and FWS, 316(a) Technical Guidance Manual (Draft 11 December 1975) at 100.
13 USEPA's proposed 316(a) rules suggested that "appreciable harm" would occur whenever a balanced, indigenous population was "disturbed." Proposed 40 C.F.R. 122.8(a), 39 Fed. Reg. 11,437-38 (28 March 1974). Following the public comment period, USEPA revised this aspect of the rules, saying: "Comments from representatives of diverse interests suggested that the statute requires the inquiry to focus on harm to the community rather than to species; that 'disturbance', was a more rigorous test than called for by law. The regulations being promulgated today make it clear that the demonstration is concerned with the question of prior appreciable harm to--not 'disturbance' of--the community."
14 The original meaning of this nonsensical term "formerly indigenous" may have been "formerly abundant indigenous species"
15 USEPA, 316(a) Technical Guidance - Thermal Discharges (Draft 30 September 1974) at 23 (emphasis added); USEPA, NRC, and FWS, 316(a) Technical Guidance Manual (Draft 11 December 1975) at 105 (emphasis added).
16 USEPA, 316(a) Technical Guidance - Thermal Discharges (Draft 30 September 1974) at 8.
17 Public Service Company of New Hampshire (Seabrook Station Units 1 and 2), NPDES Appeal No. 76-7 (Decision of the Administrator, 10 June 1977) at 22; Public Service Company of New Hampshire, et al., (Seabrook Station Units 1 and 2), NPDES Appeal No. 76-7 (Decision on Remand, 4 August 1978) at 22; Boston Edison Company (Pilgrim Station Units 1 and 2), NPDES Permit Determination No. MA0025135, Decision of the Regional Administrator, 11 March 1977) at 15-16; Boston Edison Company (Pilgrim Station Units 1 and 2), NPDES Appeal No. 78-7 (Initial Decision, 26 July 1978) at 4-5.

EPA Response:

In its comment, EPRI provides its opinion on the appropriate criteria for assessing the BIP and determining if appreciable harm has occurred. EPRI largely draws from prior determinations, regulations, and guidance documents from EPA or other federal agencies. EPA notes that several of these draft guidance documents, including the 1974 Draft 316(a) Technical Guidance – Thermal Discharges and the 1977 Draft Interagency 316(a) Technical Guidance Manual and Guide for Thermal Effects Sections of Nuclear Facilities Environmental Impact Statements – have been rescinded by EPA's Office of Water. *See* Memorandum from David Ross, EPA Assistant Adm'r (Aug. 6, 2019) (AR-1739). EPA explained in the 2011 Draft Determinations Document what the appropriate criteria are for assessing the BIP and the standards for determining if appreciable harm has occurred. See AR-618, pp. 16-39. EPRI offers no comments on EPA's assessment of this issue nor does the comment request any changes to the Draft Permit. EPA discusses the BIP and evaluation of appreciable harm in the context of this permitting decision in response to detailed comments below. The commenter also points to similarities between the standard under CWA § 316(a) and certain provisions from New Hampshire's water quality standards. EPA discussed New Hampshire water quality criteria geared to protecting aquatic life in the 2011 Draft Determinations Document. *See* AR 618, pp. 174-78.

4.2 EPA's Consideration of the 1960s Fish Community in Hooksett Pool as the BIP for the Draft Determination

4.2.1 EPA's Denial of PSNH's Request for a Variance Remains Premised on an Egregiously Flawed Finding That the Hooksett Pool in the Late 1960s Constitutes the BIP

Comment II.4.2.1 (i)	**AR-1548, PSNH, pp. 38-41**
See also AR-846, PSNH, pp. 7, 14-17, AR-872, Normandeau, pp. 13-21; AR-868, Normandeau; AR-1552, Normandeau, pp. 4, 6-7, 15-16; AR-841, UWAG, p. 69	

EPA's Statement is silent concerning a fatal flaw behind its 2011 Draft Permit—namely, that its rejection of PSNH's § 316(a) variance request is based on a comparison of Hooksett Pool in 2011 to its condition in the late 1960s, when the Merrimack River was in its most polluted condition in its recorded history and one of the most polluted rivers in the country. In its 2011 Draft Permit, EPA found "the resident biotic community identified during sampling conducted from 1967 to 1969 to best represent the [BIP] . . . ."[189] Erroneously, EPA concluded that a river impaired by uncontrolled, pre-CWA releases of raw sewage, waste from wood and paper processing and textile mills, other phosphates and pollutants[190] could represent a BIP, and, using that baseline, denied PSNH's request for a thermal variance based on its finding that the current habitat of Hooksett Pool is "no longer able to support the fish community that existed in the 1960s, or early 1970s."[191] As described in Normandeau 2011b, during the period selected by EPA for its BIP determination, the Hooksett Pool was severely impaired as a result of uncontrolled releases of raw sewage and other phosphates:

> Historic observations of this contamination give a picture of a river contaminated beyond our current comprehension: sewage so dense that a single drop contains "dangerous" levels of bacteria; coliform bacterial counts exceeding 1 million per 100 ml for several cities; toxic metals and wastes including phenol and cyanide found in the river; suspended solids covering the river bottom and decomposing, causing gas to bubble up "as if the river were cooking"; and a predominant smell of rotten egg from hydrogen sulfide, which can ruin painting on boats and houses (Wolf 1965).[192]

In his February 2016 analysis, Dr. Larry Barnthouse described this conclusion as one of three significant flaws that invalidate EPA's conclusion that the operation of Merrimack Station with once-through cooling has caused appreciable harm to the BIP of Hooksett Pool.[193] Referring to EPA's 1997 Draft § 316(a) Guidance, Dr. Barnthouse specifically noted EPA's quotation that, "[a] determination of the indigenous population should take into account all impacts of the population except the thermal discharge."[194] EPA's failure to consider the Merrimack River's highly polluted condition during the 1960s and its transition to the greatly improved conditions in more recent years failed this guidance. As explained by Dr. Barnthouse:

> As required by the Clean Water Act, all of the untreated discharges identified in the USDI (1966) report ceased by 1972. The resulting improvements in water quality, which are documented in Normandeau's (2011a) report, would have been expected to lead to biological changes in the Merrimack River, including replacement of highly pollution-tolerant species by species with lower pollution tolerance. An increase in the number of species present in the community would be expected (Rapport et al. 1985). Rather than being limited to those species present at the time Merrimack Unit 2 was constructed in 1968, the BIP should include species whose presence in the river may have been facilitated by implementation of the pollution control requirements of the Clean Water Act.[195]

Improvements in water quality likewise are reflected in Normandeau's comparison of the benthic invertebrate data collected in 1972 and 1973 to data collected in 2011.[196] As explained by Dr. Barnthouse, information on the composition of benthic invertebrate communities is routinely used to assess the extent of impairment of aquatic communities (if any) due to potential stressors such as habitat degradation and pollutant discharges.[197] Considering the data against five benthic community indices (taxa richness, the Hilsenhoff Biotic Index, Ratio of EPT abundance to Chrinomidae abundance, percent contribution of dominant taxon to the total number of organisms in each sample, and EPT richness), Dr. Barnthouse determined, as did Normandeau, that biological conditions have improved since the 1970s.[198]

Thus, to the extent EPA attributes all changes in abundance levels of some fish species to thermal discharges from Merrimack Station,[199] it ignores the effect of the improvements to water quality resulting from the CWA. Not surprisingly, as explained by PSNH in its 2012 comments, the fish community of the Hooksett Pool in the 1960s timeframe does not meet the required characteristics of a BIP.[200] Thus, it was inappropriate to use a 1967-based fish community that existed in sewage and phosphate polluted waters to assess whether there has been appreciable harm to the Hooksett Pool. EPA's conclusions regarding the effects of Merrimack Station's thermal discharge are therefore irredeemably flawed.

[189] AR-618 at 31.

[190] *See* AR-1172 at 3; AR-872 at 14 (citing USGS 2003, "As late as the mid-1960s, more than 120 million gallons per day of untreated or minimally treated wastewater were discharged into the Merrimack River.") (citation omitted); *see also* AR-1245; AR-1246; AR-1247; AR-1248.

The effect of this contamination on the aquatic biota of the river is well-documented. *See* AR-872 at 15-17 (discussing U.S. Department of Interior study measuring nutrient levels, total and fecal coliform, dissolved oxygen and biological oxygen demand levels that indicate harm to the biotic community from the pollution levels of the river).

[191] AR-618 at 118.

[192] AR-1172 at 3.

[193] AR-1300 at 43. The other, two flaws identified by Dr. Barnthouse are: (1) EPA's over-reliance on classification of fish as "coolwater" or "warmwater" when interpreting population trends, and (2) its erroneous interpretation of Merrimack River temperature data when evaluating effects of thermal exposures on representative fish species. *Id.*

[194] AR-1300 at 3 (quoting AR-444 at 74).

[195] *Id.* at 4.

[196] *Id.* at 4-6.

[197] *Id.* at 4.

[198] *Id.* at 5-6.

[199] *See, e.g.,* AR-618 at 59 (alleging that the Station's thermal discharge caused yellow perch population decline); *id.* at 60 (alleging that the Station's thermal discharge caused pumpkinseed population decline); *id.* at 74 (alleging "dominance of heat-tolerant species in Hooksett Pool [is] indicative of appreciable harm to the balanced, indigenous community").

[200] AR-846 at 13-17.

EPA Response:

EPA addresses this, the related comment from Normandeau, and other associated comments in a single response below.

Comment II.4.2.1 (ii)	**AR-846, PSNH, p. 7, 14-17** **AR-872, Normandeau, p. 13-21, 90-91** **AR-1552, Normandeau, p. 4, 6-7, 15-16**

PSNH (AR-846 at 13-17) and Normandeau (AR-872 pp. 17-21 *and elsewhere in their comments*) disagree [with EPA] that the BIP is represented by the 1967-1969 data. PSNH (AR-846 p. 14) comments that EPA failed to demonstrate how the fish community in the Hooksett Pool in the 1960s constituted a BIP because protection of that community, which was dominated by pollution-tolerant species as a result of the poor water quality of the Hooksett Pool, would require resumption of massive discharges of raw sewage and other pollutants.

Similarly, Normandeau (AR-1552, pp. 6-7) states that, as defined in 40 C.F.R. § 125.71(c), the term "balanced, indigenous community" is synonymous with the term "balanced, indigenous population" in the CWA and means a biotic community typically characterized by (1) diversity, (2) the capacity to sustain itself through cyclic seasonal changes, (3) the presence of necessary food chain species and (4) a lack of domination by pollution-tolerant species. Such a community may include historically non-native species introduced in connection with a program of wildlife management, as well as species whose presence or abundance results from substantial, irreversible environmental modifications. Normally, however, such a community will not include species whose presence or abundance is attributable to the introduction of pollutants that will be eliminated by compliance by all sources with CWA §301(b)(2).

PSNH also comments (AR-846, p.7, 14) that EPA's analysis under CWA § 316(a) was incorrectly based on a BIP from a period of time when the Merrimack River was one of the most heavily polluted rivers in the country and was severely impaired due to uncontrolled releases of raw sewage, as well as waste from industrial discharges such as wood and paper processing mills and textile mills. PSNH comments that "EPA's conclusion that every change that has occurred to the Hooksett Pool is attributable to Merrimack Station's thermal discharge, and that these changes indicated 'appreciable harm' to the BIP is therefore fatally flawed." *Id*., p. 7.

According to Normandeau, the USEPA's selection of the 1967-1969 Hooksett Pool fish community as the BIP for Hooksett Pool is flawed and does not provide an appropriate basis for USEPA's determinations presented in the §316(a) Determination Document, because the available data show that the aquatic community in the Hooksett Pool during those years was not "balanced," but rather was dominated by fish and macroinvertebrate species able to tolerate the severe pollution present in the Merrimack River prior to the improvements in water quality that followed the 1972 enactment of the CWA. USEPA does not mention, let alone consider in any reasoned, technically sound manner, either the significant systemwide pollution that existed in the Merrimack River during the 1960s or the fact that improvements in water quality can dramatically alter aquatic communities. Instead, the Agency focuses solely on the potential impacts of the thermal releases into Hooksett Pool after Unit 2 came on-line in May 1968. However, unbiased, accurate analysis of the 40 years of ecological monitoring in and on the Merrimack River in the vicinity of Merrimack Station demonstrates that the changes in abundance of the resident biota of Hooksett Pool that occurred from the 1960s to the present were not caused by the Station's thermal discharge, but by the dramatic improvements to Merrimack River water quality that began in earnest in 1972. According to the commenters, the lack of fish species considered to be intolerant to pollution, and the lack of species representing the filter feeder or herbivore trophic guilds in the 1967-69 community, reflects the high degree to which Hooksett Pool water quality was impaired during this timeframe.

Normandeau comments (AR-1552, p.4) that one of the most significant flaws in USEPA's §316(a) analysis is the Agency's selection of the 1967-1969 fish community as the Hooksett Pool BIP, and its failure, in making this selection, to account in any way for the severe, non-thermal discharge-related water quality impairments that adversely affected the Merrimack River during the 1960s. In its desire to link all of the changes that have occurred in Hooksett Pool since the 1960s to Merrimack Station's thermal discharge after May 1968 (when Unit 2 came on-line), USEPA has overlooked both these severe water quality impairments and how pollution of that magnitude negatively impacts and alters biological communities. Evidence of the Merrimack River's poor water quality during the 1960s is well-documented in the ecological reports produced during the 1960s and 1970s. Moreover, USEPA, PSNH and Normandeau specifically discussed at a 2006 meeting the potential impacts of the Merrimack River's non-thermal discharge-related water quality impairments during the late 1960s on the biological community in Hooksett Pool. Nonetheless, despite these facts, USEPA does not raise this issue once in the Draft NPDES Permit, the §316(a) Determination Document and again failed to mention this issue in this latest Substantial New Questions Document. This is puzzling, given that the improvement of Merrimack River water quality is likely the greatest ecological change to have occurred in the river over the past forty years.

EPA Response:

EPA reviewed these comments and accompanying historical water quality, benthic macroinvertebrate, and fish community data in, and in proximity to, Hooksett Pool to assess whether EPA should modify the community of aquatic life used as a baseline or reference point for evaluating PSNH's thermal variance request under §316(a) of the CWA to determine if the requested alternative thermal discharge limits would assure the protection and propagation of the BIP.

As discussed in the 2011 Draft Determinations document, EPA and NHFGD concluded that the relevant community of aquatic organisms to use as a reference point for assessing impacts to the BIP would be comprised of all species that existed in Hooksett Pool immediately prior to start-up of Merrimack Station's Unit 1, in 1960. AR-618, p. 31. Data was unavailable, however, to represent this pre-Merrimack Station thermal discharge baseline, as biological sampling did not commence until 1967. This biological sampling did, however, capture the period before and just after the substantial increase in Merrimack Station's thermal discharges that accompanied the commencement of Unit 2 operations in 1968. Therefore, EPA considered the biotic community identified during sampling conducted from 1967-1969 to provide a reasonable, and the best possible, representation of the baseline BIP for Hooksett Pool for the purpose of assessing whether PSNH's requested alternative thermal discharge limits would assure the protection and propagation of the BIP. AR-618, p. 34-5. While EPA and NHFGD considered the Hooksett Pool fish community of the 1960's to represent the baseline BIP, the agencies' analysis of impacts also focused on comparisons between the fish communities of the 1970s, 1990s, and 2000s, since these were the communities evaluated by Normandeau for PSNH's 316(a) demonstration and which were studied most thoroughly.[28]

The commenter's suggestion that EPA attributed "all changes" in the aquatic community over time to thermal discharges from Merrimack Station is incorrect; EPA never stated or adopted such a conclusion. The 2011 Draft Determinations Document explains that fish may be subjected to multiple natural and anthropogenic stressors that individually, or in combination, appreciably harm their populations. *See* AR-618, p.118-121. However, based on the body of evidence available (and presented by PSNH) at the time, EPA concluded that Merrimack Station's thermal discharge had caused, or contributed to, appreciable harm to Hooksett Pool's balanced, indigenous community of fish. *See id*. In other words, EPA found that PSNH had not carried its burden under CWA § 316(a) to demonstrate that its past thermal discharges under the existing CWA § 316(a) variance had not caused appreciable harm to the BIP.

Comments from Normandeau and PSNH that EPA ignored or overlooked, that the water quality of Hooksett Pool was impaired in the 1960s are false. PSNH provided a comprehensive list of the numerous studies and reports covering the period from 1969 to 2010 that were submitted prior to the 2011 Draft Permit in Comment II.4.1.1. While there is water quality data included in these documents, it is not a focus of any of the reports nor is it "well documented" in these reports that the Hooksett Pool or the larger Merrimack River had poor water quality to the extent that the fish community at the time was affected to the extent that PSNH and Normandeau characterize in their comments. Notably, neither PSNH nor the authors offered any demonstration among these 27 reports and documents that the poor water quality in the Merrimack River would have justified disqualifying the 1960s fish community in Hooksett Pool from representing the baseline BIP for this analysis. Contrary to the comments, there are numerous examples in these reports indicating that PSNH and Normandeau considered fish data from the 1960s acceptable for use in its CWA § 316(a) variance assessment, including, but not limited to:

- Normandeau's Fisheries Analysis Report states (AR-11 at p. 25) that electrofishing and trapnet sampling from 1967 – 2005 was examined, and that a nonparametric Mann-Kendall test was applied to examine the "…consistent 1967-2005 time series of fisheries data for significant increasing or decreasing trends in annual total catch per unit of effort for each RIS."
- In the same report (AR-11, p. 25-27) Normandeau excluded sampling data from Hooksett Pool between 1967 to 1969 from its long-term trends analysis due to stated concerns about inconsistencies in gear and sampling methods, and poor record-keeping.

[28] As should be evident from this response, data simply does not exist to characterize the Hooksett Pool BIP prior to industrialized pollution of the water body, or even prior to the beginning of Merrimack Station's discharges of waste heat to the Pool. PSNH did not provide such data in its variance application and EPA was not able to locate such data in its research. Faced with unavoidable scientific uncertainty regarding how best to characterize the baseline BIP, EPA took what it concluded was a reasonable approach, which was to look to the aquatic community that predated the operation of Merrimack Station Unit 2. This made sense because the advent of Unit 2 operations brought a consistent and substantial increase in the Facility's discharges of thermal waste to Hooksett Pool. EPA explained its approach in the 2011 Draft Determinations Document to provide an opportunity to comment on it. EPA has considered those comments and responds to them here.

Normandeau did not, however, suggest that data from this period should not be used due to pollution effects on the fish community at that time. From this report, which EPA relied heavily on for the development of the draft permit, Normandeau appeared to consider fish data from the 1960s appropriate for use in the § 316(a) analysis.

- In its "Merrimack River Monitoring Program Summary Report," dated March 1979 (AR-364, p. 97), Normandeau states that: "Hooksett Pool supports a diverse, warm-water finfish community. Fishery surveys from 1967 to 1978 have indicated the continued abundance of the dominant species: smallmouth bass, pumpkinseed, golden and common shiner, white sucker and brown bullhead. The resident populations appear to be healthy and reproduce successfully." Again, in this report, Normandeau did not suggest that the aquatic community in the Hooksett Pool had suffered from intense water pollution in the 1960s or was otherwise in poor condition, or that the aquatic community of the 1960s and 1970s should be distinguished from each other due to greater adverse effects from water pollution during the earlier decade.

According to Normandeau (AR-1552, p. 4), the effect of water quality impairments during the 1960s on the biological community was discussed during a meeting in 2006. EPA believes Normandeau is referring to a meeting that took place on October 5, 2006. EPA has no written record of any discussion about pollution other than thermal pollution from the plant with respect to the CWA § 316(a) variance. While a comment could have been made by Normandeau on this matter during the meeting, the topics of the meeting, according to Normandeau (AR-100), were: Merrimack Station Compliance with 316(a) (including Retrospective RIS Trends Analysis, Downstream Passage, Merrimack River Thermal Environment, Alternative Thermal Limits for Renewed 316(a) Variance), and Merrimack Station 316(b) Impingement Study (First Year Impingement Results). Of the 55 slides presented to EPA during that 2006 meeting (and included in the printed document), not one mentions poor water quality in the 1960s affecting the Hooksett Pool fish community.

In the nearly five years between the October 2006 meeting and the 2011 Draft Permit, PSNH and its consultants submitted four additional reports to EPA in support of the Facility's CWA § 316(a) demonstration, including the primary supporting document for PSNH's § 316(a) analysis ("*Merrimack Station Fisheries Survey Analysis of 1967 through 2005 Catch and Habitat Data,*" AR-11). None of these four reports mention historical pollution being an important factor to consider when evaluating the BIP. If PSNH regarded this issue to be as critical to the analysis in 2006 as the comments now suggest, one expects that there would have been a discussion or demonstration of the issue in its submissions in support of its request for renewal of its CWA § 316(a) variance.

While PSNH did not adequately raise any concerns about the 1960s fish community and poor water quality prior to the 2011 Draft Permit, the commenters clearly express such concerns during the 2011 and 2017 public notice periods. The Hooksett Pool fish community of the late 1960s immediately prior to and following the start-up of Merrimack Station's Unit 2 best reflects the community least influenced by the plant's full thermal effects, but certain other water quality parameters reflected a system impacted by chronic pollution. EPA agrees generally that data suggests that water quality in the Merrimack River during the 1960s was likely impaired and may have affected this fish community. Elevated nutrient and bacteria levels, as well as periods of depressed dissolved oxygen (DO), indicate that eutrophic conditions existed in the 1960s. Results from bottom dredging conducted in 1964 indicates that benthic conditions were also degraded (*See* AR-1246, p.12-14), although other studies conducted by Normandeau indicated that these conditions were in a moderate state of recovery by 1968 (*See* AR-868, p. 19-20).

Changes in the fish community can arise from both the improvement in some water quality parameters and degradation of others. While some species may be tolerant of degraded conditions such as low DO, they can also be highly sensitive to elevated temperatures. Therefore, in order to evaluate a fish community that both existed during a time period relatively close to the 1960s, but also reflects notable improvements in water quality, EPA has for the Final Permit focused more on the Hooksett Pool fish community of the 1970s in its comparison with fish community data from the 2000s. *See II.4.2.2 for a more detailed discussion*. This shift acknowledges the difficulty in separating the effects of chronic degraded water quality conditions with the added stressors associated with thermal pollution. It should not, however, be construed as EPA allowing or supporting the discharge of pollutants to an already impaired system without regard to whatever biological community existed at the time. The 2011 Draft Determinations Document explains that the BIP must satisfy the listed indices of an ecologically healthy community of organisms and cannot be dominated by pollution-tolerant species or species whose presence of abundance is attributable to § 316(a) variance-based permit limits or pollutant discharges that will be eliminated pursuant to technology-based limitations under § 301(b)(2). *See* 40 CFR § 125.71(c); AR-618 p. 20.

The question remains, however, as to whether the possibility that the water quality of the Merrimack River in the 1960s affected the fish community supports PSNH's conclusion that EPA's analysis of its request for renewal of its CWA § 316(a) variance application was flawed. The cornerstone of Merrimack Station's CWA § 316(a) variance request, which informed much of the analysis presented in the 2011 Draft Determinations Document, was Normandeau's April 2007 Fisheries Analysis Report. AR-3. This analysis looked exclusively at comparisons between the Hooksett Pool fish communities of the 1970s (1972-1974, 1976) and 2000s (2004, 2005). The 2011 Draft Determinations Document carefully considers this analysis to help EPA identify the baseline condition in the Merrimack River. The 2011 Draft Permit Determination states:

> Merrimack Station's demonstration, as presented in the Fisheries Analysis Report, is organized into three major sections. The first provides a current assessment of the fish community in Hooksett Pool based on fish sampling conducted during 2004 and 2005. The second presents the results of a fish population trend analysis based on comparable abundance trapnet and electrofish data collected through the Merrimack River Fisheries Survey between 1972 and 2005. The third presents an assessment of the relationship between the Station's thermal discharge and nine species of fish observed in the Merrimack River in the vicinity of the Station.
>
> In this section of the Determination Document, EPA reviews each section of Merrimack Station's demonstration. This review typically presents a summary of Merrimack Station's conclusions, as expressed in the Fisheries Analysis Report, followed by EPA's evaluation of the Station's analysis. In some cases, EPA

> provides the results of its own analyses utilizing data provided by Merrimack Station and/or information from published scientific literature. These reviews and analyses collectively form the basis of EPA's conclusions on the adequacy of Merrimack Station's demonstration. These conclusions are presented in Section 5.7. Section 5 also presents EPA's assessment on the status of the Hooksett Pool balanced, indigenous community, based largely on Merrimack Station's fisheries data collected over 40 years,

AR-618, p. 30. While much attention (and numerous comments) have targeted EPA's identification of the 1960s fish community as the baseline BIP, in reality EPA focused mostly on the fish community of the 1970s as the point of comparison since Normandeau used that community for evaluating long-term population trends. The data and analyses in the Fisheries Report (AR-3), and the conclusions based on them, as presented in the 2011 Draft Determinations Document, are still relevant to the question of appreciable harm to the BIP. The data and analyses from that report also reflect changes to the BIP that occurred while Merrimack Station was still operating as a baseload facility.

EPA received comments and new information regarding the presence and abundance of benthic invertebrates in Hooksett Pool, including a report that includes "then and now" comparisons from data collected in the 1970s and 2011 (AR-870). The 2011 Draft Determination Document focused primarily on the historical fish community in its assessment of thermal impacts because PSNH had provided predominantly fish data in its §316(a) demonstration. At the same time, EPA notes that benthic macroinvertebrates are typically much less mobile than fish and differences in their abundance within the ambient and thermally-influenced areas in Hooksett Pool can provide useful information on possible thermal effects from the discharge to this important biological community in Hooksett Pool.

EPA has reviewed numerous comments and supporting documents since the 2011 Draft Permit, including additional, recent studies and analyses of the aquatic community present in the Merrimack River. After reviewing all these reports and comments, for the Final Permit, EPA considers the baseline BIP for evaluating Merrimack Station's CWA § 316(a) variance request to be best reflected in the following three communities: (1) the Hooksett Pool biotic community of the 1970s; (2) the current Garvins Pool fish community, and (3) the benthic invertebrate community in the ambient section of Hooksett Pool. *See* Responses to Comments II.4.3 (and associated sub-comments). Looking at both changes in historical trends and comparisons with an adjacent fish community not influenced by a thermal discharge provides a comprehensive approach for EPA's evaluation of the fish community. This approach is similar to a "Before-After-Control-Impact" study design often used in assessing anthropogenic impacts to biological communities (Larson et al. 2018) (AR-1774). EPA finds that this multi-faceted approach is a reasonable and appropriate way to evaluate the questions at hand recognizing that any approach may be imperfect because we cannot roll back time and run a controlled experiment on the BIP in Hooksett Pool in order to more directly define the effect of the Merrimack Station thermal discharge on the BIP. In response to this unavoidable scientific uncertainty, EPA has reasonably defined the baseline BIP in multiple scientifically valid ways to provide the point of comparison for the appreciable harm assessment under CWA § 316(a).

4.2.2 The Aquatic Community in Hooksett Pool in the 1960s was Dominated by Pollution Tolerant Species

Comment II.4.2.2 (i)	AR-846, PSNH, pp. 16-17; AR-1554, LWB, pp. 5-6

As explained above, EPA regulations mandate that a BIP "will not include species whose presence or abundance is attributable to the introduction of pollutants that will be eliminated by compliance by all sources with section 301(b)(2)." 40 C.F.R. § 125.71(c). A review of the fish community of the Hooksett Pool in the 1967-1969 timeframe clearly demonstrates that 37 percent of the total fish catch from the Hooksett Pool during that time were of pollution-tolerant species.

> A review of species-specific tolerance to environmental perturbation (Barbour et al. 1999) for the fish species observed in Hooksett Pool during 1967-1968 reveals that the Hooksett Pool fish community during those years consisted only of fish species listed as tolerant or intermediate in tolerance to pollution (Table 2- 3)…Of the sixteen fish species collected during 1967-1968, five are considered tolerant to pollution, including brown bullhead, white sucker, golden shiner, yellow bullhead, and American eel (Table 2-2; Barbour et al. 1999). Those five tolerant species accounted for 37% of the total fish catch from Hooksett Pool collected during 1967-1968. In addition, the 1967-1968 Hooksett Pool fish community was composed solely of species considered to be members of the generalist, insectivore and piscivore trophic guilds.

See Normandeau Comments at 20. In addition, there were no pollution-intolerant species present during that timeframe.

> The lack of any fish species considered to be intolerant to pollution, and the lack of any fish species representing the filter feeder or herbivore trophic guilds, in the 1967-1969 Hooksett Pool fish community reflects the high degree to which Hooksett water quality was impaired by pollutants other than heat in the late 1960s.

Id. It follows then that the fish community in the Hooksett Pool in the 1960s timeframe was attributable to the heavy pollution, was dominated by pollution tolerant species, and was therefore, not a BIP.

EPA Response

EPA addresses this and related comments from Normandeau in a single response below.

Comment II.4.2.2 (ii)	AR-1552, Normandeau, p. 4-6, 9-14
See also ARA-872, Normandeau, p. 10-20	

The fish community in Hooksett Pool has changed dramatically when compared between 1967-1969 and the present day, with the number of fish species increasing from 16 in the late 1960's to 27 fish species currently inhabiting the pool (Table 2-1). However, by not providing an accurate picture of the current fish community in Hooksett Pool in the Draft NPDES Permit, USEPA obscures the obvious differences, including the nearly doubling of fish species found in the pool and the addition of species that are highly sensitive to pollution. Many of the fish species in the current Hooksett Pool fish community could not have survived the conditions

found in the Hooksett Pool of 1967-1969. The high numbers of Yellow Perch, Pumpkinseed, White Sucker, Brown Bullhead and Golden Shiners captured in 1967-1969 were in abundance because the Hooksett Pool fish community was shaped by the severely impaired water quality that existed in the Merrimack River at the time. Even so, USEPA inappropriately bases the bulk of its §316(a) analysis on that community in an attempt to demonstrate that the drop in abundance for these species was caused solely by the Station's thermal discharge into Hooksett Pool. Omitting any discussion about the dramatic improvements in Merrimack River water quality in the Draft NPDES Permit or the §316(a) Determination Document allows USEPA to advance the false argument that all of the changes to the Hooksett Pool BIP since the 1960s are solely attributable to Merrimack Station's thermal discharge. Indeed, the changes to the Hooksett Pool fish community that have occurred over the decades as water quality has so significantly improved should not be characterized as a negative outcome. Rather, because of these water quality improvements, the aquatic community that exists in Hooksett Pool today is healthier and far more diverse than the community that existed during the 1960s.

USEPA determined that the fish community observed in Hooksett Pool during 1967-1969 should serve as the BIP to which the current Hooksett Pool fish community should be compared to assess the potential impacts of Merrimack Station's thermal discharge. In so doing, USEPA

Table 2-1. Common name and percent composition for fish captured in Hooksett Pool during 1967-1968 (trapnet and electrofishing), and 2004-2005 (trapnet and electrofishing) / 2010-2013 (electrofishing).

Hooksett Pool Fish Community 1967-1968		Hooksett Pool Fish Community 2004-2013	
Common Name	Percent Comp.[1]	Common Name	Percent Comp.[2]
Pumpkinseed	31.7%	Spottail Shiner	23.7%
Yellow Perch	22.9%	Largemouth Bass	17.5%
Brown Bullhead	15.4%	Bluegill	12.6%
White Sucker	12.5%	Smallmouth Bass	10.3%
Golden Shiner	7.3%	Fallfish	8.9%
Redbreast Sunfish	4.7%	Redbreast Sunfish	7.7%
Smallmouth Bass	2.1%	White Sucker	3.9%
Yellow Bullhead	1.5%	Yellow Perch	3.6%
Chain Pickerel	1.2%	Pumpkinseed	3.5%
American Eel	0.4%	Alewife	1.4%
White Perch	<0.1%	Common Shiner	1.1%
Walleye	<0.1%	Rock Bass	1.0%
Largemouth Bass	<0.1%	Golden Shiner	0.9%
Fallfish	<0.1%	Chain Pickerel	0.7%
Madtom sp.	<0.1%	American Eel	0.7%
Common Shiner	<0.1%	Black Crappie	0.6%
		Tessellated Darter	0.5%
		American Shad	0.4%
		Sunfish family	0.3%
		Margined Madtom	0.3%
		Eastern Silvery Minnow	0.1%
		Yellow Bullhead	0.1%
		Atlantic Salmon	<0.1%
		Brown Bullhead	<0.1%
		Brown Trout	<0.1%
		Common Carp	<0.1%
		Eastern Blacknose Dace	<0.1%
		White Perch	<0.1%

1 - Based on electrofish and trapnet data from 1967 and 1968

2 – Based on electrofish and trapnet data from 2004-2005 and electrofish data from 2010-2013

either ignored or overlooked the fact that the abundance of pollution-tolerant fish species in Hooksett Pool was higher in 1967-1969 than under current conditions because of the ability of those species to survive in an aquatic habitat impaired by conventional and toxic pollutants.

The Hooksett Pool fish community and relative abundance as sampled by boat electrofishing and trap nets during 1967-1968 and described by Wightman (1971) is presented in Table 2-2. For reference, Table 2-3 presents the Hooksett Pool fish community and relative abundance as sampled by boat electrofishing and trap nets during the 2000s and described by Normandeau (2007a, 2011a, 2017a).

Table 2-2. Percent composition, USEPA trophic guild and tolerance classifications for fish captured in Hooksett Pool during 1967-1968 (trapnet and electrofishing).

Hooksett Pool Fish Community 1967-1968			
Common Name	**Percent Comp.[1]**	**Trophic Guild[2]**	**Tolerance[2]**
Pumpkinseed	31.70%	Generalist	Intermediate
Yellow Perch	22.90%	Piscivore	Intermediate
Brown Bullhead	15.40%	Generalist	Tolerant
White Sucker	12.50%	Generalist	Tolerant
Golden Shiner	7.30%	Generalist	Tolerant
Redbreast Sunfish	4.70%	Generalist	Intermediate
Smallmouth Bass	2.10%	Generalist	Intermediate
Yellow Bullhead	1.50%	Generalist	Tolerant
Chain Pickerel	1.20%	Piscivore	Intermediate
American Eel	0.40%	Piscivore	Tolerant
White Perch	<0.1%	Piscivore	Intermediate
Walleye	<0.1%	Piscivore	Intermediate
Largemouth Bass	<0.1%	Piscivore	Intermediate
Fallfish	<0.1%	Generalist	Intermediate
Madtom sp.	<0.1%	Insectivore	Intermediate
Common Shiner	<0.1%	Generalist	Intermediate
Total	**16 Species**	**3 Guilds**	**2 Tolerance Levels**

1 - Based on electrofish and trapnet data from 1967 and 1968
2 - Barbour et al. 1999
3 - Based on electrofish and trapnet data from 2004-2005 and electrofish data from 2010-2013.

A review of species-specific tolerance to environmental perturbations (Barbour et al. 1999) for the fish species observed in Hooksett Pool during 1967-1968 reveals that the Hooksett Pool fish community during those years consisted only of fish species listed as tolerant or intermediate in tolerance to pollution (Table 2-2). USEPA's own definition of "balanced, indigenous community" (i.e., BIP) provides that a BIP does not include species whose presence or abundance is attributable to the introduction of pollutants that will be eliminated by compliance by all sources with CWA §301(b)(2) (40 CFR §125.71(c)). Of the sixteen fish species collected during 1967-1968, five are considered tolerant to pollution, including Brown Bullhead, White Sucker, Golden Shiner, Yellow Bullhead and American Eel (Table 2-2; Barbour et al. 1999). Those five tolerant species accounted for 37% of the total fish catch from Hooksett Pool collected during 1967-1968. In addition, the 1967-1969 Hooksett Pool fish community was composed solely of species considered to be members of the generalist, insectivore and piscivore trophic guilds. The lack of any fish species considered to be intolerant to pollution, and the lack of any fish species representing the filter feeder or herbivore trophic guilds in the 1967-1969 Hooksett Pool fish community reflects the high degree to which Hooksett Pool water quality was impaired by pollutants other than heat in the late 1960s.

The five most abundant fish species collected in Hooksett Pool during the 1967-1968 fish sampling – Pumpkinseed, Yellow Perch, Brown Bullhead, White Sucker and Golden Shiner – represented 89.8% of the total catch. All of these fish are known for their capability to withstand low DO conditions (Holtan 1990, Fox 1994, Trial et al. 1983, Scarola 1987, Twomey et al. 1984,

Table 2-3. Percent composition, USEPA trophic guild and tolerance classifications for fish captured in Hooksett Pool during 2004-2005 (trapnet and electrofishing) / 2010-2013 (electrofishing).

Hooksett Pool Fish Community 2004-2013			
Common Name	Percent Comp.[3]	Trophic Guild[1]	Tolerance[2]
Spottail Shiner	23.7%	Insectivore	Intermediate
Largemouth Bass	17.5%	Piscivore	Intermediate
Bluegill	12.6%	Generalist	Tolerant
Smallmouth Bass	10.3%	Piscivore	Intermediate
Fallfish	8.9%	Generalist	Intermediate
Redbreast Sunfish	7.7%	Generalist	Intermediate
White Sucker	3.9%	Generalist	Tolerant
Yellow Perch	3.6%	Piscivore	Intermediate
Pumpkinseed	3.5%	Generalist	Intermediate
Alewife	1.4%	Filter feeder	Intermediate
Common Shiner	1.1%	Generalist	Intermediate
Rock Bass	1.0%	Piscivore	Intermediate
Golden Shiner	0.9%	Generalist	Tolerant
Chain Pickerel	0.7%	Piscivore	Intermediate
American Eel	0.7%	Piscivore	Tolerant
Black Crappie	0.6%	Piscivore	Intermediate
Tessellated Darter	0.5%	Insectivore	Intermediate
American Shad	0.4%	Filter feeder	Intermediate
Sunfish family	0.3%	Generalist	Intermediate
Margined Madtom	0.3%	Insectivore	Intermediate
Eastern Silvery Minnow	0.1%	Herbivore	Intolerant
Yellow Bullhead	0.1%	Generalist	Tolerant
Atlantic Salmon	<0.1%	Piscivore	Intolerant
Brown Bullhead	<0.1%	Generalist	Tolerant
Brown Trout	<0.1%	Piscivore	Intolerant
Common Carp	<0.1%	Generalist	Tolerant
Eastern Blacknose Dace	<0.1%	Generalist	Tolerant
White Perch	<0.1%	Piscivores	Intermediate
Total	**27 Species**	**5 Guilds**	**3 Tolerance Levels**

1 - Based on electrofish and trapnet data from 1967 and 1968
2 - Barbour et al. 1999
3 - Based on electrofish and trapnet data from 2004-2005 and electrofish data from 2010-2013.

Becker 1983). Three of those species – White Sucker, Brown Bullhead and Golden Shiner – are also classified as tolerant to pollution (Barbour et al. 1999). It stands to reason that the increased abundance of these five fish species in Hooksett Pool during the 1960s is attributable to their ability to withstand pollutants that were greatly reduced following the 1972 enactment and subsequent enforcement of the CWA and parallel state clean water regulations.

EPA Response:

Normandeau and PSNH state that the aquatic community of the 1960s was dominated by fish species whose abundance is attributable to their ability to withstand pollutants and, as such, cannot be considered the BIP for Hooksett Pool. PSNH and Normandeau also reiterate comments about EPA's 316(a) analysis that have been addressed in Responses to Comments above and, in this comment, offer additional lines of evidence to support their claims that the 1960s community was pollutant tolerant. EPA addresses the comments about the fish community data and what it means in terms of whether the 1960s aquatic community can appropriately be considered the BIP for the purposes of Merrimack Station's § 316(a) variance.

PSNH and Normandeau comment that 37% of the total fish catch from the Hooksett Pool during 1967-1968 were of pollution-tolerant species and there were no pollutant intolerant species. EPA notes that the five species PSNH and Normandeau focus on as "pollutant tolerant" were not the most abundant species in Hooksett Pool at the time. Instead, more than 54% of the total catch was comprised of yellow perch and pumpkinseed, which are not classified as pollution tolerant. In addition, Normandeau's 2011 Report demonstrates that there were more pollution-tolerant species present in Hooksett Pool in 2011 than in 1972. AR-3, p. 58. In addition, as a percentage of all fish caught, pollution-tolerant species were the most abundant in 1995 (42.0%) and lowest during 1973 (5.2%) which does not support Normandeau's argument that pollution-tolerant species dominated in the 1960s and that the shift in the fish community from the early 1970s on was a reflection of improved water quality.

According to Normandeau, many of the fish species in the current Hooksett Pool fish community could not have survived the conditions found in the Hooksett Pool of 1967-1969. Normandeau claims that the high numbers of Yellow Perch, Pumpkinseed, White Sucker, Brown Bullhead and Golden Shiners captured in 1967-1969 reflect the "severely impaired water quality" that existed in the Merrimack River at the time. This argument is not supported, however, by Normandeau's 2011 Report (AR-871) or the reference Normandeau uses in its most recent classifications of freshwater fish species (Halliwell, *et al.* (1999), (AR-1779). Normandeau lists the relative abundance of fish species collected in Garvins, Hooksett, and Amoskeag pools during the four-year period, 2008-2011. AR-871, p. 100. Of the 24 species collected in Garvins Pool, just upstream from Hooksett Pool, 3 of the 6 species that Normandeau alleges can only survive in "severely impaired" water quality (yellow perch, pumpkinseed, and white sucker) are among the most abundant. Furthermore, Halliwell et al. (1999) identifies pumpkinseed, yellow perch, brown bullhead, golden shiner, and white sucker as among the most commonly encountered fish species in Northeastern wadeable streams, lakes, and ponds. In other words, many of the same species identified by Normandeau as dominating Hooksett Pool in the 1960s due to "severely impaired" water quality were well-represented in Garvins Pool in 2008-2011, which Normandeau has indicated should be considered an appropriate surrogate for the Hooksett Pool BIP (See Comment II.4.3.3(iii) and are among the most common species observed in lakes, ponds, and river throughout the entire Northeast. There are also more "tolerant" species listed in Table 2-3 (from Hooksett Pool in 2011) than there were in 1972, a mere four years after the period in the 1960s identified by Normandeau as being heavily polluted. AR-871, pp. 58,73.

The data Normandeau presented in Table 2-2 (above) combines sampling data caught by both electrofishing and trap net methods. Normandeau criticized the efficacy and reliability of trap net sampling, especially sampling from the Hooksett Pool in the 1960s. Species such as white sucker, brown bullhead, and golden shiner were more abundant in the 1960s trap net sampling compared to electrofishing. Conversely, species such as largemouth bass appear to be less susceptible to trap netting. NHFGD's "Merrimack River Thermal Study" (Wightman 1971) mentions this sampling gear bias in its discussion of fish sampling in the 1960s, and Normandeau chose not to use trap net data for purposes of assessing species abundance in 2007 (AR-3) because it felt the data were unreliable. Normandeau criticizes trap net sampling conducted by NHFGD from 1967-1969 because "[a] breakdown of catch by species and date is not provided ... effort is not documented in the text and a balanced sample design does not appear to be maintained as data was compared across time and monitoring stations…" AR-3, p. 27.

In its comment Normandeau points to abundance data combining electrofish and trapnet sampling as compelling evidence that pollution-tolerant species dominated Hooksett Pool in the 1960s. However, this conclusion is not supported by electrofishing data (and, as stated above, Normandeau criticized the trapnet sampling as unreliable). The five most common species collected during <u>electrofishing</u> sampling in Hooksett Pool from 1967-1969 were pumpkinseed, yellow perch, smallmouth bass, red breasted sunfish, and largemouth bass (Wightman 1971) (AR-1). Using the pollution tolerance guild information used in Table 2-3, above (AR 3, p. 72), none of these species are listed as pollution-tolerant. Combining data from the two sampling techniques to calculate relative abundance masks the true results of each technique individually. For example, Normandeau identifies the relative abundance of largemouth bass in Hooksett Pool in 1967-1968 to be less than 0.1 percent when the two sampling data sets are combined, but electrofishing alone showed that largemouth bass represented over 40 percent of all fish caught in the southern (thermally-influenced) portion of Hooksett Pool in 1968, the year Unit 2 came on line, and approximately 10 percent in the northern, ambient section of the pool (Wightman 1971). Normandeau's inconsistent approaches to applying the trapnet data in order to make its point is not scientifically sound.

Normandeau also comments that the 1967-1969 Hooksett Pool fish community was composed "solely of species considered to be members of the generalist, insectivore and piscivore trophic guilds," and that the lack of any fish species representing the filter feeder or herbivore trophic guilds reflects the high degree to which Hooksett Pool water quality was impaired by pollutants other than heat in the late 1960s. In a footnote to its Table 2-2, Normandeau identifies EPA's trophic guild and tolerance classifications as presented in the agency's bioassessment protocols. In developing these protocols, EPA reviewed seven literature sources to select, based on the consensus of these sources, the feeding guild or pollution tolerance classification to which each fish species belonged. For species where the consensus was not unanimous, the alternative designations were listed as "exceptions." However, Normandeau uses none of the trophic guilds identified by EPA (and most of the literature sources reviewed) for the nine most abundant species identified in this table, which represent 98.1 percent of all fish caught. Instead, Normandeau selected from the trophic guild exceptions. While Normandeau suggests that the Hooksett Pool was dominated in the 1960's by "generalists" – species that can feed on a variety of forage – none of the dominant species (collected by electrofishing) fall into the generalist trophic guild presented in Normandeau's 2007 Fisheries Analysis Report (AR-3). For example, EPA's protocol identifies pumpkinseed, the most abundant species in Table 2-3, as an "insectivore," but Normandeau selects from the exceptions and labels pumpkinseed a "generalist," though the exceptions also include "piscivore."

Normandeau also comments that the lack of members of the filter feeder or herbivore trophic guilds in the 1967-1969 fish community is evidence of the impaired nature of the waters and impact on the community at the time. However, the 2010-2013 data (Table 3-2) lists only three additional species that occupy these guilds. Two of these species, alewife and American shad, are anadromous species that once ascended Merrimack River to spawn. Their absence in the 1960s, as now, is likely related more to State and/or federal stocking efforts and improvements in dam passage (including at Amoskeag Dam) rather than to improvements in water quality. Shad and alewives account for a relatively low percent of the overall catch.

The only species listed in the "herbivore guild" found in Hooksett Pool is the Eastern silvery minnow. According to Scarola (1987), the only water body where this species was found in New Hampshire (at least until 1987 (the book's second edition)) was the Connecticut River. The first documented Eastern silvery minnows in Hooksett Pool were captured in 2004 when 14 individuals were caught during electrofish sampling. As such, it's unlikely that this species would have been present in Hooksett Pool in the 1960s regardless of the water quality. While EPA agrees that it is generally desirable to have increased diversity in feeding guilds, the capture of only three individuals from 235 sampling events in 2010 and 2011 (combined) raises doubts that the Eastern silvery minnow is becoming established as a resident species in Hooksett Pool following its first documented appearance in 2004.

Changes in water quality may not be the only, or even the primary, cause for certain changes in the fish community from the 1960s. It is possible that factors other than water quality (or conditions that result from pollution, such as low dissolved oxygen) influenced the change in abundance of several of these species, including pumpkinseed and yellow perch. One such factor, as explained in the 2011 Draft Determinations Document, may have been the introduction and increase in thermal effluent from Merrimack Station. Another may have been that certain species' reproductive and/or feeding strategies enhance their ability to compete with other species and maintain robust populations as water quality improves. Normandeau recognized this possibility in its report, "Merrimack Station (Bow) Fisheries Study (Normandeau 1997" (AR-201). According to Normandeau, the decrease in yellow perch abundance between the 1970s and 1995 and concurrent increase in bluegill abundance may have been related to their "common preference for benthic food items," which could potentially lead to food competition between the two species. Normandeau comments that "[i]f food items are limiting, competition for benthic food resources may partially explain the reduction in yellow perch abundance." AR-201, p. 25. Normandeau does not suggest in this report that improved water quality in Hooksett Pool is responsible for declines in yellow perch abundance.

In sum, PSNH and Normandeau argue that relative abundance from the 1960s indicates that this community was dominated by pollution-tolerant species and further, that these species could not survive except for the severely impaired water quality of the Merrimack River at the time. Yet, from EPA's review, the data referenced in the comment does not support the conclusion that the 1960s community was "dominated" by pollutant-tolerant species. The community characterized in the most recent fisheries data is not dramatically different than the historical community in terms of the balance of "pollutant tolerant" species or in terms of the trophic guilds present. Moreover, the presence of "pollution intolerant" species, or herbivore and filter feeders, may be related to factors other than water quality, as may the decline in yellow perch. At the same time, EPA recognizes that the water quality in Hooksett Pool has shown some improvements since the 1960s (see Response to Comment 4.2.3) and that the current community has higher diversity. EPA has considered fisheries data evaluated for the 2011 Draft Permit (*i.e.*, from the 1960s, 1970s, 1990s, and 2000s) as well as recent (2010-2013) data from Hooksett and Garvins pools for the Final Permit.

Comment II.4.2.2 (iii)	**AR-1300, LWB, p. 3**

LWB comments that while it might seem reasonable to base a 316(a) determination on a "before" vs. "after" comparison of the kind relied on by EPA, in this case the transition of the Merrimack River from highly polluted conditions prevalent prior to 1970 to the greatly improved conditions present in more recent years represents a significant complicating factor (p.3). LWB Environmental Services, Inc., provides the following quotation from EPA's 1977 draft §316(a) Guidance:

> For purposes of a 316(a) demonstration, distribution and composition of the indigenous population should be defined in terms of the population which would be impacted by the thermal discharge caused by the alternative effluent limitation proposed under 316(a). A determination should take into account all impacts on the population except thermal discharge. Then the discrete impact of the thermal discharge on the indigenous population may be estimated in the course of a 316(a) demonstration. In order to determine the indigenous population which will be subject to a thermal discharge under an alternative 316(a) effluent limitation, it is necessary to account for all non-thermal impacts on the population such as industrial pollution, commercial fishing, and the entrapment and entrainment effects of any withdrawal of cooling water through intake structures under the alternative 316(a) effluent limitation. The above considerations will then make it possible to estimate the true impact of the thermal discharge on the population.

The commenter then urges that the above paragraph makes it clear that in evaluating the effects of Merrimack Station's thermal discharge it is necessary to account for the potential effects of other stressors, in particular, water pollution. The commenter further states that:

> [a]s noted by EPA in its 2011 Draft Permit (AR-618, p. 22), EPA regulations require applicants seeking alternative effluent limitations to evaluate the cumulative impact of the proposed thermal discharge together with other stressors affecting the Balanced Indigenous Population (BIP). Logically, the same requirement should be placed on EPA when performing an independent evaluation of the applicant's data.

EPA Response:

As the 2011 Draft Determinations Document explains, the potential effects of other stressors (*e.g.*, water pollution other than heat, adverse impacts entrainment and impingement of aquatic life by the power plant's cooling water intake structures) should be considered when evaluating the specific impacts associated with the thermal discharge on the BIP. AR-618, pp. 19-20. And, as noted by this comment, EPA regulations *require* applicants seeking alternative effluent limitations to evaluate the cumulative impact of the proposed thermal discharge together with other stressors affecting the BIP. EPA considered all the information provided by the applicant, but PSNH provided no such evaluation with its request for a thermal variance prior to the 2011 Draft Permit. PSNH has since submitted relevant information (such as LWB's 2016 Assessment, AR-1300) by which to evaluate the potential that the 1960s BIP was affected by the water quality at the time. EPA has considered this information and addresses it in responses to comments below.

Comment II.4.2.2 (iv)	**ARA-851, CLF, p. 9**
See also AR-852, Henderson	

EPA identified PSNH's failure to include fish data from the 1960s as the demonstration's "greatest deficiency" (AR-618 p. 78). The effect PSNH was trying to achieve by excluding fish data from the 1960s is obvious: the 1960s fish data best represents the pre-impact balanced, indigenous population in the Hooksett Pool, and without it, the decline in fish species does not appear as dramatic as it truly is (*See* AR-852). EPA easily saw through this improper manipulation of the data by PSNH and correctly included the 1960s data in its analysis.

PSNH's approach is inconsistent with the requirements of the CWA's implementing regulations, which provide that:

> Normally, however, [the BIP] will not include species whose presence or abundance is attributable to the introduction of pollutants that will be eliminated by compliance by all sources with section 301(b)(2) of the Act; and *may not* include species whose presence or abundance is attributable to alternative effluent limitations imposed pursuant to section 316(a).

40 C.F.R. 125.71(c) (emphasis supplied). Accordingly, the BIP "explicitly excludes certain currently present species whose presence or abundance is attributable to avoidable pollution or previously-granted section 316(a) variances." *Dominion Energy Brayton Point* at 48. Further, "[b]y requiring a showing that the BIP has not been harmed by the existing discharger's prior discharges, [C.F.R. 125.73(c)(1)] implicitly suggests that the population under consideration is not necessarily just the population currently inhabiting the water body but a population that may have been present but for the appreciable harm." *Id*. (*citing* Wabash, 1 E.A.D. at 592-5). Section 316(a), therefore, "cannot be read to mean that a [BIP] is maintained where the species composition, for example, shifts from…thermally sensitive to thermally tolerant species." *Id*. at 49.

EPA Response:

EPA agrees that the aquatic community prior to the startup of Unit 1 in 1960 could be the best representation of the BIP in Hooksett Pool absent the thermal discharge from Merrimack Station. See AR-618, p. 31. However, as discussed above, there was no data characterizing the community at that time. In the 2011 Draft Determinations Document, EPA considered the aquatic community from 1967-1969, which were the earliest years for which data were available, coincident with Unit 2 startup, representative of the biotic community prior to the increase in heated effluent. *Id*. While the BIP for evaluation under § 316(a) may not be attributable to alternative limitations imposed pursuant to section 316(a), the BIP should also be characterized by a lack of domination by pollution tolerant species. 40 CFR § 125.71(c). New information submitted during the public comment period demonstrates that water quality in the Merrimack River in the 1960s may well have been impaired and that these conditions may reflect a fish community impacted by poor water quality. *See* Comments and Responses in II.4.2.2 and 4.2.3. While the fish community in the late 1960s represents the BIP prior to a substantial increase in the thermal effluent from the Station and is still the best representation of the pre-thermal impact BIP, it may also reflect degraded conditions due to other types of pollution.

In response to the comments and new information, EPA has considered how to assess effects on the BIP of the Hooksett Pool from multiple perspectives. EPA has considered a long-term assessment including fisheries data from the 1960s and 1970s, as in the 2011 Draft Determinations Document and in Normandeau's long term trends analyses (AR-3). In addition, however, EPA has also evaluated the condition of the BIP in light of new fish data collected in Garvins Pool and throughout Hooksett Pool in 2010-2013, which was submitted during the public comment period for the 2011 Draft Permit. *See* Responses to Comment 4.3 (and associated sub-comments).

4.2.3 Consideration of 1960s Water Quality Data and the BIP

Comment II.4.2.3 (i)	**AR-846, PSNH, pp. 14-16**
See Also AR-872, Normandeau, pp. 14-17; AR-868, Normandeau; AR-1300, LWB, pp. 3-4	

EPA's reasons for choosing the 1967-69 time period – earliest data available, volume of heated cooling water discharged tripled in 1968 after Unit 2 came online – ignore the fact that the water quality of the Hooksett Pool during that time period was severely impaired due to uncontrolled releases of raw sewage and other phosphates. In fact,

> [h]istoric observations of this contamination give a picture of a river contaminated beyond our current comprehension: sewage so dense that a single drop contains "dangerous" levels of bacteria; coliform bacterial counts exceeding 1 million per 100 ml for several cities; toxic metals and wastes including phenol and cyanide found in the river; suspended solids covering the river bottom and decomposing, causing gas to bubble up "as if the river were cooking"; and a predominant smell of rotten egg from hydrogen sulfide, which can ruin painting on boats and houses (Wolf 1965).

Normandeau Assoc., Inc., "Historic Water Quality and Selected Biological Conditions of the Upper Merrimack River, New Hampshire" 3 (2012) ("Normandeau 2011b"); see also U.S. Department of the Interior, Report on Pollution of the Merrimack River and Certain Tributaries (Aug. 1966).

As explained in Normandeau 2011b, the Merrimack River, during the 1960s, was polluted by waste from "wood and paper processing mills and textile mills," as well as by untreated sewage from towns situated along the river. Normandeau Associates, Inc. Comments on EPA's Draft Permit for Merrimack Station, Feb. 2012, at 14 ("Normandeau Comments"). "As late as the mid-1960s more than 120 million gallons per day of untreated or minimally treated wastewater were discharged into the Merrimack River." Normandeau 2011b at 3 (citing USGS 2003).

The effect of this contamination on the aquatic biota of the river is well-documented. See Normandeau Comments at 15 (discussing U.S. Department of Interior study measuring nutrient levels, total and fecal coliform, dissolved oxygen and biological oxygen demand levels that indicate harm to the biotic community from the pollution levels of the river). Notably, this contamination, and its resulting nutrient loading to the river, caused a reduction of oxygen available to the biota.

> USDI (1966) notes the sources of pollution to the river were mainly sewage and industrial waste that contain a variety of "obnoxious components," including oxygen "demanding" materials which limit fish and aquatic life by removing [dissolved oxygen] from the water. Other "greasy substances" in the water form surface scums, settleable solids and sludge deposits, and other suspended materials can make the water turbid, limiting light penetration.

Id. at 15.

Clearly, the fish community of the Hooksett Pool in the 1967-1969 timeframe was so impaired by pollution that any improvement in water quality would affect the fish community. However, EPA ignores improvements in water quality that occurred in the Hooksett Pool as a result of the CWA. See Id. at 13-17. EPA instead attributes all changes in abundance levels of some fish species to thermal discharges from Merrimack Station. See, e.g., Determination at 59 (alleging that Station's thermal discharge caused yellow perch population decline); Id. at 60 (alleging that Station's thermal discharge caused pumpkinseed population decline); Id. at 72-74 (alleging "dominance of heat-tolerant species in Hooksett Pool [is] indicative of appreciable harm to the balanced, indigenous community").

In fact, as discussed more fully below, the fish community of the Hooksett Pool in the 1960s timeframe does not meet the required characteristics of a BIP. Thus, it is clearly inappropriate to use a 1967 based fish community that existed in sewage and phosphate polluted waters to assess whether there has been appreciable harm to the Hooksett Pool. EPA's conclusions regarding the effects of Merrimack Station's thermal discharge are therefore flawed.

EPA Response:

EPA addresses this and related comments from Normandeau in a single response below.

Comment II.4.2.3 (ii)	**AR-1552, Normandeau, p. 7-9; AR-1300, LWB, p. 4; AR-285, Normandeau**

The Report *Historic Water Quality and Selected Biological Conditions of the Upper Merrimack River, New Hampshire* (AR-868,) which PSNH submitted in 2012 as part of its response to and comments on the Draft NPDES Permit, documents the nature and substantial extent of the water pollution that had already impaired the Merrimack River as of May 1968, the month when Merrimack Station's Unit 2 commenced operation, and when, according to USEPA, Merrimack Station's thermal discharge began to cause appreciable harm to the aquatic community in Hooksett Pool (Normandeau 2011b). This historical pollution predating Unit 2's operations significantly altered the river's water quality, especially with respect to nutrients, and had a corresponding impact on resident biota. As noted by Wolf (1965):

> Historic observations of this contamination give a picture of a river contaminated beyond our current comprehension: sewage so dense that a single drop contains "dangerous" levels of bacteria; coliform bacterial counts exceeding 1 million per 100 ml for several cities; toxic metals and wastes including phenol and cyanide found in the river; suspended solids covering the river bottom and decomposing, causing gas to bubble up "as if the river were cooking"; and a predominant smell of rotten egg from hydrogen sulfide, which can ruin painting on boats and houses (Wolf 1965).

The sources of contamination were many and included waste from wood and paper processing mills and textile mills (wool and cotton fiber mills) that were situated along the river. However, one of the major sources of significant pollution came from the constant release of untreated sewage wastes into the river (Normandeau 2011b). In 1964, no town in New Hampshire on the mainstem of the Merrimack River treated its wastes (Wolf 1965). As late as the mid-1960s, more than 120 million gallons per day of untreated or minimally treated wastewater were discharged into the Merrimack River (USGS 2003). The effects of this waste effluent impacted all the aquatic biota in the river, including in Hooksett Pool. The effects of this type of sustained nutrient enrichment, and the resulting enhancement of primary producers, ultimately enhances secondary and tertiary productivity (deBruyn et al. 2003).

The United States Department of the Interior ("USDI") measured nutrient levels (nitrogen and phosphate), total and fecal coliform, dissolved oxygen ("DO") and biological oxygen demand ("BOD") levels in the Merrimack River during 1965 (USDI 1966). Levels of ammonia and nitrate were substantially elevated (approaching and exceeding 1 mg/L) in the Concord to Manchester reach of the river, and total phosphorous levels in excess of 0.1 mg/L to near 1 mg/L were recorded. These values indicate a high level of nutrient loading in the Merrimack River during that time period. In addition to the USDI data collected during 1965, sampling in Hooksett Pool during 1969 also demonstrated elevated nutrient levels, with both total phosphorous and total nitrogen levels significantly greater than what would be expected for uncontaminated waters in northeast rivers (Normandeau 2011b). Figure 3-1 (originally presented in Normandeau 1979b) presents the seasonal mean nitrate and phosphate concentrations recorded in Hooksett Pool for the period 1967-1978, when the river was at its most polluted state. In addition to the elevated nutrient levels, total and fecal coliform levels were also elevated (USDI 1966). High BOD readings, indicative of a high level of organic material in the river, were present when measured during the January-April period, with lower levels measured during the summer months (USDI 1966). Lower summer BOD combined with low DO is indicative of significant organic pollution in the river (Normandeau 2011b).

The reduction in oxygen available to Merrimack River biota that was caused by the nutrient loading to the river was the most important effect on the system as a whole. USDI (1966) notes the sources of pollution to the river were mainly sewage and industrial waste that contained a variety of "obnoxious components", including oxygen "demanding" materials that limited fish and aquatic life by removing DO from the water. Other "greasy substances" in the water formed surface scums, settleable solids and sludge deposits, and other suspended materials made the water turbid, limiting light penetration. Industrial wastes can contain chemical or toxic substances that can kill fish and aquatic organisms or promote slime growth.

USEPA and most states consider DO levels below 5 mg/L as detrimental to most temperate freshwater ecosystems (Normandeau 2011b). The DO levels measured during 1965 in the upper Merrimack River were often below 5.0 mg/L during the June through September period throughout the river reach between East Concord and Manchester, NH (USDI 1966). Minimum DO values of 2.8 mg/ L were measured during September at Garvins Falls Dam, just upstream from Hooksett Pool. Low levels of DO were also recorded during studies conducted in Hooksett Pool during the late 1960s, and it was reported in 1969 that rhythmic, daily oxygen pulses, resulting from photosynthetic and respiratory activity of aquatic organisms, ranged up to 80% during days with low flows (Normandeau 1970). Concentrations of DO during the daytime were usually well above 5 mg/L and at times as high as 10 mg/L or higher, but during the evening would fall to as low as <1 mg/L, depending on conditions (Normandeau 1969). Large diurnal changes in DO levels are indicative of a eutrophic condition, caused by high levels of nutrients such as nitrates and phosphorous being discharged into a waterbody (Normandeau 2011b). High nutrient levels result in enhanced primary productivity, which causes large phytoplankton blooms. These phytoplankton blooms were primarily responsible for the large diurnal changes in DO levels recorded in Hooksett Pool during the 1960s, which ranged from supersaturated conditions recorded during the day (due to photosynthesis) to values approaching zero during pre-dawn hours. Eutrophication can decrease biodiversity and change species composition and dominance for all aquatic biota. It can increase growth of gelatinous zooplankton, decrease epiphytic algae and change macrophyte biomass and composition (Smith et al. 1999). It is evident from these data that the pollution levels present in the Merrimack River, and in particular in Hooksett Pool, during the late 1960s were harmful to the resident aquatic biota. Indeed, trout, salmon and other fish species sensitive to low DO levels could not survive in the Merrimack River during the 1960's. Tests conducted by the New Hampshire Water Supply and Pollution Control Commission in 1968 demonstrated that Brook Trout placed in live boxes and lowered to the bottom in Hooksett Pool at Station N-10, 0 and S-17 resulted in mortalities to all fish at every station (Normandeau 1969).

In the 1960s, New Hampshire Water Use Classification and Quality Standards included Classes A through D for rivers, based primarily on dissolved oxygen, coliform bacteria and pH, among other parameters. When the USDI issued its report in 1966, New Hampshire had not yet classified the Merrimack River, but it was expected to do so by June 1967 according to the Federal Water Pollution Control Act (USDI 1966). Had the river been classified as of June 1967, the USDI data would have supported a Class D rating – a level of water pollution unheard of today.

An annual monitoring program conducted in Hooksett Pool between 1971 and 1978 observed that DO levels were higher than those measured during 1965, 1967 and 1968. During the mid-1960s, DO levels had averaged in the mid-3 mg/L range during low flow conditions at the Garvins Falls Dam. By 1972, DO values remained above 6.4 mg/L at Hooksett Pool Monitoring Station N-10. Hooksett Pool water quality was beginning to improve during the 1970s, with the reduction in nutrient loading (Figure 2-1) acting as a major driving force behind those improvements (Normandeau 2011b).

As stated in Normandeau (1979b), "[n]itrite, nitrate, orthophosphate and total phosphate concentrations decreased by an order of magnitude from 1971 to 1972. Municipal and industrial pollution abatement activity in the upper Merrimack River basin prior to 1971 was most likely responsible for this decrease in Hooksett Pond nutrient concentration."

EPA Response:

PSNH and Normandeau generally summarize the results of Normandeau's 2011 Report "*Historic Water Quality and Selected Biological Conditions of the Upper Merrimack River, NH*" (AR-868) which itself is a review of historical water quality assessments. PSNH and Normandeau comment that it is evident, based on the data summarized in the report, that pollutant levels in Hooksett Pool in the 1960s were harmful to resident aquatic biota. EPA agrees generally with the comment that poor water quality conditions during the 1960s resulting from harmful practices such discharging poorly treated wastewater and untreated sewage to the river would likely have affected fish and other biological communities present at the time.

The comments and associated reports demonstrate that Hooksett Pool water quality in the 1960's showed evidence of elevated levels of some pollutants and that, to some extent, levels of certain pollutants have improved since this time period. For example, reductions in concentrations of total and fecal coliform since the 1960s are indicative of the installation of wastewater treatment facilities and their improved capabilities over time. See AR-868, p. 16-21. Sources of pollution such as wood and paper processing, wool and textile mills, and, particularly, septic and sewage discharges, likely contributed to the elevated nutrient levels that were likely an important contributor to depressed DO levels. EPA also agrees that certain water quality parameters, such as nutrient levels, have improved in the Merrimack River since the 1960s. Indeed, such improvements are expected given that these sorts of water quality problems helped to spark enactment of the federal Clean Water Act of 1972, 33 U.S.C. §§ 1251 *et seq.*, and that the various programs implemented under the statute, including the National Pollutant Discharge Elimination System (NPDES) permit program, have had substantial success in forcing reductions in pollutant discharges. Accordingly, reduced industrial and municipal pollutant discharges under the CWA has undoubtedly resulted in improved water quality in the Merrimack River, though the levels of degradation during the 1960s, and the nature and pace of improvements since that time, has likely varied from location to location.

According to Normandeau, DO levels less than 5 ppm have essentially been eliminated from the upper Merrimack River. See AR-868, p. 15-21. DO levels may have been improving even in the late 1960s. According to Normandeau's 1969 report (AR-181), all samples of DO concentration at two of the three Hooksett Pool stations were above 5.0 ppm in 1968, the minimum state criterion for meeting Class B standards. Concentrations did drop to a minimum of 4.8 ppm at Station-0, where the Facility's thermal discharge enters the river,[29] but averaged 6.6 ppm during the sampling period conducted from June through September 1968. There were 42 days of "low flow" conditions in 1968 with flows below 1,000 cfs in Hooksett Pool, according to Normandeau's Supplemental Report No. 1. AR-285, p. 8. These data indicate that, even under

[29] Merrimack Station's thermal discharge was itself likely contributing to low DO concentrations, given the low DO levels at the point of the thermal discharge and the fact that warmer water cannot hold as much DO as cooler water.

the "worst case" conditions (i.e., high ambient temperatures and low-river flow) experienced in the summer of 1968, average DO concentrations still met the minimum state criteria. Normandeau's data suggest that water quality, at least as reflected by DO concentrations, was improving as early as 1967.

Normandeau's comments on the biological impacts related to depressed DO levels in Hooksett Pool are inconsistent with some of its conclusions expressed when it initially assessed these physical-chemical parameters. In its Supplemental Report No. 1 (AR-285, p. 36), Normandeau concluded that even though daily oxygen pulses ranged up to 80 percent during days with low flows, they resulted from photosynthetic and respiratory activities of aquatic organisms, and did not approach levels (at Station S-0) considered to be harmful to the ecological balance of the Merrimack River. Furthermore, Normandeau stated that during high flows, DO (percent saturation) fluctuated as little as 20 percent (AR-285).

In addition, DO concentrations tended to drop during summer low flow (and warmer water) periods under existing conditions in the 1960's, indicating that DO levels during these periods may have been even further depressed in areas of Hooksett Pool affected by the plant's thermal plume. Temperature stratification and associated DO depression in areas of Hooksett Pool downstream of Merrimack Station's thermal discharge have been documented since Unit 2 first came online in 1968. Normandeau's first thermal effects analysis report (AR-181) points out a significant and consistent difference between DO concentrations taken at Station S-17 (just above Hooksett Dam) in 1968 at the surface and at depth. AR-181, p. 96. This monitoring occurred just after Unit 2 came online in May 1968 and continued through early September. The report goes on to state that the variation between bottom and surface DO's was not as apparent at the north station, upstream of the plant's thermal discharge. *Id*. This DO depression at depth occurred where thermal stratification apparently resulted from Merrimack Station's buoyant thermal plume.

EPA agrees that DO levels have generally improved in the upper Merrimack River since the 1960s, but portions of Hooksett Pool has continued to fail state standards for DO concentration and/or saturation, as repeatedly documented by NHDES water quality assessments. *See* https://www.des.nh.gov/organization/divisions/water/wmb/swqa/index.htm. In addition, data collected since 1968 suggests Merrimack Station's surface-oriented thermal plume has consistently caused, or contributed to, DO depressions during summer, low-flow conditions. As previously described in the response to Comment #3, DO depressions within the thermally-influenced portions of Hooksett Pool were documented in 1968, following the start-up of Merrimack Station's Unit 2. Merrimack Station's Annual Report for 2011 (AR-1610), which was developed by Normandeau, reported that the daily average DO concentration at the plant's cooling water intake for Unit 2 (Station N-5) fell below 5.0 ppm for 10 of the 11 days between August 18-28, 2011.

Normandeau comments that biochemical oxygen demand (BOD) is reflective of decreases in dissolved and suspended organic matter in the river. See AR-868. P. 16-21. EPA agrees that, in general, decreased BOD levels would be associated with improving water quality, particularly increased levels of DO, but Normandeau provides no evidence to support the comment that BOD has decreased in Hooksett Pool, or even in the upper Merrimack River as a whole. In its 2011

Water Quality Report (AR-868, p. 17), Normandeau cites its own 1969 report which states that heavily polluted rivers such as the Merrimack generally have an abundance of dissolved substances that impose oxygen demand (BOD). There is no other mention of BOD in that report except for four tables that include BOD values collected in the 1960s, 1970s and 2003. According to Table 9 (p.18) in the 2011 Water Quality Report, the highest BOD level recorded in 1965 was 5.4 ppm. In 1967 and 1968, the BOD values were 2.28 ppm and 1.84 ppm, respectively. In 2003, the values were a low of "<2"ppm and a high of 12 ppm. The 2003 data does not support the comment that BOD has improved since the 1960s, but rather it suggests that BOD levels more than 40 years later are higher than those recorded in 1965.

Normandeau and PSNH comment that nutrient loading, characterized by high levels of nitrogen and phosphorus, was indicative of eutrophic conditions in Hooksett Pool in the 1960s. *See also* AR-868, p. 16-21. LWB also comments that nitrate and phosphate, although not directly toxic to aquatic life, are plant nutrients that stimulate plant growth and sometimes cause blooms of harmful algae. *See* AR-1300, p. 4. EPA agrees that eutrophication is caused by high nutrient levels and that nutrient levels in Hooksett Pool dropped substantially between the late 1960s and early 1970s, but they have not changed significantly since then, according to Normandeau's 2011 Water Quality Report (AR-868, p. 19). Data on nitrogen and phosphorous concentrations in the Merrimack River during the 1960s are limited, but the 2011 Water Quality Report (AR-868, p. 20) indicates that nitrate and phosphate concentrations in the vicinity of Merrimack Station declined by approximately 90% between 1967 and 1972. Normandeau argues that phosphorus in the Upper Merrimack River peaked in 1968 and has declined since then. While 1968 may have been a peak, as the 2011 Water Quality Report indicates, phosphorus concentrations have remained steady since the 1970s when much of the fisheries data evaluated in the 2011 draft Determinations Document was collected. *See* AR-868, p.19. Nitrate levels have also remained consistent with those in the 1970s. In 2003, nitrate was measured at 0.170 mg/l, which is within the range of samples taken between 1971 and 1978, and phosphate levels (TOP/PO4) in 2003 exceeded six of the eight years sampled in the 1970s.

The US Army Corps of Engineers study (USACOE 2012) referenced in the 2011 Water Quality Report (AR-868) provides more data on total phosphorus and orthophosphates concentrations in the Upper Merrimack and Pemigewasset River Study. According to the USACOE report, total phosphorus downstream of Concord, which includes the Garvins, Hooksett, and Amoskeag impoundments, were above EPA recommended levels for streams flowing into impoundments (USACOE 2012). As the report explains, measuring orthophosphates along with total phosphorus provides an idea of how much of the nutrient is bio-available for algal growth. Garvins, Hooksett, and Amoskeag impoundments all had significantly higher orthophosphate concentrations compared to the rest of the river samples (USACOE 2012). However, the amount of algae observed in this area did not reflect these elevated orthophosphate concentrations, suggesting that algal growth was inhibited by some other factor, but not the lack of bio-available phosphorous (USACOE 2012). The report concludes that higher than average flows in the impoundments in the summer of 2009 likely prevented excessive algal growth that could have contributed to stressed DO conditions (USACOE 2012).

Normandeau comments that the increased diversity and abundance of macroinvertebrates is indicative of the absence of concentrated sources of pollution. *See* AR-868, p. 15-21. EPA agrees that increased diversity and abundance is often indicative of good water quality, but new information provided by Normandeau suggests that Hooksett Pool's macroinvertebrate community may have been impacted by the appearance and abundance of the invasive Asian clam (*Corbicula fluminea*). *See Sections II.4.4.5 and II.5 for a detailed discussion on macroinvertebrates and Asian clams*.

Finally, Normandeau states that Hooksett Pool in 1967-1969 would have been classified as a "Class D water" by the State of New Hampshire, although acknowledges that the state never actually assigned it that classification. EPA does not consider the posited hypothetical change in classification in and of itself to be strong evidence of improved water quality. Prior to 1991, Hooksett Pool was considered a Class C water (usable only for non-contact recreational purposes, such as fishing and boating, and for some industrial purposes) but it was legislatively upgraded to Class B in by the state in 1991, as were all Class C waters. Normandeau's Merrimack Monitoring Program Summary Report, states that while low DO concentrations are partially responsible for non-attainment of the legal B classification for this river segment, DO concentrations measured in Hooksett "Pond" during this survey have rarely declined below Class B (6 ppm and 75 percent saturation) levels during the past seven years (1972-1978) (Normandeau 1979). DO excursions below state standards apparently occurred then, as they continue to do, in the impounded sections of the Merrimack River, namely the Garvins, Hooksett, and Amoskeag pools, according to NHDES water quality assessments (NHDES 2008, 2010, 2012). Furthermore, while substantial reductions in phosphorous between the 1960s and 1970s clearly represent important improvements in reduced pollutant loadings, the repeated failure to meet state water quality standards within the impounded portions of the upper Merrimack River, including Hooksett Pool, does not support the argument that water quality improved dramatically since the 1970s. Therefore, EPA does not find compelling the argument that water quality improvements since the 1960s alone explain changes in Hooksett Pool's biological communities. *See* https://www.des.nh.gov/organization/divisions/water/wmb/swqa/2018/index.htm

In sum, EPA agrees with the comments that the sampling of certain water quality parameters during the 1970's, including nutrient concentrations, indicated marked improvements over sampling results from the 1960s. From the information provided by Normandeau's documents and comments, it appears that water quality in Hooksett Pool, as measured by the physical-chemical parameters sampled, were, for the most part, suitable for sustaining a BIP during the 1970s. At the same time, many water quality problems, including low DO concentrations, have persisted in Hooksett Pool beyond even the 1970s.

4.2.4 Current Water Quality in Hooksett Pool

Comment II.4.2.4	**AR-872, Normandeau, pp. 94, 118**
See also AR-868, Normandeau, pp. 15-16	

[Responding to AR-618, p. 82-83 and p. 119] Normandeau disagrees with EPA's assertion that Hooksett Pool's water quality is currently impaired. This is an odd assertion given that the State granted a CWA § 401 certification to PSNH for the Merrimack Hydroelectric Project (which comprises the Garvins Falls, Hooksett, and Amoskeag Dams and Hydroelectric Stations) following the completion of water quality monitoring in 2002 and 2003 (Gomez and Sullivant 2003). In addition, a recently released Army Corps of Engineers report stated that water quality within Merrimack River impoundments is good (USACOE 2011). These governmental actions are not consistent with the contention of poor water quality in Hooksett Pool.

The Gomez and Sullivan (2003) report explains why low DO was measured on this one date in 2002. According to the report, these were worst-case conditions due to very low flows (below the 95% exceedance interval for low flows), there was no rainfall, and there were above normal air temperatures. Because this was a diurnal study, the low DO values measured were near dawn, when BOD would have caused the low DO readings. Gomez and Sullivan (2003) identify the cumulative effects of a wastewater discharge into the river above Hooksett Dam as a possible cause.

EPA Response:

EPA's statements in the 2011 Draft Determinations Document that Hooksett Pool's water quality was impaired at that time were based on NHDES's water quality assessments, which had repeatedly concluded that areas within Hooksett Pool failed to meet state water quality standards based on the documented non-attainment of certain pollution parameters identified in the assessments, including DO concentration and saturation. In the last six assessments (2008, 2010, 2012, 2014, 2016, 2018), NH DES's Final Attainment Status of impaired waters (also referred to as the "303d list"), the Merrimack River within Hooksett Pool (upstream of the plant) is listed as being in "Severe Impairment" for DO concentration and saturation (See NHRIV700060302-25-02, NH DES website).

The Final 2018 Section 303(d) Surface Water Quality List indicates that the aquatic life integrity designated use in the Merrimack River upstream of the discharge (Segment NHRIV700060302-25-02) is impaired for dissolved oxygen and dissolved oxygen saturation.[30] The Hooksett Pool impoundment (Segment NHIMP700060802-02), which begins just downstream of the discharge, is listed as "good" for dissolved oxygen and "likely good" for dissolved oxygen saturation but "likely bad" for turbidity and due to nonnative fish, shellfish, or zooplankton. The segment downstream of Amoskeag Dam (NHRIV700060802-14-02) is "severely impaired" for dissolved oxygen saturation but "good" for dissolved oxygen. It is also listed as "poor" for aluminum and E. coli (recreational designated uses), "likely bad" due to nonnative fish, shellfish, or zooplankton, and "poor" for pH and mercury. The "likely bad" status due to the presence of nonnative fish, shellfish, or zooplankton may due to the presence of non-native organisms in Hooksett Pool; in particular, the Asian clam (*Corbicula fluminea*). The existence of this highly invasive species was first brought to EPA's attention by Normandeau during the public comment period for the 2011 Draft Permit in the report "Comparison of Benthic Macroinvertebrate Data Collected from the Merrimack River near Merrimack Station During 1972, 1973, and 2011," dated January 2012." (Normandeau 2012a). The presence of the Asian clam, notably limited to areas of Hooksett Pool within the plant's thermal influence, is discussed in greater detail in Section 5 of this document.

[30] https://www.des.nh.gov/organization/divisions/water/wmb/swqa/2018/index.htm

The Gomez and Sullivan study provides data for the lower portions of Hooksett Pool that are not reflected in the State's water quality assessment covering 2002-2003. This report presents temperature and DO data collected in July and August, 2002, at stations in the Amoskeag Pool, Hooksett Pool, and Garvins Pool. The data not only clearly captures thermal stratification in Hooksett Pool downstream from the plant's thermal discharge, but also associated DO depressions that fall below the state's limit of 5.0 ppm (Gomez and Sullivan 2003). According to the Gomez and Sullivan study (2003), during monitoring in July 2002, DO concentrations in Garvins Pool never dropped below 7.1 ppm, and were never below 6.8 ppm in Amoskeag Pool. In Hooksett Pool, while surface DO levels were similar to Garvins and Amoskeag pools (7-8 ppm), DO levels began dropping at a depth of about 1 meter (3 feet) and continued to drop steadily towards the bottom where concentrations ranged from 4.9-5.6 ppm. Temperatures in Garvins Pool during this time period ranged from approximately 24.4° - 26.1°C (75.9°- 79.0°F) at the surface, while in Hooksett Pool, temperatures ranged from 27.2°-29.9°C (80.1°-85.8°F) at the surface. Temperatures in Garvins Pool typically decreased by no more than 1°C between the surface and the bottom, but in Hooksett Pool they dropped by as much as 2.9°C (5.2°F) between the surface and the bottom, consistent with the effects associated with a buoyant thermal plume.

In August 2002, DO depressions in Hooksett Pool were even more extreme. DO concentrations at the surface in all three pools ranged between approximately 6.6-8.1 ppm, and both Garvins and Amoskeag pools demonstrated fairly uniform DO concentrations throughout the water column. In contrast, DO concentration levels in Hooksett Pool dropped dramatically at depth; eight of nine samples were less than 5.0 ppm at the bottom with five of the samples at or below 4.0 ppm. The lowest observed value (3.5 ppm) was collected at 8:00 am when DO depressions can occur naturally due to lack of photosynthesis overnight combined with the respiration of aquatic organisms. However, excursions below state water quality standards for DO concentration did not just occur in the early morning hours. A bottom DO level of 3.9 ppm was observed at 3:00 pm (Gomez and Sullivan, 2003) when photosynthesis should be near the highest daily levels. The sampling in Hooksett Pool occurred just above the Hooksett Dam, roughly 2.9 miles downstream from where Merrimack Station discharges its heated cooling water into the river. This information provides further evidence that the plant's thermal plume can affect the entire lower half of Hooksett Pool.

Gomez and Sullivan (2003) concluded that the river was experiencing extremely low flow conditions during the summer of 2002, but that the water columns in both Garvins Pool and Amoskeag Pool were very well mixed and oxygenated, and had temperature and DO that followed typical daily patterns. In Hooksett Pool, on the other hand, thermal stratification was occurring and DO levels fell below 5.0 ppm. The report goes on to state that:

> [t]he temperature regime in this impoundment is dictated somewhat by the cooling water used at Merrimack Station upstream of the dam. It is unusual to see lower dissolved oxygen levels in the cooler portion of the water column at Hooksett because colder water has the potential to hold more dissolved oxygen.

Gomez and Sullivan (2003) present possible causes for the low DO levels at the bottom of the Hooksett impoundment including temperature increases from the cooling water discharge upstream (*i.e.*, Merrimack Station), extremely low river flows, a lack of submerged aquatic vegetation at the sampling site, and the cumulative effects of wastewater treatment plant discharges into the river above Hooksett Dam.

EPA was not able to locate the 2011 Draft U.S. Army Corps of Engineers report referenced in Normandeau's comment (AR-872, p. 118) as stating that water quality within Merrimack River impoundments is "good." EPA reviewed the subsequent version of that Draft report but could find no such general conclusion (AR-1254, Upper Merrimack and Pemigewasset River Study, Field Program 2009-2012, Draft Data Report, September 2012). EPA did, however, find in that report useful information on temperature, DO, and nutrients in Hooksett Pool and adjacent impoundments during the 2009-2010 sampling period, which are discussed below. EPA has also provided detailed discussion of other water quality data and believes that this more detailed discussion is of more importance to the analysis for this permit than any generalized statement that the Corps may or may not have made about whether or not water quality in the Merrimack's impoundments was "good."

According to the Upper Merrimack and Pemigewasset River Study report, two low-flow events in 2010 were captured (July 27 and September 21,) and one high-flow event in 2012 (May 17). The report identifies notable temperature increases of approximately 3°C (5.4°F) and 6°C (10.8°F) during the low flow events, which it attributes to Merrimack Station's cooling water discharge (ACOE 2012). Figure 4-12e of the report, depicts the significant variation in temperature from the surface to the bottom in Hooksett Pool during the two low-flow events. During the second low-flow event (September 21, 2010), the high temperature stratification (>6°C (10.8°F)) is associated with depressed DO percent saturation levels that fall below the state standard of 75 percent, though DO concentration remained between 6-7 ppm. DO levels measured during the high flow event (May 17, 2012) were generally at or near saturation, demonstrating the comparatively greater effect thermal stratification can have on DO during low-flow events compared to high-flow events.

4.3 Evaluation of Historical and Recent Fisheries Data

4.3.1 A Thorough Review of the Totality of the Evidence Submitted Demonstrates that the Aquatic Community Currently in the Hooksett Pool is a BIP and that No Appreciable Harm to that BIP has Resulted from Merrimack Station's Thermal Discharge

Comment II.4.3.1	**AR-1548, PSNH, pp. 21-26**
See also AR-1300, LWB; AR-1554, LWB, pp. 5-6; AR-1153, Normandeau	

In its Statement, EPA advises it is "reevaluating the effects of shorter-term thermal conditions, particularly on species that may be especially sensitive to such temperature excursions in relation to their ability to survive and compete with more thermally-tolerant species."[103] As demonstrated in the submissions of Normandeau, Enercon and Dr. Barnthouse since the 2012 Comments, speculation based on a comparison of abstract temperature data with theoretical fish tolerance thresholds developed in laboratory studies is not only unwise but is also unnecessary. The actual data from 40+ years of intensive biological study demonstrates Hooksett Pool is a BIP and that river temperatures, short and long-term, have not caused appreciable harm to the fish community of Hooksett Pool. PSNH has met its thermal variance burden through multiple, mutually supporting analyses that, taken together, clearly demonstrate an absence of harm caused by the operation of Merrimack Station. These include analyses of fish community composition, long-term trends in the abundance of representative important fish species ("RIS"), and key biological characteristics of the fish belonging to these species. Many of these analyses compared the fish community in Hooksett Pool to the communities present in the adjacent upstream (Garvins) and downstream (Amoskeag) Pools.

From 1972 through 1978, Normandeau, on behalf of PSNH and under the direction of the TAC, performed thermal and biological monitoring, including electrofish sampling, in the Hooksett Pool to characterize the river biota for the purpose of detecting potential long-term trends relating to the Station's operations.[104] It repeated the same thermal and biological monitoring and sampling program during 1995 and again during 2004, 2005, 2010, 2011, 2012, and 2013 to obtain additional annual observations of the fish communities present in the Merrimack River, including the RIS selected and approved by the TAC.[105]

The four years of sampling from 2010 through 2013 are especially relevant, because these surveys included Garvins and Amoskeag Pools as well as Hooksett Pool.[106] During all four years, samples were collected at the same 24 stations (6 in Garvins Pool, 12 in Hooksett Pool, and 6 in Amoskeag Pool), during the months of August and September. The same sampling procedures were used at every station during each of these 4 years. In addition, in 2012, spring sampling was conducted in all three Pools to obtain information concerning the spawning condition of 2 species of interest—white sucker and yellow perch—species EPA had identified as being thermally sensitive that have declined in abundance because of Merrimack Station's thermal discharge.[107] As explained by Dr. Barnthouse:

> These surveys provide a high-quality data set for evaluating whether the operation of Merrimack Station is causing observable adverse changes in the fish community of the Hooksett Pool, as compared to communities in upstream and downstream pools. Examples of such changes would be comparatively low or high abundance of thermally sensitive fish species, anomalous values of community metrics, or impaired reproductive condition. Absence of these types of changes would indicate that the fish community in Hooksett Pool is not being affected by station operations.
>
> The fact that the surveys included both upstream and downstream pools is especially important. If only the upstream Garvins Pool had been sampled, any differences between Hooksett and Garvins Pools could be due to natural upstream-downstream gradients in physical and biological conditions, not due to Merrimack Station's thermal discharge. The existence of such gradients was recognized more than 100 years ago (e.g., Shelford 1911), and is well- established in the ecological literature (Vannote et al.

> 1980). According to these ecological principles, the fish communities in Garvins, Hooksett, and Amoskeag pools should be different, but should differ in ways that are consistent with the expected upstream to downstream gradient in environmental conditions. Specifically, Garvins and Amoskeag Pools should be less similar to each other than either is to Hooksett Pool. Finding that these pools are *more* similar to each other than to Hooksett Pool would indicate that Hooksett Pool deviates from the expected gradient and could be adversely affected by Merrimack Station.[108]

In his 2016 report, Dr. Barnthouse considered statistical analyses of trends data for 15 resident fish species set out in Normandeau 2011a and the report's comparisons between the fish communities present in Garvins, Hooksett, and Amoskeag Pools.[109] Similar to Normandeau's finding of no appreciable harm, Dr. Barnthouse found Merrimack Station's thermal discharge has caused no appreciable harm to the BIP of Hooksett Pool. Among his other findings supporting no appreciable harm, Dr. Barnthouse concluded:

> Taxa Richness, meaning the number of different fish species collected, has increased from 12 species collected in 1972 to 19 species collected in 2011. Except for the anomalous year 1995 when bluegill dominated the electrofishing catch, species diversity as measured by the Shannon Diversity Index has increased since the 1970s. Since environmental stress has been frequently found to decrease taxonomic richness and diversity (Rapport et al. 1985), these increases could be responses to improved water quality in the Merrimack River. They are definitely inconsistent with the expected effects of thermal stress, which would be to decrease richness and diversity. Normandeau (2011b) also found that the percent of species classified as "generalist feeders," another indicator of environmental degradation, has decreased. The percent of species classified as pollution-tolerant has varied but not noticeably changed. ***Taken together, these community-level results support a conclusion that there has been no appreciable harm to the BIP due to the operation of Merrimack Station*.**[110]

Further, Dr. Barnthouse found the "most revealing results" presented in Normandeau's 2011b report to be its comparisons of the relative abundance of species and "catch-per-unit- effort" ("CPUE") between the fish communities in Garvins, Hooksett, and Amoskeag Pools.[111] Except for a few occasionally abundant species such as tessellated darter (Garvins Pool, 2010) and margined madtom (Amoskeag Pool, 2012), the most abundant species during all four years were species discussed in EPA's § 316 Determination and identified as RIS by Normandeau.[112] Within each Pool, the same species tended to dominate numerically in most or all four years.[113] All three Pools consisted of a mix of warmwater, coolwater, and warmwater/coolwater species.[114] Three coolwater species were numerically dominant in Garvins Pool, as compared to 2 in Hooksett Pool and 1 in Amoskeag Pool. Although this pattern suggests a potential upstream-downstream gradient in thermal tolerance, examination of the percent contribution of coolwater species to the total catch does not support the existence of such a gradient. During the years 2010-2013, the percent contributions of coolwater fish to the total catch in Hooksett Pool is actually higher than in Garvins Pool for three of the four years.[115] Further, although no upstream-downstream trends in thermal tolerance are evident in the survey data, there is a clear trend in taxonomic composition, specifically in dominance of the fish community by members of the family Centrarchidae.[116] Centrarchids collected in the Garvins, Hooksett, and Amoskeag Pools during 2010-2013 include black crappie, bluegill, largemouth bass, pumpkinseed, redbreast sunfish, rock bass, and smallmouth bass. Four of the five most abundant species in Amoskeag Pool are centrarchids, as are four of the six most abundant species in Hooksett Pool. The trend is clear. For all four years, centrarchids contributed the greatest percentage of the total fish community in Amoskeag Pool and the least in Garvins Pool. Hooksett Pool was intermediate with respect to percent centrarchids in all four years.[117] Upstream-downstream gradients in abundance of individual fish species are also apparent in the fish community survey data. Total CPUE was highest in Garvins Pool, lowest in Amoskeag Pool, and intermediate in Hooksett Pool.[118]As explained by Dr. Barnthouse:

> This result implies that there is a clear upstream-downstream gradient in fish abundance within these three pools, consistent with established ecological principles. Abundance is highest in the upstream Garvins Pool, lowest in downstream Amoskeag Pool, and intermediate in Hooksett Pool.[119]

[101] *See, e.g.,* U.S. EPA Region 1, Clean Water Act NPDES Permitting Decisions for Thermal Discharge and Cooling Water Intake from Kendall Station in Cambridge, MA, 316(a) and (b) Determination Document (June 8, 2004) ("Mirant Kendall Determination"), at 34-35 (question under § 316(a) is what informed scientific judgment would be without speculation about evidence not in record). This document is attached hereto as Exhibit 9.

[102] *See* AR-846; AR-1170.

[103] AR-1534 at 40.

[104] *See* AR-1150; AR-1149; AR-1148; AR-1147; AR-1146; AR-1145; AR-1155; AR-1151; AR-1159; AR-1156; AR-198; AR-364; AR-1203. The full title of the Normandeau reports covering the span of 1969-2012 are provided on pages 13-16 of these comments.

[105] *See* AR-184; AR-1153; Normandeau 2017a.

[106] *See id.*

[107] *See id.*

[108] LWB 2017 Analysis at 1-2.

[109] AR-1300 at 16-18.

[110] Id. at 16-17 (emphasis added).

[111] *Id.* at 17.

[112] LWB 2017 Analysis at 2-4.

[113] *Id.* at 4.

[114] *Id.*

[115] *Id.*

[116] *Id.* The centrarchids are among the most diverse and abundant groups of freshwater fish in North America. *Id.*

[117] *Id*. at 4-6.

[118] *Id*. at 6.

EPA Response:

PSNH comments that it "repeated the same thermal and biological monitoring and sampling program during 1995 and again during 2004, 2005, 2010, 2011, 2012, and 2013" that was performed from 1972-1978. EPA notes first that the recent biological sampling program was similar to, but not the same as, the sampling from the 1970s. Most significantly, Normandeau eliminated trapnet fish sampling beginning in 2010. Trapnet sampling was part of the original fish sampling study design developed by NHFGD in the 1960's and had been adopted by the TAC for sampling conducted in the 1970s, 1995, and 2004 and 2005. Trapnet sampling had provided an important data set for understanding changes in fish abundance independent of electrofishing sampling. Normandeau's Fisheries Survey Analysis for the period 1967-2004 (AR-3) revealed an 89.5 percent drop in abundance for all species combined that comprised the Hooksett Pool fish community in the 1970s compared to the 2000s community (2004, 2005) based on trapnet sampling it had conducted. Normandeau then claimed that this sampling method is not appropriate for riverine locations, but the reason it was used in the first place was because Hooksett Pool (commonly referred to as Hooksett "Pond" in early reports) is more lacustrine (lake-like) than riverine due to being impounded on both ends. *See*, *e.g.*, AR-1, AR-198.

LWB applies Vannote et al.'s (1980) (AR-1553, p. 2) "River Continuum Concept" to argue that a clear upstream-downstream gradient in fish abundance within the Amokseag, Hooksett, and Garvins Pools is consistent with a finding of no appreciable harm. The Vannote et al. (1980) study addressed structural, functional, and biological characteristics of a "lotic" system, specifically in reference to "natural, unperturbed stream ecosystems," though the authors suggest the concept could possibly apply to systems affected by unnatural disturbances (*e.g.*, impoundments). In EPA's view, these concepts do not appear to be directly applicable to the three pools in the Merrimack River, which have been created by, and are managed as, three hydroelectric projects. In addition, the scale of the upstream-downstream gradient as LWB has applied it is much smaller than that discussed in the Vannote et al. (1980) study. Fish sampling around Merrimack Station targets roughly 15 miles of a heavily altered section of a 117-mile river, whereas in Vannote et al. (1980), the authors were comparing differences in river segments that vary considerably in size and other structural characteristics moving from the headwaters down to the mouth of a river system. In contrast, the structural characteristics of Garvins, Hooksett and Amoskeag Pools are similar, according to studies conducted by Normandeau (AR-869). Therefore, the upstream-downstream gradient concept does not seem applicable to differences in fish communities found between these three river impoundments in relatively close proximity to each other. Vannote et al. (1980) also suggests that fish communities along the river shift from coolwater species low in diversity to more diverse, warmwater communities (AR-1777, p. 133), but the fish communities of these three pools do not consistently follow that pattern, according to Normandeau's most recent fisheries report (AR-1551).

LWB comments (AR-1300, pp. 16-17) that the observed increase in species diversity and richness, evident in the diversity indices used in several of the recent reports (e.g., AR-1300, AR-

1554, AR-1552, AR-1153, AR-1551) are “inconsistent with the expected effects of thermal stress, which would be to decrease richness and diversity.” This argument is not supported by the expectation by Vannote et al. (1980) that natural systems further upstream would have coolwater fish communities *low* in diversity. Conversely, warmer systems downstream would tend to have greater biodiversity than colder systems, all other things being equal. LWB points to Rapport et al. (1985) in support of higher diversity being a desirable indicator of community health, and often it is, but Rapport considers the effects of pollution more generally, and not the effects of thermal pollution, specifically.

PSNH comments, based on supporting analysis by LWB and Normandeau, that community-level results, including taxa richness, species diversity as measured by the Shannon Diversity Index, the percent of species classified as “generalist feeders,” and comparisons of relative abundance and “catch-per-unit- effort” (“CPUE”), between the fish communities in Garvins, Hooksett, and Amoskeag Pools collectively support a conclusion that there has been no appreciable harm to the BIP due to the operation of Merrimack Station. One question regarding the utility of species richness or diversity in Normandeau’s most recent fisheries analysis (AR-1551) is the fact that Hooksett Pool had twice the number of sampling sites as either Garvins or Amoskeag pools (12 vs. 6). This means there was twice the number of chances to catch a novel or rare species. EPA addresses each of these arguments in detail in Response to Comment II.4.4.1. Generally, many of the arguments put forth do not support a finding of “no appreciable harm” due to Merrimack Station’s operations.

At the same time, EPA acknowledges that the lack of decreasing trends in abundance for coolwater species considering the most recent data from 2010-2013 suggests thermal conditions in Hooksett Pool may be improving for the resident species most sensitive to elevated temperatures from the Facility’s thermal discharge. In addition, the proportion (in relative abundance) of warmwater species to coolwater species in Garvins Pool and Hooksett Pool is similar and suggests that the Garvins Pool fish community can provide another viable point of comparison to represent the BIP. EPA also considers the Hooksett Pool fish community of the 1970s to provide an acceptable representation of the proper BIP.

EPA has evaluated the data from more recent years since Merrimack Station shifted its operational profile to more like a seasonal peaking facility rather than that of a baseload generator. This evaluation indicates that the new operational profile is, not surprisingly, associated with lower water temperatures in the river. These lower water temperatures should provide habitat conditions that provide reasonable assurance of the protection and propagation of the BIP going forward (*i.e.*, prospectively) and, as a result, support granting permit limits based on a CWA § 316(a) variance that are consistent with the Facility’s reduced thermal discharges.

4.3.2 Current Fish Communities in Hooksett Pool

Comment II.4.3.2	**AR-864, PSNH, pp. 17, 33** **AR-872, Normandeau, pp. 21, 33, 46, 59**

Normandeau (AR-872, p. 21) and PSNH (AR-864, p.17) comment that, based on the biological sampling data from 1972-2011, the current community in Hooksett Pool is the proper BIP for considering PSNH's request for a thermal variance. According to PSNH and Normandeau, the current aquatic community in Hooksett Pool is characterized by (1) diversity at all trophic levels, (2) the capacity to sustain itself through cyclic seasonal changes, (3) the presence of necessary food chain species, and (4) non-domination by pollution tolerant species and, therefore, meets all of the characteristics of a BIP as defined by the regulations at 40 CFR 125.71(c) (AR-864, p.17; AR-872, p. 21, 46).

PSNH comments that EPA incorrectly selected the compromised fish community that survived in the toxic pollutant-impaired Hooksett Pool of the 1960s as the BIP and did not take into consideration and appropriately evaluate all of the fish, macroinvertebrate and other aquatic sampling data from 1972-2011 (AR-864, p. 33). PSNH maintains that if this data had been evaluated, EPA would have concluded that the current fish community in the Hooksett Pool is the proper BIP for the purpose of considering PSNH's variance renewal request (AR-864, p. 33).

PSNH and Normandeau agree with EPA that the resident fish in Hooksett Pool comprise a single population due to their high mobility and lack of barriers from moving around the entire pool. Normandeau's analyses of fish communities in Garvins, Hooksett, and Amoskeag pools is based on 2008-2011 data from sampling points throughout these entire pools. According to Normandeau, fish species in Hooksett Pool comprise a single population and it is, therefore, unclear why, in Section 5.6.2.1 (AR-618, p. 42) of the 2011 Draft Determinations Document, EPA presents the results of its own analysis of fish captured in the ambient and thermally-influenced zones of Hooksett Pool (AR-872, p. 59).

EPA Response:

The evaluation of thermal effects from Merrimack Station on Hooksett Pool's fish community has included an assessment of the fish assemblages in both the ambient and thermally-influenced sections of the pool since thermal impact assessments were first conducted by Normandeau and NHFGD in the 1960s. There is no written record EPA is aware of that explains why NHFGD and Normandeau Associates did not also use Garvins Pool as a reference for making comparisons in the initial studies, instead of focusing the assessment on comparisons between the different zones of the Hooksett Pool itself, but this study design has been continued throughout the 1970s, in 1995, and again in 2004 and 2005. Indeed, the commenters' own approach to assessing long-term impacts to the Hooksett Pool fish community was described in Normandeau's comprehensive 2007 Fisheries Analysis Report as follows:

> If a statistically significant negative (decreasing) trend was observed, it was interpreted with respect to whether the Station's thermal discharge may be a contributing factor by examining the time series trend in a subset of the data representing the population of the RIS [Representative Important Species] in the Thermally-influenced portion of Hooksett Pool compared to the population if the RIS in the ambient water upstream from the influence of Merrimack Station's thermal discharge. Finding no significant trend over time or finding a significant

> increasing trend was considered to statistically support a finding of "no prior appreciable harm.

AR-3, p. 25. Clearly, Normandeau embraced this approach to evaluating thermal impacts within Hooksett Pool (*i.e.*, comparing thermally-influenced versus ambient sections of the Pool) for the past 40 years, up until 2007. Normandeau also used it in its consulting work supporting the Vermont Yankee power plant's request for a CWA § 316(a) variance, in which it assessed impacts to the "lower" Vernon Pool by comparing results from that area with those from sample sites *upstream* of the plant's thermal discharge (See Normandeau 2004). Even Normandeau's analysis for a June 2009 report on the biocharacteristics of yellow perch and white sucker populations in Hooksett Pool (Normandeau 2009) evaluated differences between the "ambient" and "thermally-influenced" portions of Hooksett Pool. As explained in the 2011 Draft Determinations Document, EPA did not agree with Normandeau's conclusions that demonstrated declines in fish abundance, both within the thermally-influenced and ambient sections of Hooksett Pool, reflected impacts other than those from the plant's thermal discharge. Given a fish's ability to move anywhere within the pool, EPA argued that a decline in "populations" in both segments of the pool could indeed reflect impacts related to the plant's effects in the thermally-influenced segment. Thus, while EPA and Normandeau did not agree on the ramifications of this information, both agreed that it was reasonable to compare the results from areas of the Hooksett Pool upstream and downstream of Merrimack Station's thermal discharge.

EPA still maintains that a *decrease* in abundance of a particular species in both the ambient and thermally-influenced sections of Hooksett Pool does not, by itself, demonstrate that factors other than the plant's thermal discharge are causing the decline, particularly for more mobile species. But comparisons with similar communities in water bodies unaffected by thermal discharges that are in close proximity to Hooksett Pool can provide an additional opportunity to evaluate how the species or community is faring in the absence of thermal affects. It also provides a means to assess how the fish community in the ambient portion of Hooksett Pool compares to these other "ambient" reference locations.

Normandeau decided to sample again in 2010 and 2011, but added two new sampling stations to the upper (ambient) section of Hooksett Pool. In doing so, there was for the first time an equal number of sampling stations in the ambient and thermally-influenced zones, which would be more appropriate for conducting comparisons between the two segments of Hooksett Pool. Additionally, six stations were sampled in Garvins Pool and Amoskeag Pool. Despite this apparent effort to standardize sampling in all four river segments (i.e., from north to south: 6 stations each in Garvins Pool, the ambient zone of the Hooksett Pool, the thermally-influenced zone of the Hooksett Pool, and Amoskeag Pool), Normandeau did not provide an analysis differentiating between the ambient and thermally-influenced sections of Hooksett Pool in its Fisheries Survey Analysis of 1972-2011 Catch Data report (Normandeau 2011). Instead, for the first time since 1967, and without providing an explanation for changing the analytical approach, Normandeau lumped all the data from the ambient and thermally-influenced sections together under "Hooksett Pool." Fortunately, Normandeau did provide fish sampling results for the north (ambient) and south (thermally-influenced) portions of Hooksett Pool in its 2017 fisheries report (ARA-1551, pp. 16 and 19).

There are clearly distinctions in the fish assemblages found in the upper (ambient) and lower (thermally-influenced) segments of Hooksett Pool, based on both electrofish and trapnet data. Normandeau's cluster analysis demonstrates that the fish community in the upstream (ambient) section of Hooksett Pool more closely resembles that of Garvins Pool than it does the community found in the lower (thermally-influenced) portion of Hooksett Pool. (*See* AR-871, pp.19-20).

4.3.3 EPA Should Have Considered the Adjacent Garvins Pool as the Point of Reference for its Appreciable Harm Determination

Comment II.4.3.3 (i)	**AR-846, PSNH, pp. 34-36**
See also AR-872, Normandeau, pp. 21, 83, 113	

As demonstrated in § IV.A.2 above, the current fish community in the Hooksett Pool is a BIP. A comparison to assess appreciable harm is therefore unnecessary. However, instead of analyzing the current fish community in the Hooksett Pool with respect to the characteristics of a BIP, EPA decided to compare the current fish community with that of the Hooksett Pool in the 1960s. This was improper – comparing the current fish population with that of the 1960/1970 timeframe ignores the "corresponding changes to the river's indigenous aquatic populations" resulting from improved water quality of the river. See id. If EPA wanted to confirm the lack of appreciable harm evidenced by the existence of a BIP in the Hooksett Pool, it should have instead used the fish community in the Garvins Pool as a point of reference. Such a comparison also confirms that no appreciable harm has resulted from thermal discharges at Merrimack Station. The EAB has recognized the flexibility with which EPA can and should consider the BIP. In Wabash, the EAB stated that the definition of BIP "is in the nature of a guideline: it describes important factors to be weighed and considered, but it does not spell out an all-inclusive checklist of criteria that lends itself to rote application." As PSNH's consultants have concluded, the Garvins Pool is a much more appropriate BIP upon which EPA should have based its analysis.

The Garvins Pool shares similar characteristics with the Hooksett Pool

The Garvins Pool is located immediately upstream of the Hooksett Pool approximately 2 ½ miles north of Merrimack Station (with PSNH's FERC-licensed Garvins Falls Hydroelectric facility forming the border between the two pools) and shares similar characteristics: "Physical habitat types within both the Garvins and Hooksett impoundments were surveyed during 2010 (Normandeau 2011d). "Sand/silt/clay was the abundant substrate type within both pools, followed by boulder and woody debris." Normandeau Comments at 84. Like the Hooksett Pool, the Garvins Pool has experienced improved water quality and associated environmental changes. The one key difference between the Hooksett Pool and the Garvins Pool is that the Garvins Pool has not been subject to Merrimack Station's thermal discharge. Thus, the current fish community in the Garvins Pool Provides a more appropriate point of comparison that may allow the identification of trends in Hooksett Pool that are potentially due to Merrimack Station's thermal discharge . . . [T]he biocharacteristics data collected during this 2008-2011 sampling confirms that when compared to the fish community in Garvins Pool, the fish community in Hooksett Pool in general, and individual species in Hooksett Pool in particular, is diverse, healthy and productive. Id. at 21-22.

This approach of using a reference, or control, water body from which to determine impacts from the thermal discharge is widely accepted.

The EAB and EPA have both acknowledged instances in which it is appropriate to "use a nearby water body unaffected by the existing thermal discharge as a reference area." See Letter from EPA Region 4 to North Carolina Department of Environment and Natural Resources (Nov. 16, 2010). For Duke's Cliffside Station, EPA concludes that "[e]xamination of an appropriate reference area may be applicable in this case," relying on the EAB"s decision in Brayton Point I, 12 E.A.D. 490 (2006). In Brayton Point I, EPA relied on a "hypothetical community" of fish, i.e., a fish community that may have existed before the plant began operation. There, the issue was whether EPA should have instead used a nearby fish community as a reference point, rather than the hypothetical community it chose. Unlike the Garvins Pool, however, the nearby fish community considered in Brayton Point I was found by EPA to have been impacted by the plant's thermal discharge. Here, the Garvins Pool (being upstream and separated by a dam from the Hooksett Pool) clearly has not been affected by Merrimack Station's thermal discharge; therefore, use of it as a reference area is supported and appropriate. EPA recognizes the need for using a reference or control water body in other contexts as well. For instance, when determining Total Maximum Daily Loads ("TMDLs"). In its "Protocol for Developing Sediment TMDLs," EPA states, "Where local experience has been gained in applying sediment indicators, it is often possible to identify target conditions through analysis of historical conditions or reference stream conditions in relatively high quality parts of the watershed." See US EPA Office of Water, Protocol for Developing Sediment TMDLs EPA 841- B-99-004 (1st ed. 1999), available at www.epa.gov/owow/tmdl/sediment/pdf/sediment.pdf. EPA should have looked to the Garvins Pool to assess whether the thermal discharge from Merrimack Station had caused appreciable harm to the BIP of the Hooksett Pool.

EPA Response:

EPA addresses this and related comments from Normandeau in a single response below.

Comment II.4.3.3 (ii)	**AR-1552, Normandeau, p. 15-16**
AR-867, Normandeau	

Rather than designate the compromised fish community that survived in the conventional and toxic pollutant-impaired Hooksett Pool of the 1960s as the Hooksett Pool BIP, USEPA should find that the current fish community in Garvins Pool provides an appropriate point of comparison that may allow the identification of trends in Hooksett Pool that are potentially due to Merrimack Station's thermal discharge. The current fish community in Garvins Pool meets USEPA's definition of "balanced indigenous population," because it is a community characterized by (1) diversity at all trophic levels, (2) the capacity to sustain itself through cyclic seasonal changes, (3) the presence of necessary food chain species, and (4) non-domination by pollution-tolerant species (40 C.F.R. §125.71(c)).

A spatial comparison among the fish communities sampled in Garvins, Hooksett and

Amoskeag Pools during the years of 2010, 2011, 2012, and 2013 was performed using the Bray-Curtis percent similarity index (Normandeau 2011a; Normandeau 2017a). This analysis showed that differences existed among the fish communities of each of the three pools, and that there was a trend of decreasing similarity among pools moving downriver from Garvins Pool to Hooksett Pool to Amoskeag Pool. Comparing the 2010 fish communities, the Bray-Curtis similarity was greater between Garvins and Hooksett Pools (64.4%) than it was between Garvins and Amoskeag Pools (23.4%). Results for subsequent sampling years produced a comparable trend; Garvins and Hooksett Pool values of 43.2%, 61.5% and 72.8% and Garvins and Amoskeag Pool values of 23.4%, 41.0%, and 65.8% for the years 2011, 2012, and 2013, respectively. Differences in community similarity of fish residing in a regulated river have been observed elsewhere for spatially separated segments (Pegg and McClelland 2004; Pegg and Taylor 2007). These results indicate that the fish community in Garvins Pool, which is not subject to Merrimack Station's thermal discharge, is not wholly distinct from the fish community in Hooksett Pool.

Garvins Pool, located immediately upstream of Hooksett Pool (the two pools are separated by Garvins Falls Dam), is uninfluenced by the Station's thermal discharge but has similarly benefited from the significant water quality improvements that have occurred in the Merrimack River since 1972. The pool is contained within the natural banks of the Merrimack River and extends approximately eight miles upstream of the Garvins Falls Dam to near Sewalls Falls (PSNH 2003). There are discrete differences between Garvins and Hooksett Pools in habitat and physical area. The Garvins Pool impoundment has a surface area of approximately 640 acres at full pond versus 350 acres at full pond for Hooksett Pool (PSNH 2003). Additionally, abundance of submerged aquatic macrophytes is greater in Garvins Pool than in Hooksett Pool, and fish in Garvins Pool have access to productive oxbow and backwater habitats that are not available in Hooksett Pool. Backwater habitat in riverine systems serve as important nursery and spawning areas for resident fish species. Nonetheless, sand/silt/clay is the dominant substrate type within both pools, followed by boulder and woody debris (Normandeau 2011d), and both pools have undergone similar environmental changes over the last four decades due to improved water quality and the introduction of non-native species. Merrimack River fisheries sampling was undertaken during 2008 and 2009 to examine and compare biological characteristics of two fish species, Yellow Perch and White Sucker, among Garvins, Hooksett and Amoskeag Pools (Normandeau 2009a). Additional sampling was undertaken from 2010 through 2013 to provide a current assessment of the whole fish community in Garvins, Hooksett and Amoskeag Pools (Normandeau 2011a; 2017a). As discussed in detail below, the biocharacteristics data collected during this 2008-2013 sampling confirms that when compared to the fish community in Garvins Pool, the fish community in Hooksett Pool in general is diverse, healthy and productive, as are individual species in Hooksett Pool.

EPA Response to Comments II.4.3.3 (i) and (ii):

The commenter identifies the current Garvins Pool aquatic community, which is just upstream from Hooksett Pool and the Garvins Falls Dam and not influenced by any thermal discharge, as constituting the proper reference BIP for Hooksett Pool. EPA agrees that Garvins Pool would be a potentially appropriate reference point for comparison with Hooksett Pool, but since the first fisheries studies were conducted by NHFGD in the 1960s, with subsequent studies conducted by

Normandeau in the 1970s and early 2000s, Garvins Pool was never used as a reference point, and no fisheries data from Garvins Pool were submitted to EPA by PSNH or Normandeau prior to the release of the draft permit in September 2011. It should also be noted that there was no recommendation made in any of the reports submitted prior to EPA's release of the 2011 Draft Permit that Garvins Pool be used as a proxy for the Hooksett Pool BIP instead of looking at the long-term changes in *the fish community of Hooksett Pool*. Focusing on the Hooksett Pool's fish community makes sense, of course, as at least one aspect of an assessment of whether Merrimack Station's thermal discharges caused prior appreciable harm to the BIP in the receiving water. *See Dominion*, 12 EAD at 557 (discussion 40 CFR § 125.73(c)(1)(i) and (ii)). Fish community comparisons were also provided by the commenter for the Black Rock Pool of Schuylkill River, in Pennsylvania (AR-867), but EPA found too many differences with this fish community over 290 miles away (southwest) to make it a suitable proxy for the Hooksett Pool BIP.

Two reports submitted by Normandeau after the 2011 Draft Permit was issued present the results of additional Hooksett Pool fisheries studies conducted in 2010-2011 (AR-871) and 2012-2013 (AR-1551). These reports also provide the first ever comparisons between the Hooksett Pool fish community and that of Garvins Pool, immediately upstream. These reports also evaluated the fish assemblage data from the ambient portion of Hooksett Pool, comparing it to both the lower, thermally-influenced portion of Hooksett Pool, as well as Garvins Pool. Garvins Pool is considerably longer than Hooksett Pool (9.8 miles vs. 5.8 miles), yet Normandeau decided to collect only half the number samples collected in Hooksett Pool (6 vs. 12) without explanation. Furthermore, only the middle two miles of Garvins Pool were sampled, omitting important back water areas, and locations in closer proximity to the two dams that define the pool. However, with four years of data now available for comparison (2010-2013), Garvins Pool can provide a contemporary comparison of adjacent, similar waterbodies. They are not, of course, identical waterbodies and each has its own characteristics and circumstances (*e.g.*, the Concord, NH, wastewater treatment plant discharges to Garvins Pool upstream of the Garvins Falls Dam).

There are certain benefits and limitations to using the Garvins Falls "community" for purposes of representing Hooksett Pool's "balanced indigenous community" when assessing the plant's thermal variance request. While Garvin's Pool is not ideal for the reasons mentioned above, as an impounded portion of the Merrimack River bordering Hooksett Pool upstream of the influence of Merrimack Station's thermal plume, it could be a useful reference site for comparisons with Hooksett Pool biological communities. Therefore, EPA has evaluated the new information provided by Normandeau to ensure available habitat types were similar in both pools, that the sampling conducted adequately supported the analyses and conclusions presented, and to determine whether the Garvins Pool fish community should be considered an appropriate BIP proxy for that of Hooksett Pool. EPA's evaluation of the Merrimack Station's §316(a) variance request for the Final Permit considers both the original comparison of the 1970s Hooksett Pool fish community with that of the 2000s, as well as comparisons of these communities that include additional data from 2010-2013.

4.3.4 Fisheries Data Analysis

Comment II.4.3.4 (i)	AR-1577, EPRI, p. 3-13; AR-1554, LWB, pp. 5-6

The terms “warmwater”, “coolwater” and “coldwater” for classifying fish species has a long history in the common vernacular. However, in the scientific literature, there are no generally accepted criteria for assigning fish species to these three classes. “Warmwater” generally refers to fish species that are best adapted to water temperatures >70°F (e.g., sunfishes and basses, catfishes) whereas “coldwater” species refer to those that are best adapted to water temperatures <60°F (e.g., trouts and salmons). The term “coolwater” is more nebulous and is often used to refer to species that do not cleanly fall into one of the other two categories.

Most fish species can be found over wide ranges in water temperatures and do not always fall into such neat categories as described above. Hence, there are often differences as to how fisheries scientists assign species to these categories. Hence, EPRI believes use of such categorizations in evaluating the protection and propagation of the BIC is fraught with uncertainty.

LWB comments (AR-1554, pp 5-6) that EPA asserted in its §316 Determination that “coolwater” species in the Hooksett Pool were replaced by more thermally tolerant “warmwater” species after startup of Merrimack Station. However, as noted both by Kendall (1978) and EPRI (2011) classification of species as “coolwater” or “warmwater” is based primarily on geographic ranges, not on thermal tolerance data. As noted by LWB (2016a), all of the species discussed in the §316 Determination are widely distributed throughout eastern North America, from Canada to the U.S. mid-Atlantic or even Gulf Coast states. Each species inhabits a wide variety of thermal regimes and possesses a wide range of thermal tolerances. Of the species that EPA asserted had declined since the 1970s, only chain pickerel, yellow perch, and white sucker have been classified as “coolwater” species. Yellow bullhead has been classified as a “warmwater” species, and brown bullhead and pumpkinseed have been classified as both “coolwater” and “warmwater” by different authorities.

EPA Response:

By the commenter’s (EPRI) own description, a species whose temperature preference falls between 60-70ºF would not be captured under the coldwater or warmwater guild. As EPA described in the 2011 Draft Permit (AR-618, p. 33), citing Morrow and Fischenich (2000)(AR-72, p. 5), coolwater species tend to have upper lethal limits that are similar to, or slightly lower than, those of warmwater species, but require cooler average temperatures during the growing season. Given that the central question of this review is whether or not Merrimack Station is causing, or contributing to, the appreciable harm to the BIP through its discharge of waste heat, understanding which species are the most sensitive to elevated temperatures throughout each lifestage is critically important. That said, the specific temperature requirements of certain species in Hooksett Pool is what classifies them as being particularly vulnerable to increased water temperatures, not whether they are labeled “coolwater” species.

LWB suggests that because a species has a wide geographic distribution it must have a wide temperature tolerance. Clearly, many species do have a wide distribution, in part thanks to intentional or accidental introductions from areas outside their native range. But just because a species is present in a particular location doesn’t mean it’s well-suited for the thermal conditions of that area. In this §316(a) thermal variance request, EPA focused on ensuring that the indigenous community of fish species in Hooksett Pool is protected, which means ensuring the preferred ambient temperatures of these species are sufficiently maintained, thus assuring the protection and propagation of the BIP, including enabling these species to survive and thrive through each lifestage.

Comment II.4.3.4 (ii)	**AR-872, Normandeau, p. 8, 70, 116**
See also AR-1300, LWB, p. 8-11	

According to Normandeau, the majority (10 of 16) of fish species captured in Hooksett Pool during the 1960s were warmwater species. Wightman (1971) and Normandeau (1969) state clearly that the Hooksett Pool fish community during the 1960s was a warm water fishery. Normandeau comments that the Hooksett Pool community is still composed of a mix of warmwater and coolwater species, and that 15 of the 16 fish species recorded in Hooksett Pool during the 1960s are still present.

LWB comments that EPA classified pumpkinseed as a warmwater species, although it is identified elsewhere as a coolwater species, citing Carlander (1977) and Eaton and Scheller (1996). The other species that show substantial declines between 1972 and 2005, according to the electrofishing data, were yellow perch, white sucker, brown bullhead, chain pickerel, and yellow bullhead. Of these, only chain pickerel, yellow perch, and white sucker are generally recognized as coolwater species. Brown bullhead has been classified variously as either a coolwater or warmwater species, and yellow bullhead is generally recognized as a warmwater species. The other species identified by EPA as part of the BIP are a mix of coolwater and warmwater species, all of which fluctuated in abundance during the time period examined without apparent trend.

EPA Response:

EPA agrees there were more warmwater species present in Hooksett Pool in the 1960s than cool or coldwater species, although, as LWB comments, some species such as pumpkinseed and brown bullhead have also been classified as coolwater species. The presence of these warmwater species is likely due, at least in part, to the reduction in flow velocities and increased water temperature related to the impoundments formed by the placement of dams along this stretch of the Merrimack River, especially the Garvins Falls (built in 1901) and Hooksett dams (built in 1927) that define Hooksett Pool. The dams not only dramatically altered what was once a riverine environment, converting the Hooksett Pool river segment to an impoundment that more closely resembles pool (or "pond" as it was referred to in the 1960s and 1970s), but the dams also inhibited or prevented the migration of fish to and from the pool, as well.

The continued presence, if not at the same relative abundance, of most of the species that existed in Hooksett Pool in the 1960s is encouraging since it suggests that there is potential for the fish community to once again reflect conditions unaffected by the influence of Merrimack Station's thermal discharge. Since the plant's discharge can affect up to roughly half of Hooksett Pool, the total disappearance of otherwise common fish species would not be expected since the upstream portion of the pool remains as a thermal refuge from the influence of the plant's heat. *See*

Response to Comment II.4.4.1. EPA recognizes that the introduction or appearance of new fish species in the pool prevents re-establishment of the precise historic BIP, however, restoring thermal conditions within the pool sufficient to allow the most temperature-sensitive resident species to compete with all other species is needed to restore balance to the existing fish community so that the BIP's protection and propagation is assured.

Comment II.4.3.4 (iii)	AR-872, Normandeau, p. 74, 84, 104-6, 109

In response to EPA's comparison of pumpkinseed and bluegill catch in Garvins Pool during electrofishing by NHFGD in August 2007 (Section 5.6.3.3e of the 2011 Draft Determinations Document, p. 99), Normandeau comments again that relative abundance is not representative of abundance because it is influenced by abundance of other species, and goes on to provide CPUE data from its 2010 and 2011 electrofishing sampling to support its argument of decreased pumpkinseed abundance compared to bluegill in Hooksett Pool. Normandeau argues that bluegill have become a major component of the Garvins Pool fish assemblage absent any thermal influence. Normandeau believes bluegills rose in abundance in Garvins Pool due to their ability to outcompete other fish species, including yellow perch and pumpkinseed, once water quality in the river improved. Normandeau also argues that the greater abundance of pumpkinseed in Garvins Pool can be explained by greater habitat diversity in Garvins Pool, as compared to Hooksett Pool, including oxbow and backwater areas inundated with the submerged aquatic vegetation preferred by pumpkinseed.

Normandeau comments that EPA incorrectly attributed the decrease in abundance of pumpkinseed in Hooksett Pool to the increase in Merrimack Station's thermal discharge resulting from Unit 2 coming on-line in 1968. Normandeau comments that the heat tolerance of bluegill is similar to pumpkinseed, not "considerably higher" as EPA states in the 2011 Draft Determinations Document. Normandeau contends that pumpkinseed are as thermally tolerant as bluegill and thermal additions are not needed for bluegill to outcompete pumpkinseed. For example, according to Normandeau, in Pennsylvania, pumpkinseed continued to dominate the fish community below Cromby Generating Station's thermal discharge more than 15 years after two generating units came on-line and were observed surviving and spawning in temperatures as high as 97°F.

Normandeau states that where competition for forage and/or habitat exist, bluegill will out-compete pumpkinseed. Normandeau also states, however, that pumpkinseed are more capable of withstanding lower DO levels and fluctuating environmental conditions than other species, such as bluegill, which allows them to survive in fluctuating and low DO environments that effectively eliminate other species, such as bluegill. According to Normandeau, if the decline in pumpkinseed abundance was solely due to Merrimack Station's thermal discharge, then a large decline would have been observed over the ten-year period immediately following Unit 2 coming on-line (1968-1978). Normandeau comments that the observed reduction in organic pollution since the 1970s and subsequent decline in submerged aquatic vegetation beds likely was a greater contributor to the decrease in pumpkinseed abundance.

EPA Response:

Regarding the comment on using relative abundance for assessing actual abundance, EPA agrees that it should not be used by itself for evaluating changes in actual abundance of any particular species. EPA discussed the limitations and potential misinterpretation of relative abundance (and the similar "rank abundance" metric) in the 2011 Draft Determinations Document. AR 618, p. 67. Nevertheless, this metric does illustrate well how species are faring relative to each other. This is an important consideration when evaluating thermal effects on a BIP from power plants discharges since altering temperature in an aquatic environment can affect how different species compete for forage, juvenile refugia, spawning habitat, etc. EPA has considered both relative and actual abundance (CPUE) in its evaluation of aquatic biological communities in Hooksett Pool.

Regarding the comment that bluegill has become a major component of Garvins Pool fish assemblage, this species represents only 4.1 percent of the Garvins Pool community based on the average of data collected by the commenter in 2010 and 2011 (AR-871, p.32, 36). EPA typically considers a relative abundance of 5 percent or greater to be "numerically dominant," so bluegill does not fall into that category. Regarding the comment that bluegills rose in abundance in Garvins Pool due to their ability to outcompete other fish species, including yellow perch and pumpkinseed, when water quality in the river improved is not supported by the commenter's sampling data, which suggests they are not outcompeting yellow perch, and are only slightly more abundant that pumpkinseed. According to sampling conducted in Garvins Pool from 2010-2014, the mean relative abundance was 11.7 percent for blue gill, 11.0 percent for yellow perch, and 7.8 percent for pumpkinseed.

Normandeau also argues that the greater habitat diversity in Garvins Pool, as compared to Hooksett Pool, including oxbow and backwater areas inundated with the submerged aquatic vegetation (SAV) preferred by pumpkinseed, is less likely to limit pumpkinseed abundance. This may be true, but no sampling was conducted by Normandeau in the extensive oxbow and backwater areas where SAV is heavily inundated. For reasons not explained in the report, Normandeau sampled only six stations within a two-mile stretch in the central portion of Garvins Pool, which is approximately 9.8 miles long. If these important habitats had been sampled, the abundance of pumpkinseed may have indeed been higher, and more species may have been captured.

Regarding comments on the heat tolerance of bluegill and pumpkinseed, after reviewing additional information on thermal tolerance of these species, EPA agrees with the comment that the thermal tolerance of these two species are similar enough that habitat *avoidance* related to temperature is not likely to be a factor involving competition between these two species. In fact, attraction to the thermal plume during most months, and interspecies competition that may result, may be more of a factor when contemplating to what degree, if any, Merrimack Station's thermal discharge contributed to the significant decline in pumpkinseed abundance in Hooksett Pool.

Normandeau comments that if the decline in pumpkinseed abundance was solely due to Merrimack Station's thermal discharge, then a large decline would have been observed over the ten-year period immediately following Unit 2 coming on-line (1968-1978). Yet, EPA notes that pumpkinseed abundance *did* decline dramatically during the 1970s. In just five years, pumpkinseed CPUE in Hooksett Pool dropped by almost half (48%) from 37.65 in 1972 to 19.45 in 1976, based on the 1970s data that Normandeau used for conducting its trends analysis (AR-

3). By 1995, the next year that sampling was conducted, pumpkinseed CPUE had dropped to 0.95. *Id*. Further, EPA never suggested that the decline in pumpkinseed abundance was "solely" due to Merrimack Station's thermal discharge. The 2011 Draft Determinations Document, AR 618, p. 100, stated that a reasonable argument can be made that increased thermal discharges related to the operation of Unit 2 contributed to the decline of pumpkinseed by altering the thermal environment in much of Hooksett Pool, in combination with the introduction of the more heat-tolerant, non-native bluegill.

4.3.5 Macroinvertebrates in 1960s

Comment II.4.3.5 (i)	**AR-1552, Normandeau, pp. 13-14**

Further evidence of the polluted nature of Hooksett Pool during the 1960s is evidenced by macroinvertebrate sampling conducted during that time period. Macroinvertebrate communities are useful indicators of anthropomorphic perturbation due to their limited mobility. They are unable to avoid adverse environmental conditions and are often eliminated from areas where stresses exceed tolerance levels. In response to stressed conditions, the macroinvertebrate community often shifts towards high numbers of a few tolerant taxa. Data from USDI (1966) clearly indicates that pollution in the Merrimack River was adversely affecting the river's macroinvertebrate community. Less than 15 miles of the Merrimack River, from a total of 115 miles studied, contained benthic organisms.

A review of shoreline kick net samples collected at Hooksett Pool Monitoring Stations N-10, S-0, S-4 and S-16 during 1972 revealed low values for Ephemeroptera/Plecoptera/Trichoptera (EPT) richness, taxa richness and EPT/Chironomid ratio, all of which can be attributed to the low water quality conditions in Hooksett Pool prior to the Clean Water Act (Normandeau 1973a). Kick net data collected in October 2011 at these same monitoring stations (N-10, S-0, S-4 and S-16) showed that EPT richness had increased by 150-300% from 1972, and taxa richness had increased from 7-10 species in 1972 to 21-23 species in 2011 (Normandeau 2012a). The 2011 EPT/chironomid ratios were also higher than their 1970s counterparts, as would be expected from samples collected in a river with improved water quality and habitat tolerated by more pollution-sensitive species (Normandeau 2012a). Benthic samples collected by ponar during 1972, 1973 and 2011 at Monitoring Stations N-10, S-0, S-4 and S-16 also show indications of improved riverine conditions over time, although these are not as dramatic as the shoreline samples, likely due to the sand substrate typically inhabited by tolerant organisms even in pristine conditions (Normandeau 2012a).

EPA Response:

EPA received comments on how changes in the benthic macroinvertebrate community in Hooksett Pool since the 1960s reflect improved water quality. In addition to these comments, a detailed study of macroinvertebrates was conducted by Normandeau in 2011. The results of this study, and a comparison to similar studies conducted in 1972 and 1973, were submitted in a report during the comment period. EPA reviewed these comments and the new report, as well as previous studies conducted in Hooksett Pool, in order to evaluate changes in the macroinvertebrate community over time related to water quality, including the thermal effects from Merrimack Station. The Agency discusses these comments and materials further in responses below.

Comment II.4.3.5 (ii)	**AR-868, p.19-21**

Normandeau comments that according to a US Department of the Interior (USDI) report from 1966, benthic organisms were "totally absent" in the lower 57 miles of the river, and less than 15 miles of the total 115 miles of the Merrimack River that was studied contained benthic organisms (AR-868, p. 19).

Normandeau further comments that, according to its 1969 report (Normandeau 1969), large variations in mussel productivity were found, with the section of the river south of the Station discharge canal more productive than to the north. Normandeau adds that its 1969 report characterized the Hooksett Pool as being in a moderate stage of recovery from past pollution, based on sampling conducted in 1967 and 1968" (AR-868, p. 21).

Normandeau also references macroinvertebrate information from the 1990s, based on sampling conducted by the Upper Merrimack River Local Advisory Committee, Merrimack River Watershed Council and NH DES in the published report, "The State of the Upper Merrimack River 1995-1997" (Normandeau-HWC 21). Normandeau comments that according to this report, sensitive taxa were found to be present at all 11 sites sampled between Franklin and Bow, although sensitive species declined downstream of Concord. Normandeau concludes that significant changes in aquatic biota have clearly occurred in the upper Merrimack River since the mid-1960s (AR-868, p. 21).

EPA Response:

EPA agrees that water quality throughout portions of the Merrimack River was historically degraded to the degree that the benthic biological communities were impacted, and that the river's water quality has generally improved in more recent years. However, the approximate location of the southern (downstream) end of Hooksett Pool is at river-mile 81, which is 24 miles upstream of the upstream end of the area described in the USDI report. Therefore, regarding Normandeau's reference to the USDI report describing the total absence of benthic organisms in the lower 57 miles of the river, the area in question did not include Hooksett Pool. As a result, it cannot be the basis for firm or specific conclusions about Hooksett Pool conditions.

The USDI report that Normandeau references is Part II of a six-part study of the Merrimack River and selected tributaries. Part III (Stream Studies - Biological) was not mentioned in any comments received, but EPA reviewed it to better understand the biological conditions that existed at that time of the study (1964-1965). The Part III study included eight stations sampled in Hooksett Pool using a Petersen dredge. According to the report (USDI 1966c), stations sampled closest to Garvins Falls Dam produced only an "impoverished" assemblage of bottom fauna, consisting of a few sludgeworms and midgefly larvae indicative of a zone of moderate pollution. The report further states that sediments 2.63 miles upstream of Hooksett Dam were composed mostly of silt and organic sludge, with leeches and omnivorous snails dominating.

Snails were particularly abundant (USDI 1966c). Sampling of the stream bed 0.19 miles upstream from Hooksett Dam produced sediment samples that were black and had a septic odor, and consisted chiefly of sand, silt, and organic sludge (USDI 1966c). Only a few midgefly larvae and dragonfly nymphs were found in these sediments, and only a few predatory leeches (USDI 1966c). The report suggests that other insects such as mayflies and caddis flies could not tolerate the septic conditions of the sediments and overlying waters and concluded that the conditions found indicated gross to moderate pollution existed in this section of the Merrimack River.

This USDI report provides site-specific evidence that benthic conditions in Hooksett Pool, and upstream of Hooksett Pool, during the mid-1960s were still degraded due to anthropogenic sources of pollution. However, these findings differ from those presented in Normandeau's 1969 report. According to Normandeau's study, not only were a variety of macrofauna collected at all stations during sampling conducted in 1967 and 1968 (as Normandeau's comments reflect), but included in the samples was *Spongilla lacustris*, a benthic species which the report states "is characteristically intolerant of pollution…." This species was collected in isolated patches along the length of the study area (p. 195) (Normandeau 1969). This 1969 Normandeau report - the most complete and comprehensive survey to-date of this section of the Merrimack River, according to Normandeau – concluded that this area of the Merrimack River (*i.e.*, Hooksett Pool) was in a stage of moderate recovery from pollution characteristic of this flow (p. 189). Taken together, the findings in these studies would suggest that improvements in the benthic conditions of Hooksett Pool began between 1965 and 1967.

In response to Normandeau's comments on the macroinvertebrate sampling results presented in the published report, "The State of the Upper Merrimack River 1995-1997," EPA reviewed the report, as well as a subsequent report published by the Upper Merrimack Monitoring Program, in 2010. A water quality assessment of the upper Merrimack River was conducted from 1995-1997 by the Upper Merrimack Monitoring Program (UMMP 2000). Site 11 of this study was located one half-mile below Garvins Falls Dam in Hooksett Pool, approximately two miles upstream from Merrimack Station's discharge canal. The study looked at several water quality parameters, as well as benthic macroinvertebrate diversity. Based on this assessment, this site received a ranking of 3.0, indicating "fair" river quality (UMMP 2000).

The water quality assessment of the upper Merrimack River that was conducted from 1995-1997 by the Upper Merrimack Monitoring Program was continued through 2007 and published in the report "State of the Upper Merrimack River 1995-2008." Again, Site 11 of this study was located one half-mile below Garvins Falls Dam, in Hooksett Pool. The study monitored *E. coli* and benthic macroinvertebrates. *E.coli* bacterial data from 1996 through 2008 indicate bacterial contamination along this river reach (UMMP 2010). Organism density fluctuated, but community composition remained relatively stable over the 11-year period (UMMP 2010). The number of sensitive macroinvertebrate species (EPT richness) at this site range from 33-88 percent, with an average of 51 percent. Anything above 50 percent is considered to be "non-impaired", or "excellent." Based on the overall macroinvertebrate health assessment, however, this site received a ranking of 2.0, indicating "poor" river quality, down from the fair rating (3.0) it received in 1997(UMMP 2010).

Normandeau comments that “significant” changes in aquatic biota have clearly occurred in the upper Merrimack River since the mid-1960s. EPA agrees that benthic conditions have generally improved, but that evidence of stressors to water quality remains, as these studies and water quality monitoring by NH DES and others attest to.

EPA has concluded that the comments it received related to water quality in the Merrimack River during the 1960s warranted a re-review of available water quality and fisheries data to better understand conditions during that time period and reassess the suitability of using the fish community of the 1960s as the BIP. Based on this reevaluation, EPA has decided there is sufficient uncertainty in distinguishing between changes in the biological communities associated with degraded water quality and those associated with the plant’s thermal effects. Therefore, consistent with these comments, EPA has focused more on comparisons between the benthic community of the 1970s and 2000s. See Reponses to Comments II.4.4.5.

4.3.6 Submerged Aquatic Vegetation in the 1960s

Comment II.4.3.6	**AR-872, Normandeau, pp. 114-115**

According to Normandeau, presence-absence data implies a decline in the overall extent of SAV in Hooksett Pool between the 1970s and the most recent data collected in 2002 and 2010. Normandeau suggests that the large nutrient inputs from sewage discharges in the 1960s enhanced the presence of algae and SAV.

Normandeau suggests that the absence of SAV at the discharge canal in 1972-1974 is most likely disturbance-related from the 1972 canal dredging. Normandeau points out that aquatic spike rush (*Eleocharis* sp) was very abundant on the west side of Station 0 in 1971, but not recorded in 1972, 1973, or 1974. Large SAV beds were mapped in this location in 2002 and 2010 (AR-868, p. 21).

EPA Response:

Normandeau suggests that large nutrient inputs from sewage discharges in the 1960s enhanced both growth of algae and the presence of SAV, but EPA concludes that the latter is unlikely since the health of SAV is closely related to its ability to photosynthesize underwater. As Normandeau comments (AR-868, p. 19), eutrophication favors growth of plants such as macro-algae and plankton over more complex plants, and algal blooms can reduce water clarity and, in turn, ambient light to SAV. SAV species are complex plants that tend to suffer from reduced water clarity due to eutrophication. Increases in algae production would be expected with increased nutrient availability (especially phosphorous in freshwater), but that would likely cause a decrease in water clarity which, in turn, would likely impair SAV’s ability to photosynthesize. Increased algal growth on the SAV leaves would further inhibit photosynthesis. The reduction of SAV, not an increase, is a common water quality indicator of nutrient enrichment.

Normandeau also comments (AR-1552, pp. 15-21) that Hooksett Pool has maintained the continued presence of SAV beds required for fish habitat, albeit only in certain locations and with variable densities. SAV is important fish habitat, especially for juvenile fish and, as discussed above, is an important indicator of water quality since it requires good water clarity to photosynthesize. However, Normandeau's own studies from the 1970s, 2002, and 2012 indicate that SAV habitat within Hooksett Pool has declined. AR-868, p. 21. According to Normandeau's analysis, SAV was present at 76 percent of the sites sampled in two years or more during the 1970s, 60 percent of stations sampled were within SAV beds in 2002, and only 50 percent of stations sampled were within SAV beds in 2010. (AR-868, p. 16). This notable decline in SAV does not support Normandeau's contention that water quality has improved in Hooksett Pool over conditions in the 1970s.

While the loss of SAV habitat since the 1970s clearly does not support the argument that water quality has improved between the 1970s and now, there also appears to be no clear connection between the plant's thermal discharge and the loss of SAV, as SAV is also diminished in areas of the Hooksett Pool upstream of Merrimack Station's thermal discharge. In addition, EPA agrees that the loss of aquatic spike rush may have resulted from mechanical disturbance of the substrate associated with dredging.

4.4 Appreciable Harm

Comment II.4.4	AR-1552, Normandeau, pp. 4-6

Merrimack Station is seeking a renewal of its existing thermal discharge variance under CWA §316(a) as part of USEPA's renewal of the Permit. CWA §316(a) provides that a permit applicant may demonstrate that any effluent limitation proposed for the thermal component of a discharge is more stringent than necessary to assure the protection and propagation of the balanced, indigenous population ("BIP") of shellfish, fish and wildlife in and on the body of water into which the discharge is made. Applicants with an existing thermal discharge, such as the Station, may demonstrate that the existing discharge is protective of the BIP by evaluating the BIP over a series of years during which the discharge occurred, and showing an absence of appreciable harm (40 C.F.R. §125.73(c); USEPA 1977). Contrary to USEPA's unfounded assertions, the data and analyses presented in the many reports prepared by Normandeau since 1969 and submitted to USEPA, NHDES and, after 1992, the other members of the Technical Advisory Committee (TAC) demonstrate that Merrimack Station's thermal discharge has not resulted in appreciable harm to the BIP in Hooksett Pool, and that the thermal discharge limits in the existing Permit adequately assure the protection and propagation of that BIP

EPA Response:

In the 2011 Draft Permit Determinations Document, EPA presented its analysis supporting the 2011 Draft Permit and the Agency's decision to reject PSNH's request for renewal of the CWA § 316(a) variance associated with the 1992 Permit. *See* AR 618, Sections 4.0, 5.0, 6.0 and 9.0. *See also id.* at 28. The variance for the 1992 Permit set thermal discharge requirements that effectively allowed the Facility to discharge the waste heat associated with baseload operations using open-cycle cooling. *Id.* at 27-28. In the 2011 Draft Determinations Document, EPA concluded that the Facility did not carry its burden to demonstrate either that the existing thermal discharge under the existing CWA § 316(a) had not caused prior appreciable harm to the Hooksett Pool's BIP, or that despite such prior appreciable harm, the protection and propagation of the BIP would be assured going forward with renewal of the existing variance. *See id.* at Section 6.0. *See also* 40 CFR §§ 125.73(c)(1)(i) and (ii).

In response to the many comments and supporting documents received in response to its analyses in support of the 2011 Draft Permit, EPA revisited the question of whether Merrimack Station demonstrated that no appreciable harm to the BIP of Hooksett Pool has resulted from the Facility's thermal discharges under the CWA § 316(a) variance-based limits in the 1992 Permit. 40 CFR § 125.73(c)(1)(i). In this re-evaluation, the Agency has not only considered comparisons of historical fish communities (1970s, primarily) with those of the early 2000s (2004, 2005), but has also considered newer fish community data collected from 2010-2013, and the possible implications decreased operations at Merrimack Station. Additionally, it has looked at the biological community more broadly to include the macro-invertebrate community, both from a historical perspective, as well as on the basis of comparisons between the current communities within Hooksett Pool representing both ambient and thermally-influenced areas. Finally, having received and reviewed four years of sampling data and analysis for the Garvins Pool fish community, EPA agrees with comments that the current Garvins Pool fish community represents one acceptable proxy for the Hooksett Pool BIP and, as such, EPA has evaluated comparisons of these two communities, as well.

EPA's responses to comments related to appreciable harm are included below, as well as in other applicable responses found elsewhere in this document.

4.4.1 No Appreciable Harm to the Hooksett Pool Fish Community

Comment II.4.4.1	**AR-1552, Normandeau, pp. 15-22, 24-26**
See also AR-1548, PSNH, pp. 27-38; AR-846, PSNH, pp. 17-27, 29-30, 32-34, 37, 47, 53-59; AR-1554, LWB, pp. 5-7; AR-1300, LWB; AR-872, Normandeau, pp. 23-27, 46, 80, 83, 84	

EPA Introduction to this group of comments and responses.

As indicated in the box immediately above, EPA has grouped together here several comments by PSNH and its consultants that address a common set of issues. EPA has reviewed these comments and the documents they reference and provides responses below. In an effort to retain the detailed comments below as presented, EPA has broken these comments out into subparts and has inserted its responses to those subparts within this list or group of comments. EPA also references other responses where additional discussion on these topics can be found. PSNH reiterates these comments made by Normandeau, which are also included here (*see* AR-1548, pp. 27-38; AR-846).

Normandeau Comment (i):

CWA §316(a) provides that a permit applicant may demonstrate that any effluent limitation proposed for the thermal component of any discharge is more stringent than necessary to assure the protection and propagation of the BIP in and on the body of water into which the discharge is made. Applicants with an existing thermal discharge may demonstrate that the existing discharge is protective of the BIP by evaluating the BIP over a series of years during which the discharge occurred, and showing an absence of appreciable harm (40 C.F.R. §125.73(c); USEPA 1977). Here, support for a finding of "no appreciable harm" to the fish community in Hooksett Pool from Merrimack Station's thermal discharge is provided through assessment of trends in abundance and an examination of the health and condition of fish species within the waterbody segment, as well as by comparison of these metrics from an appropriate reference BIP, the current fish community in Garvins Pool.

USEPA's finding of appreciable harm is clearly incorrect because properly interpreted, the data show that over time, there have not been (1) appreciable decreases in any coolwater fish species in Hooksett Pool, (2) appreciable increases in warmwater species in Hooksett Pool, (3) appreciable decreases in the diversity of species in Hooksett Pool (as discussed in detail below, the Shannon Diversity Index value shows that the current fish population in Hooksett Pool is more diverse now than it was forty years ago), or (4) appreciable increases in the abundance of generalist feeders or pollution-tolerant species in Hooksett Pool (Normandeau 2011a; Normandeau 2017a). In fact, when compared to Garvins Pool – the thermally uninfluenced impoundment immediately upstream from Hooksett Pool, and the proper reference to compare to Hooksett Pool – the biocharacteristics of the fish population in Hooksett Pool in general, and of the individual species in Hooksett Pool in particular, indicate no appreciable harm to the BIP (Normandeau 2011a; Normandeau 2017).

EPA Response:

EPA has carefully considered the comments and supporting documents received by the commenter and others related to the question of appreciable harm, and has provided detailed responses above, in II.4.4, and below in this response (II.4.4.1)**.**

Normandeau Comment (ii):

There has been no appreciable harm to the BIP in Hooksett Pool based on decreases in any coolwater species. Aquatic habitat that has been adversely impacted by a thermal discharge characteristically contains a higher abundance of fish species that are tolerant of warmer water, and a lower abundance of fish species that prefer cooler water. Merrimack Station's thermal discharge has not adversely impacted the abundance and distribution of fish in Hooksett Pool (the area of the Merrimack River from which Merrimack Station withdraws cooling water and into which it discharges heated effluent). If the Station's thermal discharge adversely impacted the abundance and distribution of fish in Hooksett Pool during 1972-2013, it would be expected that the abundance of resident coolwater species in the pool (as estimated by standardized electrofish sampling efforts conducted between 1972 and 2013), should have significantly decreased over time. However, no such significant decrease in abundance was observed for any of the five coolwater fish species resident in Hooksett Pool. The abundance of one coolwater fish, Black Crappie, has increased significantly in Hooksett Pool since its introduction and first detection during 2004. The lack of significantly decreasing trends for the other native and resident coolwater fish species (Chain Pickerel, Fallfish, White Sucker and Yellow Perch) are not consistent with the hypothesis that Merrimack Station's thermal discharge has caused appreciable harm to the BIP in Hooksett Pool (Normandeau 2017a).

EPA Response:

According to the commenter's most recent fisheries report (AR-1551, p. 27), with the addition of the 2012 and 2013 sampling data, trends in abundance for yellow perch and chain pickerel no longer show statistically significantly declines. EPA views this as good and encouraging news since declines in both species were significant up through 2011. *See* AR-871, p. 225.

Normandeau comments that Merrimack Station's thermal discharge has not adversely impacted the abundance and distribution of fish in Hooksett Pool, but fisheries data provided to EPA, up to its issuance of the 2011 Draft Permit, did not support this statement. Normandeau's 2007 fisheries report presents sampling data for the ambient and thermally-influenced sections of Hooksett Pool, and both electrofishing and trapnet sampling clearly demonstrate notably lower abundance levels in the thermally-influenced section for coolwater species such as yellow perch and white sucker. *See* AR-3, pp. 20, 22, 62, 63. This apparent avoidance of the thermally-influence section of Hooksett Pool during the summer months by these thermally-sensitive coolwater species factored into EPA's determination that Merrimack Station had caused, or contributed to, appreciable harm to the Hooksett Pool BIP. EPA still considers this valid and compelling evidence of appreciable harm at that time, but new fisheries data suggest conditions may be improving, possibly in response to dramatic reductions in operations at Merrimack Station.

EPA questions the comment that black crappie abundance has increased significantly. It appears that the analysis included years in the 1970s and 1995 when the species was not captured. This resulted in the use of five data points (in catch per unit effort, or CPUE) of "0.0" before black crappies were actually caught in 2004 or considered part of the Hooksett Pool resident fish community (See AR-1551, p.34).

Mean CPUE (per 1,000 ft) of black crappie captured by electrofishing in Hooksett Pool during August and September of select years. From Table 3-3, AR-1551, pg. 34

1972	1973	1974	1976	1995	2004	2005	2010	2011	2012	2013
0.00	0.00	0.00	0.00	0.00	0.05	0.10	0.27	0.15	0.09	0.01

EPA did not run its own analysis, but the CPUE values provided in the table from 2004 and later do not seem to indicate a significant increase in abundance. EPA would not consider black crappie part of the BIP anyway given its relatively recent arrival in Hooksett Pool, but it does view this coolwater species' ability to persist as an encouraging sign that Hooksett Pool may be more habitable for coolwater species, generally.

Normandeau Comment (iii):

There has been no appreciable harm to the BIP in Hooksett Pool based on increases in warmwater species. As estimated by the same standardized electrofish sampling efforts, there have not been significant increases in abundance for nine of the ten warmwater fish species resident in Hooksett Pool during the 1972-2013 time period. Abundance of the native Pumpkinseed has significantly decreased and abundance of Rock Bass has significantly increased since its introduction and first detection during 1995 sampling. There were no significant differences in the abundance of Rock Bass within Garvins and Hooksett Pools during the period of comparable sampling in those locations (2010-2013) indicating Rock Bass in Hooksett Pool have not increased at a rate greater than that in the thermally uninfluenced Garvins Pool. The lack of a significant increase in the abundance of any warmwater fish species other than Rock Bass during the period of comparable sampling is not consistent with the hypothesis that Merrimack Station's thermal discharge has caused appreciable harm to the BIP in Hooksett Pool (Normandeau 2017a).

EPA Response:

While EPA notes the significant increase reported for Rock Bass abundance, EPA would not expect to see a steady increase in the abundance of any particular warmwater species over time since each is largely competing with other warmwater species for limited forage and spawning habitat. More telling would be a collective change in relative abundance of warmwater species versus coolwater species over time, but EPA does not see such a comparison in Normandeau's last two fisheries reports (AR-871 and 1551).

Normandeau Comment (iv):

There has been no appreciable harm to the BIP in Hooksett Pool based on a decrease in diversity of the fish community. Based on the 1972-2013 electrofish sampling efforts, the highest Shannon diversity index values for the Hooksett Pool fish community observed were in 2011 and 2013. Moreover, all of the per year diversity index values from the sampling years in the 2000s were higher than the values from the sampling years in the 1970s, indicating that the diversity of the fish community in Hooksett Pool – and therefore the biological health of that community – has generally increased, not decreased, over the past forty years. Community evenness values for each year of comparable sampling between 1972 and 2013 indicate the current Hooksett Pool fish community is distributed more equitably among species than the community during the 1970's which was dominated by a limited number of fish species. Examination of richness, diversity and evenness values for each year of comparable sampling supports a finding that Merrimack Station's thermal discharge has not reduced the diversity of the fish community in Hooksett Pool. These findings support the hypothesis that Merrimack Station's thermal discharge has not caused appreciable harm to the BIP in the Hooksett Pool (Normandeau 2017a).

EPA Response:

EPA agrees that increased diversity can reflect improved water quality, but it can also reflect changes that are not necessarily beneficial to the resident indigenous community. EPA has commented various times throughout this document, that increased diversity is not necessarily a positive indicator when evaluating impacts to a fish community from heat. It's widely known that the most diverse aquatic systems in the world exist in tropical or subtropical regions. According to Vannote et al. (1980) (AR-1777), in large river systems fish populations show a shift from coolwater fish species low in diversity [upstream] to more diverse warmwater communities [further downstream]. So, having a diverse community dominated primarily by warmwater species does not necessarily represent the proper BIP when coolwater species once represented a larger percentage of that resident community. The more important question related to changes in diversity would be how do changes in the number and abundance of warmwater species compare to the number and abundance of coolwater species.

Differences in diversity and species richness data for a single water body over time can also be influenced by changes in sampling effort and/design. Similarly, these metrics can be affected when sampling in multiple water bodies. Such changes occurred when Normandeau conducted fish sampling in Hooksett and Garvins pools from 2010-2013. *See Comment II.4.4.5(iv) for a detailed discussion of sampling disparities between Hooksett and Garvins pools.* These inconsistencies raise questions as to whether differences in species richness are truly comparable, or instead reflect results associated with inconsistent sampling effort or sampling locations lacking adequate representation of varied habitats within a waterbody.

Normandeau Comment (v):

There has been no appreciable harm to the BIP in Hooksett Pool based on an increase in generalist feeders. The percentage of generalist feeders in a fish community increases as the physical and chemical habitat deteriorates (Barbour et al. 1999). The percentage of generalist feeders was highest in Hooksett Pool in 1976 and lowest in 2010 across the 1972-2013 data set. The decrease in percent generalist feeders from the 1970's to present can be attributed to the decrease in abundance of Pumpkinseed, a generalist feeder that represented more than 50% of the Hooksett Pool fish community in the early 1970's. Decreases in Pumpkinseed are linked to improved water quality leading to decreases in submerged aquatic habitat and subsequently an increase in competition with Bluegill, a species that could not survive the low DO levels that existed in the pool in the early 1970's. The reduced percentage of generalist feeders in Hooksett Pool from 1972 to 2013 supports a finding that Merrimack Station's thermal discharge has not caused appreciable harm to the BIP in Hooksett Pool.

EPA Response:

While it may reflect changes associated with effects from pollutants other than heat, the generalist category is not unique to any particular temperature guild. As such, EPA doesn't consider this information particularly helpful, except perhaps to provide general information on differences of the feeding guilds related to changing water quality. Interestingly, however, Normandeau's 2017 Fisheries Report (AR-1551, p. 36) lists the percentage of generalist feeders in Hooksett Pool as being 74.65% in 1972 and 73.5% in 2013. These data do not support the argument that there has been a decrease in generalist feeders, or a substantial improvement in water quality as reflected by such a decrease, and it does not support a finding of no appreciable harm.

EPA also takes issue with Normandeau's classification of pumpkinseed as a "generalist." In 2007 (AR-3, pp. 72, 105), Normandeau identifies pumpkinseed as an "insectivore," based on EPA's "Rapid Bioassessment Protocols for Use in Streams and Wadeable Rivers, Second Edition." AR-1164. In developing these protocols, EPA reviewed seven literature sources to select, based on the consensus of these sources, which feeding guild or pollution tolerance classification each fish species belonged. For species for which the consensus was not unanimous, the alternative designations were listed as "exceptions." In its 2012 comments (AR-872 p. 18), Normandeau changed the classification of pumpkinseed to from "insectivore" to "generalist," still citing EPA's rapid bioassessment publication. In a footnote to its Table 2-2 (p.18), Normandeau identifies EPA's trophic guild and tolerance classifications as presented in the agency's bioassessment protocols. Of the nine most abundant species identified in this table, representing 98.1 percent of all fish caught, Normandeau uses none of the trophic guilds identified by EPA (and most of the literature sources reviewed) as being the most appropriate classification for these species. Instead, Normandeau appears to select from the trophic guild exceptions. For example, pumpkinseed, which at 31.7 percent is the most abundant species, is listed as an "insectivore" in EPA's protocols, but Normandeau selects "generalist" from the exceptions, which also includes "piscivore."

Normandeau changed its literature source altogether for classifying trophic guilds and pollution tolerance in its more recent 2011 fisheries report (AR-871). While no "pollution" tolerance classifications changed for any of the five species listed, pumpkinseed and redbreast sunfish move from the "insectivore" to the "generalist" feeder guild, using this new resource (Halliwell et al. 1999). This selection of alternative classifications may be an attempt to strengthen the "pollution" argument but is at odds with the classifications in EPA's protocols.

Normandeau Comment (vi):

Aquatic habitat that has been adversely impacted by a thermal discharge characteristically contains a higher percentage of pollution-tolerant individuals. Following a peak in the percentage of pollution-tolerant fish (primarily Bluegill) during the 1995 sample year, the percentage of pollution-tolerant fish observed during 2010 through 2013 are similar to the range of percentages observed during the 1970's. It should be noted that although the Bluegill is considered "Tolerant" to pollution, it could not survive in Hooksett Pool in the 1960's because it could not tolerate the low dissolved oxygen (DO) levels that existed at the time. Indeed, fish such as Pumpkinseed and Yellow Perch are actually considered "Intermediate" in pollution tolerance, but these fish were able to survive and reproduce in the severe pollution that existed at the time because they could withstand the low DO levels. The uniform dominance of Bluegill within both Hooksett and the thermally uninfluenced Garvins Pool based on the electrofishing sampling conducted from 2010-2013 demonstrate that the Bluegill didn't become abundant in Hooksett Pool due to thermal input as EPA speculated because this fish is just as abundant in Garvins Pool. In 2013, Bluegill was the dominant fish captured in both Garvins Pool (32% of catch) and Hooksett Pool (24% of catch). These findings support the hypothesis that Merrimack Station's thermal discharge has not caused appreciable harm to the BIP in the Hooksett Pool (Normandeau 2011a; 2017a).

EPA Response:

EPA disagrees with the assertion that an aquatic habitat that has been adversely impacted by a thermal discharge characteristically contains a higher percentage of pollution-tolerant individuals unless the pollutant being considered is heat. Heat tolerant species are not typically classified "pollution-tolerant" simply for their tolerance to heat. That said, the presence of a widespread surface-oriented thermal plume can exacerbate DO conditions at depth under low-flow conditions by inhibiting vertical mixing with more DO-enriched surface waters. This condition is similar to low DO associated with eutrophic conditions. Such an incident was documented in Hooksett Pool during the summer of 2002. *See* Response to Comment II.4.2.3 for a detailed description.

Beyond the question of whether abundance of pollution-tolerant species is or is not related to appreciable harm in the context of § 316(a), the commenter's own analysis demonstrates that there were more pollution-tolerant species present in Hooksett Pool in 2011 than there were in 1972, a mere four years after the period in the 1960s identified by Normandeau as being heavily polluted. *See* AR-871, p.73. Normandeau's comment that the percentage of pollution-tolerant fish observed during 2010 through 2013 are similar to the range of percentages observed during the 1970's is not supported by its own data. According to data provided in Normandeau's 2011 report (AR-871, p. 73) and 2017 report (AR-1551, p. 22), the percentage of pollution-tolerant species in Hooksett Pool during the 1970s averaged 8.5% while in the 2000s (2010-2013) they averaged 19.8%, more than twice as high. These data do not support the commenter's argument that the percent of pollution-tolerant species in Hooksett Pool over time is evidence of a lack of appreciable harm.

Regarding Normandeau's comments on the appearance and abundance of bluegill in Hooksett and Garvins pools, EPA discusses the characteristics and relevance of bluegill in more detail in the response to comment 4.3.4. While bluegill relative abundance in Garvins Pool was indeed 32% in 2013, it was only 6.9% in 2012. Over the 4 years of comparison sampling (2010-2013), bluegill relative abundance in Hooksett Pool averaged only slightly higher than in Garvins Pool (15% vs. 11.7%). *See* AR-1551, p. 33.

Once introduced to Garvins Pool, it's no surprise that bluegill would become established. The commenter provides an explanation in its Fisheries Analysis Report (*See* AR-3, p. 108) for why bluegill might dominate. According to Normandeau, citing Scarola (1987), the spawning period for bluegill spans a longer period of time than the sunfish species native to New Hampshire. Also, a female bluegill can, on average, lay more than four times the number of eggs produced by a female pumpkinseed, and a male bluegill may raise two to three broods per season. The report goes on to state that, in addition to being more prolific spawners, the larger bodied bluegill will also compete with the pumpkinseed for spawning habitat, as both prefer to nest in gravelly substrate. *See also* Response to Comment II.4.3.4.

With the benefit of additional sampling in Hooksett Pool (2010-2013) and the inclusion of Garvins Pool fish community data, EPA agrees that bluegill abundance appears to be similar between both pools. Still, the relative abundance of bluegill in Garvins Pool averaged over 4 years (2010-2103) was marginally greater (11.7%) than that of pumpkinseed (7.8%) over the same time period. In Hooksett Pool during the same period, however, bluegill relative abundance was three times greater than pumpkinseed (15% versus 4.8%). Differences in habitat and food availability between the two pools, as mentioned in earlier comments, may explain why pumpkinseed appear to do better in Garvins Pool than in Hooksett Pool. However, this difference does not rule out some influence related to the Facility's thermal discharge, as well. On a positive note, pumpkinseed relative abundance in 2013 was, at 13.2%, the highest it's been, by far, since sampling was conducted in 1976. While referred to in negative terms in multiple comments received by Normandeau and PSNH, this indigenous sunfish species may be showing signs that its relative abundance in Hooksett Pool is beginning to stabilize.

Normandeau Comment (vii):

A review of warmwater and coolwater species compared between Hooksett Pool and Garvins Pool indicates that there has been no appreciable harm to the BIP in the Hooksett Pool. As noted above, aquatic habitat that has been adversely impacted by a thermal discharge characteristically contains a higher abundance of fish species that are tolerant of warmer water, and a lower abundance of fish species that prefer cooler water. However, a comparison of the 2010 through 2013 fish communities in Hooksett Pool and Garvins Pool (the thermally uninfluenced impoundment immediately upstream from Hooksett Pool) shows no clear pattern consistent with the hypothesis that Merrimack Station's thermal discharge has caused an increase in the abundance of warmwater species or a decrease in the abundance of coolwater species in the pool. The EPA stated numerous times in the draft permit that the rise of Bluegill and Spottail Shiner abundance in Hooksett Pool was due to the thermal input from the Station because these fish can tolerate warm water and even suggested that these two fish species should not be included in certain analyses of fish abundance because they were not part of the 1960's fish community. However this hypothesis was rejected after four years of fisheries sampling in Garvins Pool, the thermally uninfluenced impoundment immediately upstream from Hooksett Pool. Spottail Shiner was the dominant fish species in Garvins Pool in electrofish samples in 2010 (51% of catch), 2011(45%) and 2012 (46%), and in 2013 Bluegill was the dominant fish collected, representing 32% of total catch in Garvins Pool (Normandeau 2011a; Normandeau 2017a). Fallfish, a coolwater fish, was the dominant fish species collected in Hooksett Pool in 2011 electrofish sampling and represented 20% of the total catch that year. Fallfish had significantly higher CPUE in Hooksett Pool electrofish sampling compared to Garvins Pool in 2011, 2012 and 2013. Additionally, White sucker, a coolwater fish, had significantly higher CPUE in Hooksett Pool electrofish sampling compared to Garvins Pool in 2010, 2011 and 2013. These comparisons, therefore, support the hypothesis that Merrimack Station's thermal discharge has not caused appreciable harm to the BIP in the Hooksett Pool (Normandeau 2011a; Normandeau 2017a).

According to LWB (AR-1554, p. 7) data compiled by Normandeau (2017b) shows that Garvins, Hooksett, and Amoskeag Pools all support a mix of "warmwater" and "coolwater" species. Comparing these three pools across the four years 2010-2013, the percent of all fish collected that were classified as "coolwater" was actually higher in thermally-influenced Hooksett Pool than in the upstream Garvins Pool for 3 of the 4 years (AR-1553, p.5, Table 5).

Hence, to the extent that there is any meaningful distinction between "coolwater" and "warmwater" fish species, the available data provide no evidence that the thermal discharge from Merrimack Station has caused "coolwater" species in Hooksett Pool to be replaced by "warmwater" species.

EPA Response:

EPA reviewed the breakdown in coolwater and warmwater species relative abundance for Garvins and Hooksett pools over the sampling period 2010-2013 and found, on average, the two pools have very similar proportions of warmwater and coolwater species, based on data provided in Normandeau's two most recent fisheries reports (AR-871 and AR-1551). EPA's calculations, based on these two fisheries reports, indicate that during the period from 2010-2013, the relative abundance of warmwater species was 75.4% in Hooksett Pool and 74.1% in Garvins Pool. The relative abundance of coolwater species was 23.1% in Hooksett Pool and 25.3% in Garvins Pool. This information is consistent with the comment urging that, during this more recent time period, a comparison of the relative abundance of warmwater and coolwater species indicates that the Hooksett Pool fish community is in similar condition to the upstream Garvins Pool fish community.

LWB's comments related to the mix of warmwater and coolwater species in Hooksett and Garvins Pools during this recent time period are supported by the data referenced. EPA also wanted to know how this mix has changed over time in Hooksett Pool. While EPA could find no comparison in Normandeau's last two fisheries reports, the data were provided in the 2017 fisheries report (AR-1551, p. 33, 34). EPA compared mean relative abundance (RA) and catch per unit effort (CPUE) between warmwater and coolwater species for the 1970s (1972, 73, 74, 76) and 2000s (2010, 11, 12, 13). *See Table below*.

Differences between mean RA and CPUE of coolwater and warmwater fish species based on data from Tables 3-2 and 3-3 in AR-1551, pp. 33-34.

Time Period	Coolwater Species		Warmwater Species	
	CPUE	RA %	CPUE	RA %
1970s	33.4	15.6	157.9	82.4
2010s	16.7	19.6	68.9	77.0
Difference	-16.7	+4.0	-89.0	-5.4

This comparison indicates that the proportion of coolwater to warmwater species in Hooksett Pool has increased since the 1970s. Therefore, with the addition of new fisheries data (2010-2013) from a period when the plant was operating at reduced frequencies, this would support comments that the current Hooksett Pool fish community is similar to the Hooksett Pool BIP of the 1970s.

Another finding from this comparison that is more troubling is the notable decline in fish abundance from both temperature guilds between the 1970s and 2010s. Coolwater species declined by almost 17 (number of fish caught per 1,000 feet), a 50 percent decline from the 1970s. Warmwater species declined by even more at 56.4 percent.

Normandeau Comment (viii):

A review of generalist feeders and pollution tolerant species compared between Hooksett Pool and Garvins Pool indicates that there has been no appreciable harm to the BIP in the Hooksett Pool. As noted above, aquatic habitat that has been adversely impacted by a thermal discharge characteristically contains a higher percentage of both generalist feeders and pollution-tolerant individuals. Although the percentage of generalist and tolerant species were higher in Hooksett Pool than Garvins Pool during 2010 through 2013, (except for 2013 when pollution tolerant fish were higher in Garvins Pool), these differences were the result of increased relative abundance of both coolwater and warmwater species in Hooksett Pool. In 2011, 2012 and 2013, the coolwater Fallfish and coolwater White Sucker along with the warmwater Bluegill contributed to the higher percentage of generalist feeders in Hooksett Pool. The percentage of generalist feeders in all three pools in most years is dominated by warmwater fish and in 2013 Bluegill, Pumpkinseed and Redbreast Sunfish accounted for 96.9% of the generalist feeders in Garvins Pool, 92.7% in Amoskeag Pool and in Hooksett Pool the three sunfish species plus Fallfish and White Sucker (coolwater fish) accounted for more than 92% of the generalist feeders captured. The data demonstrates that the dominant generalist species in Hooksett Pool were similar to those present in Garvins Pool during each sampling year. The percentage of pollution tolerant fish species in most years is dominated by Bluegill in all three pools. The uniform dominance of Bluegill as a tolerant fish species within both Hooksett and the thermally uninfluenced Garvins Pool suggests factors other than thermal regime (e.g., habitat diversity, food resources) are likely contributing to the observed differences. If Merrimack Station's thermal discharge has adversely impacted the BIP in Hooksett Pool by increasing the percentage of generalist feeders or pollution-tolerant individuals, it would not be expected that coolwater species would have significantly contributed to these increases, as documented (Normandeau 2011a; 2017a).

EPA Response:

The commenter concludes that "a review of generalist feeders and pollution tolerant species compared between Hooksett Pool and Garvins Pool indicates that there has been no appreciable harm to the BIP in the Hooksett Pool," but EPA finds this conclusion is not supported by the commenter's own data and analyses. The commenter acknowledges that the percentage of generalists was higher in Hooksett Pool than in Garvins Pool each year from 2010 to 2013. Regardless of whether coolwater species contributed to the generalist category, this analysis does not support a finding of no appreciable harm.

Normandeau Comment (ix):

A review of length-weight-curve sampling data of fish compared between Hooksett Pool and Garvins Pool indicates that there has been no appreciable harm to the BIP in Hooksett Pool.

Where aquatic habitat has been adversely impacted by a thermal discharge, sampling data tend to show a decreasing slope to the length-weight curve, signifying progressively lower weight for a given length for a resident fish species over time or in comparison to the same species residing in a thermally uninfluenced habitat. Such a decreasing slope indicates a reduction in quality of body condition due to the thermal impact. Adequate length-weight data was available to compare within-year condition for four coolwater species in Garvins and Hooksett Pools for the time period 2008-2011 (Normandeau 2011a) and for three coolwater species between Garvins and Hooksett Pools for the time period 2012-2013 (Normandeau 2017a). Of the seven possible comparisons for the 2008-2011 time period, there were no significant differences observed in weight growth relative to a constant increase in length in three cases (2011 chain pickerel, 2009 white sucker, 2009 yellow perch). In three instances (2011 fallfish, 2011 white sucker, 2008 yellow perch), the length-weight curves showed coolwater species in Hooksett Pool grew significantly more rotund (or "fatter") with increasing length than in Garvins Pool. Only yellow perch during 2011 grew significantly more rotund with increasing length in Garvins Pool than was observed in Hooksett Pool. For the 2012-2013 time period, slope differences in the length-weight relations indicated that coolwater Fallfish and Yellow Perch grew significantly less rotund (or "fatter") with increasing length in Hooksett Pool than in Garvins Pool. Conversely, White Sucker grew significantly more rotund in Hooksett Pool than in Garvins Pool. Here, the observations of similar or increased growth among some coolwater species and age groups residing in Hooksett Pool compared to the same species residing in thermally uninfluenced Garvins Pool during years of comparable sampling (2008-2011 and 2012-2013) indicate that there has been no appreciable harm to the BIP in Hooksett Pool (Normandeau 2011a; Normandeau 2017a).

EPA Response:

While there is lack in consistency in the evidence indicating adverse impact, as demonstrated through these length-weight analyses, EPA does not agree that this evidence supports a finding of no appreciable harm. The data suggest white sucker, a coolwater species, did not show an adverse effect for the period studied, but yellow perch length-weight data for 2011-2013, as well as fallfish data for 2012-2013, appear to indicate these species grew significantly less rotund in Hooksett Pool compared to Garvins Pool.

According to the commenter's 2011 fisheries report (AR-871, p. 198), the length-weight relationship (condition) of yellow perch was significantly lower in 2011 than in 2005, which supports that the yellow perch in Hooksett Pool collected in 2011 were in worse condition compared to those collected during 2005. Also, the report (p. 198-199) states that the mean length at age of age-1, age-2, age-3 yellow perch was significantly larger in Garvins Pool than was observed in Hooksett Pool. Therefore, these results appear to meet the definition of "adversely impacted by a thermal discharge" for two of the three coolwater species studied, as defined in this comment.

Normandeau Comment (x):

Where aquatic habitat has been adversely impacted by a thermal discharge, sampling data tend to show lower mean length at age for resident fish species compared to the same species in a thermally uninfluenced area, due to a reduction in growth rates associated with thermal stress. Adequate age data for comparison of mean length at age for individual cohorts between Garvins and Hooksett Pools were collected for three coolwater species (White Sucker, Yellow Perch and Fallfish) and four warmwater species (Bluegill, Pumpkinseed, Largemouth Bass, and Smallmouth Bass) during 2008-2013 (Normandeau 2011a; Normandeau 2017a). Of the 15 available comparisons from the 2008-2013 time period for warmwater species, eleven showed no significant difference for mean length at age for individuals residing in Hooksett and Garvins Pools. Mean length at age was significantly greater in Hooksett Pool than in Garvins Pool for the remaining four comparisons. Of the 18 available comparisons from the 2008-2013 time period for coolwater species, ten showed no significant difference for mean length at age for individuals residing in Hooksett and Garvins Pools, six demonstrated greater mean length at age for individuals in Garvins Pool versus Hooksett Pool and two demonstrated greater mean length at age for individuals in Hooksett Pool versus Garvins Pool. Based on the assumption that warmer water conditions will enhance the growth of warmwater fish and inhibit growth of coolwater fish, these observations are not consistent with the hypothesis that the operation of Merrimack Station has caused appreciable harm to the balanced, indigenous fish population in the Merrimack River.

EPA Response:

The commenter's assumption that warmer water conditions will inhibit the growth of coolwater species also assumes that coolwater species will simply tolerate elevated temperatures, but these species (and all species) tend to abandon areas where temperatures reach stressful levels, if possible.

Normandeau Comment (xi):

Where aquatic habitat has been adversely impacted by a thermal discharge, sampling data typically show a greater total mortality (Z) for a resident fish species compared to the same species in a thermally uninfluenced area, due to increased stress associated with thermal impacts. Here, the mortality levels observed in Hooksett Pool are lower than or equal to those observed in Garvins Pool for five of the seven species examined (Normandeau 2017a). Mortality of the coolwater Fallfish and Yellow Perch was significantly higher in Hooksett Pool than in Garvins Pool, but mortality of the coolwater White Sucker was significantly lower in Hooksett Pool than in Garvins Pool. The increased mortality of Yellow Perch in Hooksett Pool compared to Garvins Pool is directly linked to the mortality of 777 Yellow Perch individuals that were harvested for the biocharacteristics study between 2008-2012 and cannot be conclusively attributed to thermal stress. When this analysis was conducted in 2011 (prior to the 2012 fish collections), the mortality of Yellow Perch was not significantly higher in Hooksett Pool compared to Garvins Pool (Normandeau 2012). No significant differences in mortality of warmwater species (Bluegill, Largemouth Bass, Pumpkinseed, and Smallmouth Bass) were detected between the pools. These observations are not consistent with the hypothesis that the operation of Merrimack

Station has caused appreciable harm to the balanced, indigenous fish population in the Merrimack River.

EPA Response:

EPA reviewed these data and analyses but does not find them compelling evidence as a predicter of appreciable harm. Additionally, for two coolwater species, yellow perch and fallfish, the commenter states that elevated mortality rates in Hooksett Pool are attributed to sampling mortality. This sampling issue makes any meaningful conclusions for those two important coolwater species impossible.

Normandeau Comment (xii):

Where aquatic habitat has been adversely impacted by a thermal discharge, sampling data tend to show lower fecundity for resident coolwater fish species compared to the same species in a thermally uninfluenced area, due to thermal stress. Fecundity of Yellow Perch and White Sucker was significantly higher in Hooksett Pool compared to Garvins Pool in 2012 (Normandeau 2017a). The observation of greater fecundity of two sensitive coolwater species in Hooksett Pool is not consistent with the hypothesis that the operation of Merrimack Station has caused appreciable harm to the balanced, indigenous fish population in Hooksett Pool.

EPA Response:

While this comparison suggests that yellow perch and white sucker had greater fecundity in 2012 in Hooksett Pool compared to Garvins Pool, which is encouraging, EPA is not convinced that fecundity would necessarily be lower in coolwater species due to thermal stress. Perhaps a better indicator of thermal effects on reproductive success, at least for yellow perch, would be egg viability at time of spawning.

There was another aspect of Normandeau's analysis on reproductive effects that is not mentioned in this comment. The commenter compared age and length of male and female yellow perch at 50% maturity between populations in Hooksett and Garvins pools. The results indicated a notable disparity between pools. According to the report (AR-871, p. 200), the age at maturity for both male and female yellow perch in Hooksett Pool was considerably younger than in Garvins. Similarly, the length at maturity was considerably smaller in Hooksett Pool versus Garvins Pool. (*See table below*). The report does not suggest these findings are inconsistent with the hypothesis that the operation of Merrimack Station has caused appreciable harm to the balanced, indigenous fish population in Hooksett Pool.

Age and length of male and female yellow perch collected by electrofishing within Garvins and Hooksett Pools during 2008 and 2009 from Table 4-15-18 in AR-871, p. 213.

Pool	Age at 50% Maturity		Length (mm) at 50% Maturity	
	Male	Female	Male	Female
Garvins	4.2	4.1	201	176
Hooksett	1.6	2.3	135	141

Although there may be other reasons for these dramatic differences, reductions in age and size at maturity have been identified as stress indicators for some commercial fish species (Trippel, 1995) (AR-1776). Normandeau does not offer an explanation for these data. These particular comparisons do not support a finding that Merrimack Station's thermal discharge has not caused appreciable harm to the BIP in Hooksett Pool relative to the thermally uninfluenced Garvins Pool.

Normandeau Comment (xiii):

A comparison of external and internal parasites on the same resident species in both Hooksett Pool and Garvins Pool indicates that there has been no appreciable harm to the BIP in Hooksett Pool. Resident fish species in aquatic habitat that has been adversely impacted by a thermal discharge characteristically manifest more frequent infestation of internal and external parasites compared to the same species resident in a thermally uninfluenced area, indicating a reduction in the overall health and conditions of the fish due to thermal impacts. Internal parasites were assessed for two coolwater fish, White Sucker and Yellow Perch and they were equal or in greater abundance in Garvins Pool for both species (Normandeau 2017a). Of the six warmwater species examined, the prevalence of external parasites was greater in Hooksett Pool compared to Garvins Pool for two species, Smallmouth Bass (2012, 2013) and Spottail Shiner (2012). External parasites were equal or in greater abundance in Garvins Pool for Bluegill (2012, 2013), Largemouth Bass (2012, 2013), Pumpkinseed (2012-2013) and Redbreast Sunfish (2013). Of the five coolwater fish species, the prevalence of external parasites was greater in Hooksett Pool for Black Crappie (2012), Fallfish (2012), White Sucker (Spring 2012, 2013) and Yellow Perch (2012). External parasites were equal or greater in Garvins Pool for Fallfish (2013), White Sucker (Fall 2012), and Yellow Perch (2013). Based on the assumption that warmer water conditions will enhance the frequency of parasitic infection of both warmwater and coolwater fish species, the inconsistent results do not provide support for the hypothesis that the operation of Merrimack Station has caused appreciable harm to the balanced, indigenous population in the Merrimack River.

EPA Response:

EPA has reviewed these comments and analyses but does not consider the absence or prevalence of parasites to be a major indicator of appreciable harm, or lack thereof, in this review. Parasites exist in most every temperature regime, and EPA agrees that stress caused by temperature or other sources can suppress a fish's immune system, increasing the potential for parasitic infestations. However, warmwater species are not likely to be stressed through exposure to the Facility's thermal plume in most sections of Hooksett Pool, and coolwater species exposed to elevated temperatures sufficient to cause a stress response are likely to abandon those areas, when possible.

Normandeau Comment (xiv):

In sum, observations on the 1972-2013 time series of abundance data for both coolwater and warmwater fish in Hooksett Pool demonstrated that there was no significant decrease in abundance observed for any of the five coolwater fish species resident in Hooksett Pool (Normandeau 2017). The abundance of one coolwater fish, Black Crappie, has increased significantly in Hooksett Pool since its introduction and first detection during 2004. The lack of significantly decreasing trends for the other native and resident coolwater fish species (Chain Pickerel, Fallfish, White Sucker and Yellow Perch) is not consistent with the hypothesis that Merrimack Station has caused appreciable harm to the balanced, indigenous population. There has been no appreciable harm to the BIP in Hooksett Pool based on increases in warmwater species. As estimated by the same standardized electrofish sampling efforts, there have not been significant increases in abundance for nine of the ten warmwater fish species resident in Hooksett Pool during the 1972-2013 time period. Abundance of the native Pumpkinseed has significantly decreased and abundance of Rock Bass has increased since its introduction and first detection during 1995 sampling. There were no significant differences in the abundance of Rock Bass within Garvins and Hooksett Pools during the period of comparable sampling in those locations (2010-2013) indicating Rock Bass in Hooksett Pool have not increased at a rate greater than that in the thermally uninfluenced Garvins Pool. The lack of a significant increase in the abundance of any warmwater fish species other than Rock Bass during the period of comparable sampling is not consistent with the hypothesis that Merrimack Station's thermal discharge has caused appreciable harm to the BIP in Hooksett Pool (Normandeau 2017a).

Finally, where aquatic habitat has been adversely impacted by a thermal discharge, fish sampling data typically show a reduction in quality of body condition, lower mean length at age, higher total instantaneous mortality rate, decreased reproductive potential and more frequent infestation of parasites when compared to an appropriate BIP. Here a review of biocharacteristics for thirteen fish species resident in both Hooksett Pool and Garvins Pool did not indicate a consistent pattern of impaired health and condition for either warmwater or coolwater individuals residing in Hooksett Pool (Normandeau 2011a; Normandeau 2017a) which is supportive of a finding of "no prior appreciable harm" due to Merrimack Station operations.
EPA Response:

EPA has carefully considered the comments and analyses provided by the commenters in regard to appreciable harm. As described in the responses to each comment above, EPA does not agree that many of the comments support a finding of "no appreciable harm" due to Merrimack Station's past operations under the terms of the 1992 Permit and the CWA § 316(a) variance underlying it. That said, there are three important areas where the more recent data is encouraging regarding the possible current state of the BIP:

1. The lack of a decreasing trend in abundance for coolwater species with the addition of sampling data from 2010-2013 suggests thermal conditions in Hooksett Pool may be improving for the resident species most sensitive to elevated temperatures from the Facility's thermal discharge. This could reflect a biological benefit from the reduction in operations at Merrimack Station, particularly during summer months.

2. The proportion (in relative abundance) of warmwater species to coolwater species in Garvins Pool and Hooksett Pool appear remarkably similar based on the most recent data. As explained in the beginning of this section (4-1), EPA concurred with comments received that the Garvins Pool fish community could serve as an acceptable representation of what the current Hooksett Pool BIP should be. As such, EPA finds the similarities in the fish communities of these adjacent impoundments to provide evidence on the side of supporting a finding of "no appreciable harm," as of 2013, to the Hooksett Pool BIP.

3. The proportion (in relative abundance) of coolwater species to warmwater species in Hooksett Pool increased in the 2010s when compared to the 1970s. EPA considers the Hooksett Pool fish community of the 1970s as an acceptable point of reference to assess the BIP. Therefore, from this perspective, in its evaluation of appreciable harm, EPA finds this evidence supports the view that, as of 2013, the condition of the Hooksett Pool BIP has improved, possibly associated with the Facility's reduction in operations and associated thermal discharges.

4.4.2 Adequate Fish Passage as Evidence of No Appreciable Harm

Comment II.4.4.2 (i)	**AR-1552, Normandeau, p. 22**
See also AR-846, PSNH, p. 51; AR-872, Normandeau, pp. 34-43	

Hooksett Pool is used by both resident and anadromous fish species. For the purposes of assessing the potential impact of Merrimack Station's thermal discharge on the BIP in Hooksett Pool, the entire length of Hooksett Pool should be considered a single water body, because fish residing in the pool are not limited in their ability to move about. The absence of any fish passage structure at Hooksett Dam prevents adult anadromous species from accessing Hooksett Pool unless directly stocked in or above Hooksett Pool. While several species of anadromous fish are occasionally present in Hooksett Pool due to stocking, the pool is not used as spawning or juvenile rearing habitat. With regards to anadromous species, the major role of Hooksett Pool is to serve as a downstream passage route and, once fish passage is installed, an upstream passage route. Concerns related to the interaction of migrating anadromous fish species and Merrimack Station's thermal discharge have been examined. Telemetry studies using Atlantic Salmon smolts (Normandeau 2006) and adult American Shad (Normandeau 1979c) indicated that the thermal plume did not act as a barrier to upstream or downstream migration.

In contrast to these comments, Normandeau disagrees with EPA's statement in the Determination Document (Section 5.3.1, p 34) that only juvenile Atlantic salmon, American shad, and alewife spend time in the pool during their downstream migration to the sea (AR-872, p. 55). According to Normandeau, adult Atlantic salmon have been captured in Hooksett Pool and are able to move past the thermal discharge without suffering mortality. Normandeau further comments that stocked American shad stocked use Hooksett Pool for more than just a migratory corridor, and successful spawning by stocked adult shad has been observed (p. 56-57).

EPA Response:

EPA's 2011 Draft Determinations Document, AR-618, p. 95, concluded that fish passage studies conducted for PSNH indicated that it was unlikely that Atlantic salmon out-migration would be impaired by the plant's thermal discharge, given the higher river flows and relatively cold ambient temperatures that commonly exist during the spring period when Atlantic salmon smolts migrate downstream through Hooksett Pool. In addition, the buoyant nature of Merrimack Station's thermal plume would leave room for Atlantic salmon smolts to travel beneath the plume to get downstream, if necessary. In any event, this is no longer a pertinent issue for this permit issuance because Atlantic salmon are no longer stocked in the Merrimack River, and upstream access to Hooksett Pool is currently impeded by the lack of a fish passage system at Hooksett Dam.

Regarding the comment that stocked American shad use Hooksett Pool for more than just a migratory corridor, EPA reviewed the locations of where American shad were captured in Hooksett Pool during electrofish sampling conducted by Normandeau in 2010 and 2011. Normandeau conducted fish sampling at 12 stations during the months of August and September; six stations were upstream from the plant's thermal discharge and six were downstream within the thermally-affected area of the pool. In 2010, a total of 69 American shad were caught on six dates at four stations from August 12 to September 23, according to catch data provided to EPA (AR-1778). Of these 69 American shad, all were captured upstream from Merrimack Station's thermal discharge. In 2011, the sampling effort resulted in only one American shad being caught. That fish was also located in waters upstream from Merrimack Station's thermal discharge. While it appears that there may be suitable habitat in Hooksett Pool for American shad, sampling conducted by Normandeau suggests that shad are using only the ambient waters upstream from the influence of Merrimack Station's thermal discharge, which represent roughly only 50 percent of the otherwise available habitat within Hooksett Pool.

American shad may also be present in Hooksett Pool in larval form due to the stocking of this early lifestage by USFWS in waters upstream from Hooksett Pool. Larval American shad could be present in Hooksett Pool from mid-June through the end of July based on the timing of stocking efforts (See discussion of temperature requirements of larval American shad on pages 90-93 in EPA's draft determination). EPA remains concerned that under reduced capacity plant operations, larval American shad drifting through Hooksett Pool could still be exposed to harmful, or potentially lethal, thermal conditions within Merrimack Station's thermal plume. Therefore, the Final Permit includes a temperature limit developed specifically for the protection of drifting American shad larvae. The acute limit (31.3ºC) is set 2ºC lower than the temperature identified in studies as causing lethality, and if this temperature is exceeded at Station S-4, the Facility must take measures necessary to ensure the temperature at S-4 is below the acute limit within 3 hours from the hour in which the exceedance occurs. Using the 2ºC buffer in this context is consistent with recommendations from the Gold Book and National Academy of Sciences (1973). *See* AR-175.

4.4.3 No Appreciable Harm to Hooksett Pool Shellfish and Macroinvertebrate Communities

Comment II.4.4.3 (i)	AR-1552, Normandeau, p. 24 AR-872, Normandeau, p. 45 AR-846, PSNH, pp. 26-28

Kick net macroinvertebrate sampling was conducted within Garvins Pool and at Monitoring Station N-10 in Hooksett Pool during late 2011 to validate the use of N-10 as a control site for the assessment of potential impacts to the macroinvertebrate community due to Merrimack Station's thermal discharge. Due to the limited mobility of benthic organisms in Hooksett Pool and the presence of ambient water temperatures at Station N-10, its use as such a control site is appropriate. Among the metrics examined for kick net data, no consistent pattern was detected to suggest that a significant difference in the macroinvertebrate communities within Garvins Pool and Hooksett Pool at Station N-10 exists. Kick net sampling provides the best representation of macroinvertebrate species available as a food source to fish residing within shallow water littoral habitats (Flotemersch et al. 2006). Even though the wadeable shore zone only accounts for a small proportion of the entire river channel, it may be the most productive and diverse zone for benthic macroinvertebrates (Wetzel 2001).

Macroinvertebrate sampling was conducted during October 2011 using the same sampling techniques and sampling locations as was performed during 1972. When compared to samples collected during 1972, kick net data collected in 2011 at Monitoring Stations N-10, S-0, S-4 and S-17 showed an increase in EPT richness of 150-300%. Taxa richness increased from 7-10 in 1972 to 21-23 in 2011. The 2011 EPT/chironomid abundance ratio was higher than that recorded during the 1970s, as would be expected from samples collected in a river with improved water quality and habitat tolerable for more pollution sensitive species (Normandeau 2012a). Degraded habitat conditions that might be caused by continued exposure to Merrimack Station's thermal discharge should result in a consistent pattern of reduced diversity and increased abundance of pollution-tolerant species for the Hooksett Pool macroinvertebrate population located downstream of Merrimack Station over time (1970s to present). That hypothesis is not supported by the data collected during 2011.

Normandeau further states (AR-872, p. 115) that macroinvertebrate communities are an excellent indicator of the health of an aquatic system. Due to their limited mobility, they are unable to avoid adverse environmental conditions, and are often eliminated (AR-872, p. 115). PSNH and Normandeau comment that continued exposure to Merrimack Station's thermal discharge should result in a consistent pattern of reduced diversity and increased abundance of pollution-tolerant macroinvertebrate species in Hooksett Pool over time, but data does not support this hypothesis (AR-846, p. 28).

Kick net data shows no difference between Garvins and Hooksett at N-10, but Ponar data shows increased richness and diversity at Garvins in relation to Hooksett N-10 (AR-846, p. 20); kick net is the best representation of macroinvertebrate species available as a food source to fish residing within shallow water littoral habitats (AR-846, p. 27).

EPA Response:

EPA agrees with the comment that macroinvertebrate communities are an excellent indicator of the health of an aquatic system given that, due to their limited mobility, they are unable to avoid adverse environmental conditions. EPA also agrees with PSNH's comment that continued exposure to Merrimack Station's thermal discharge should result in a consistent pattern of reduced diversity and increased abundance of pollution-tolerant macroinvertebrate species in Hooksett Pool over time if pollution intolerant species are being harmed by the thermal discharge, but EPA would argue that, in this case, "pollution-tolerant" means tolerant of elevated temperatures. Moreover, EPA does not agree with the comment that the data do not support this hypothesis.

Macroinvertebrate sampling within Garvins Pool and Hooksett Pool (at Station N-10) served to validate the use of N-10 as a control site for the assessment of potential impacts to the macroinvertebrate community due to the MS thermal discharge. "Ponar data revealed increased richness and diversity within Garvins Pool relative to Hooksett Pool (N-10)". (AR-872, p. 45)

A direct comparison of sampling data collected in Garvins Pool and Hookset Pool (downstream of Merrimack Station) was not done due to concerns over the effect of varied seasonal timing of the sampling (p. 46) Normandeau argues that degraded habitat conditions due to continued exposure to Merrimack Station's thermal discharge should result in a consistent pattern of reduced diversity and increased abundance of pollution-tolerant species for the macroinvertebrate population located downstream of Merrimack Station over time (1970's to present), but that this hypothesis is not supported by the data collected during 2011 (p.46).

The comment suggests that macroinvertebrate diversity has increased in the 2000's when compared to sampling conducted in the 1970's. During the public comment period, Normandeau submitted to EPA the report, "Comparison of Benthic Macroinvertebrate Data Collected from the Merrimack River near Merrimack Station during 1972, 1973, and 2011," dated January 2012, which serves to document changes in the benthic macroinvertebrate community composition from the 1970s to 2011, based on sampling conducted during 1972, 1973, and 2011 (p.1). Qualitative sampling appears to indicate improvements in the aquatic insect community with the most dramatic differences between the two decades seen in taxa richness, EPT richness, and EPT to Chironomidae abundance ratio. However, quantitative sampling of benthic macroinvertebrates revealed the presence of a highly invasive bivalve, the Asian clam (*Corbicula fluminea*), that had, at the time, never before been documented in this section of the Merrimack River, or anywhere else this far north in New England. Not only were they present, but they dominated sections of Hooksett Pool at and below the plant's thermal discharge canal, and were totally absent upstream from the thermal discharge.

EPA found the dominance of this highly invasive species in the thermally-influenced portion of Hooksett Pool, and its well-documented capacity to impact indigenous benthic invertebrate species elsewhere, to be disturbing new information. It provided evidence suggesting that the macroinvertebrate community in Hooksett Pool might have been negatively affected by Merrimack Station's thermal discharge. While the plant didn't introduce this species, its thermal discharge, especially during the winter months when Asian clam mortality is typically high under ambient conditions in northern climates, may have provided a thermal refuge for the clams to survive and thrive. *See* Section 5.0 for more information and discussion on Asian clams.

Comment II.4.4.3 (ii)	AR-870, Normandeau, pp. 1-14 AR-1300, LWB, pp. 4-5

Normandeau comments that it collected aquatic insects and benthic invertebrates during sampling conducted in 2011, and compared the results to similar sampling conducted in 1972. (AR-870, p.1). The sampling results and analyses are included in the report "Comparison of Benthic Macroinvertebrate Data Collected from the Merrimack River near Merrimack Station During 1972, 1973, and 2011," dated January 2012 (AR-870). According to this report, comparisons between sampling conducted in 1972 and 2011 show dramatic improvements in aquatic insect community composition, especially improvements in the ratio of pollution-sensitive species (EPT) to pollution-tolerant species (e.g., Chironomidae).

LWB Environmental Services, Inc. comments that information on the composition of benthic invertebrate communities is now routinely used to assess the extent of impairment of aquatic communities due to stressors such as habitat degradation and pollutant discharges (Barbour et al. 1999, Karr and Chu 1999). The objective of the Normandeau 2011 study was to determine whether changes in Merrimack River benthic invertebrate communities between these two time periods were consistent with improvements in water quality that have occurred since the 1960s.

Normandeau further comments that sampling of the benthic invertebrate communities also indicated that water quality improved slightly at all stations compared to 1972 data, although differences were not as large as the kick sample data (AR-870, p.14 Normandeau noted that the numerically-dominant taxon at the middle and western stations of S-0, S-4, and S-17 was the Asian clam, *Corbicula fluminea*, an invasive species that was introduced from Asia in the early 1900s.

LWB Environmental Services, Inc. also comments that data collected using both kick net and Ponar sampling were used to calculate five benthic community indices. These were (1) taxa richness, (2) Hilsenhoff Biotic Index, (3) Ratio of Ephemeroptera, Plecoptera, and Trichoptera (EPT) abundance to Chironomidae abundance, (4) Percent contribution of the dominant taxa to total number of organisms, and (5) EPT richness. All these metrics can be used to assess whether benthic invertebrate communities have been impaired due to environmental stress (Barbour et al. 1999).

Normandeau notes that several metrics, such as Hilsenhoff Biotic Index, total abundance, and percent contribution of the dominant taxon did not consistently indicate improved conditions for a specific year or station (AR-870, p.15). Normandeau also noted that Garvins Pool Stations DSR, USR, and Hooksett Pool Station N-10 showed little difference in metric values (AR-870, p.14).

Normandeau comments that the qualitative sampling conducted on aquatic insects along the shoreline provide the best data to compare benthic macroinvertebrate samples between the 1970s and 2011. It states that this is the case because organisms found in the littoral zones are typically more pollution sensitive than those found in the sand substrates invertebrate community, so that responses to changes in water quality would be more obvious (AR-870, p. 15). Normandeau also points out that kick net sampling provides the best representation of macroinvertebrates species available as a food source to fish residing within shallow water littoral habitats, even though the wadeable shore zone accounts for only a small portion of the river channel, perhaps being the most productive and diverse zone for benthic macroinvertebrates (AR-872, p. 45). LWB Environmental Services, Inc., comments that overall, the benthic invertebrate study provides some evidence that biological conditions in the Hooksett Pool have improved since the 1970s.

EPA Response:

Although only one sample was collected along each bank at the four stations sampled, EPA agrees that the qualitative aquatic insect data collected in 2011 suggests notable improvements compared to sampling conducted in 1972. However, a larger data set collected in 2011 during quantitative benthic sampling does not show similar improvements over data collected in 1972 and 1973. Therefore, these results are inconclusive.

EPA does not agree that the aquatic insect data collected along the shoreline should be considered better than benthic samples collected in deeper water. Both sets of sampling data are important for understanding the status of the entire macrobenthic community of Hooksett Pool.

EPA does agree with the comment that the shoreline shallows are important habitat for both aquatic invertebrates and vertebrates, including juvenile fish. This is precisely why Merrimack Station's surface-oriented thermal plume, which can hug the banks and extend down three-feet, has such a high capacity to affect fish that reside in these important habitats downstream from the plant's discharge canal. But the habitat "value" of a particular site sampled in a river can vary considerably over time as woody debris accumulates, then breaks down, or is washed downstream. Based on this limited sampling effort, it's unclear whether a substantial increase in abundance of aquatic insects at a particular location between 1972 and 2011 should be attributed solely to improved water quality, or to natural changes in available habitat at those sites over time that are unrelated to water quality, or both. Nevertheless, given that certain parameters of Hooksett Pool water quality have improved in that 40-year period, positive changes in the macrobenthic community within the shallow water littoral habitats would be expected, although similar improvements would be expected in the remaining benthic habitats, as well**.** This was not the case, however, as discussed below.

As Normandeau points out, deeper, unvegetated areas comprised of sand/silt/clay make up, by far, the largest habitat area in Hooksett Pool. According to Normandeau's March 2011 report, "Quantification of the Physical Habitat within Garvins, Hooksett, and Amoskeag Pools of the Merrimack River," sediments (sand/silt/clay) make up 90 percent of the total area of Hooksett Pool, with only 17 of the 382 acres being vegetated by SAV. Benthic organisms tend to be more sedentary in these unvegetated or sparsely vegetated, comparatively stable habitats, which exist below the depth typically scoured by ice movement. These organisms not only live on (or burrow into) the riverbed but can form habitats themselves by living in dense aggregations. For example, mollusks such as mussels can serve as habitat formers in these areas that otherwise lack substantial bottom structure. Additionally, benthic organisms' lack of mobility during most lifestages makes them useful for studying the effects of pollution above and within the influence of a point source discharge of pollutants.

Regarding Normandeau's comments on the documented presence of Asian clam (*Corbicula fluminea*) in Hooksett Pool, EPA considers the presence of this highly invasive species a troubling discovery. Asian clams are considered by some scientists to be one of the most invasive species in freshwater aquatic systems (Sousa et al. 2008). When EPA received this report in 2012, Hooksett Pool was the northern-most location in New Hampshire with a confirmed presence of Asian clams, and only the fourth known location within the state. According to NH DES, the other sites in New Hampshire include the Merrimack River downstream from Hooksett Pool, in Merrimack, and two ponds south of Hooksett Pool (Cobbetts Pond and Long Pond). Since 2012, however, other populations have been discovered in New Hampshire, including areas further upstream in the Merrimack River. *See Section 5.0 for a more complete discussion of Asian clams, included studies and analyses submitted by PSNH and CLF.*

According to the environmental fact sheet published by NH DES in 2012, Asian clams can form dense clusters of over 5,000 clams per square meter, dominating the benthic community and altering the benthic substrate. Large populations can severely alter lake or riverine food webs by competing directly with existing native fish and shellfish species for food and space. The clams release phosphorous into the water column through burrowing, feeding from the sediment, and their excreta, which can stimulate plant and algal growth, making potentially hazardous cyanobacteria blooms more likely to occur. In addition, according to NHDES's fact sheet, larval clams can be drawn into and damage boat engines. Similarly, they can be drawn into raw water intakes like those used at drinking water, electrical generation, and industrial facilities, impacting those systems. Asian clams are such a concern in New Hampshire that it is illegal to import, possess, or release them in the State. Additionally, NHDES's Watershed Report Cards for 2014, 2016, and 2018 identified the lower portion of Hooksett Pool as "likely impaired for non-native fish, shellfish, or zooplankton." EPA understands this to reflect the presence of Asian clams in the thermally-influenced section of Hooksett Pool. *See* https://www.des.nh.gov/organization/divisions/water/wmb/swqa/2018/index.htm.

While the presence of Asian clams in Hooksett Pool is, in itself, of great concern to EPA and NH DES, their distribution within Hooksett Pool is especially alarming. Sampling results provided in Normandeau's report (Normandeau 2012) presents compelling evidence that a relationship exists between the presence/abundance of Asian clams and Merrimack Station's thermal discharge. Normandeau collected two grab samples each at three locations upstream from the plant's discharge canal, for a total of six samples. From the data provided in the report (Normandeau 2012), it is unknown if any individual Asian clams were collected in these samples, but they were not listed as the dominant taxon. Of the 18 samples taken at or downstream of the plant's discharge canal, however, Asian clams were the dominant taxon in 14 of them, ranging in relative abundance from 58 to 94 percent, with a mean of 78.6 percent at the sites where they were dominant.

EPA reviewed published scientific literature to see if the relationship between Asian clams and thermal plumes from power plants had ever been studied. EPA found two studies that looked at this question and both found a strong relationship between the presence of Asian clams and the thermal plumes from power plants. One study was conducted near the Connecticut Yankee power plant, on the lower Connecticut River, and the other took place in a freshwater section of the St. Lawrence River, in Quebec. In the St. Lawrence River, which is considerably further north than Hooksett Pool, Asian clams were only present downstream of the power plant, and the clam's distribution appeared to be associated with the warm water plume (Simard et al. 2012, AR-1404). In the study conducted on the lower Connecticut River, the investigators concluded that high winter survival during most years was attributable to the power plant's thermal discharge, and that the key to *Corbicula*'s success in establishing a population in the Connecticut River was its ability to colonize refugia from winter temperature and spring freshet flow extremes that often cause high clam mortality (Morgan et al. 2003, AR-1405). Normandeau's findings regarding the location of Asian clams in Hooksett Pool appear consistent with the results from the studies at these other two power plants.

In response to concern over the presence of Asian clams in Hooksett Pool, EPA and NHDES collaborated on a study in 2013 and 2014 to look at the presence and abundance of Asian clams in Hooksett Pool and other known locations in New Hampshire. Sampling was conducted in July and November 2013, and in September 2014. Stations sampled by Normandeau in 2011 were revisited, as well as sites upstream from the plant's discharge canal, including stations in Garvins Pool, and downstream in Amoskeag Pool. During these sampling events, no Asian clams were collected at either the nine stations in Hooksett Pool upstream of Merrimack Station's discharge canal, or at any stations farther upstream in Garvins Pool. Asian clams were, however, found at, and downstream of, the plant's discharge canal, as well as in Amoskeag Pool, the impoundment immediately downstream from Hooksett Pool. During the sampling effort in September 2014, EPA divers collected samples and took video and photos of the river bottom in areas directly downstream of, at the mouth of, and directly upstream of the plant's discharge canal. This qualitative sampling revealed both high densities of clams near the mouth of the discharge canal and clam size that exceeded that of the clams collected further downstream in Hooksett Pool, and in Amoskeag Pool below the Hooksett Dam.

Normandeau and AST Environmental conducted additional Ponar sampling and diver transect sampling in 2014 and 2016. This sampling focused primarily on assessing the effects associated with Asian clams on native benthic invertebrates, especially mussels. *See Section 5 for more information on these sampling efforts, and related analyses.*

Comment 4.4.3 (iii)	**AR-872, Normandeau, pp. 45-46** **AR-870, Normandeau, p. 5**
See Also AR-1549, Enercon, pp. 25-35	

Normandeau comments that a direct comparison of kick net and Ponar data collected in Garvins Pool and Hooksett Pool *downstream* of Merrimack Station was not done due to concerns over the effect of varied seasonal timing of the sampling (AR-872, p. 46), but that macroinvertebrate sampling within Garvins Pool and Hooksett Pool served to validate the use of N-10 as a control site for the assessment of potential impacts to the macroinvertebrate community due to the Merrimack Station's thermal discharge. Due to the limited mobility of benthic organisms in Hooksett Pool, and the presence of ambient water temperatures at Station N-10, Normandeau comments that N-10's use as a control site is appropriate.

Normandeau argues that degraded habitat conditions due to continued exposure to Merrimack Station's thermal discharge should result in a consistent pattern of reduced diversity and increased abundance of pollution-tolerant species for the macroinvertebrate population located downstream of Merrimack Station over time (1970's to present), but that this hypothesis is not supported by the data collected during 2011. Normandeau also comments that the relatively high thermal tolerance of organisms found in the benthic macroinvertebrate community and the surface-orientation of the thermal plume were two factors ameliorating any discharge effects.

EPA Response:

Normandeau's expressed concern over the effect of "varied seasonal timing" to explain why it did not conduct direct comparisons between Garvins Pool and the thermally-influenced portions of Hooksett Pool appears to be related to a decrease in water temperature over the two-week period between sampling events in Hooksett Pool (Oct 25-26, 2011) and those in Garvins Pool (Nov 7-9, 2011). According to Normandeau's 2012 report, surface water temperatures dropped from approximately 11°C to 6°C (52° - 43°F) (AR-870, p. 5). Given that these benthic organisms have limited mobility, as Normandeau noted, changes in organism abundance during this two-week period may not have occurred unless there was a major die-off, or organisms buried themselves deeper into the sediments. Nevertheless, Normandeau's concern appears to underscore the strong influence temperature has on aquatic life, even macrobenthic organisms.

Normandeau's macrobenthic study found that taxa richness and diversity were both greater in Garvins Pool than in Hooksett Pool, upstream from the plant's thermal discharge (at Station N-10). It's unfortunate that Normandeau did not collect additional samples during the November sampling period at the Hooksett Pool stations within the influence of the thermal discharge.

Normandeau claims (at AR-872, p. 45) that the effects of the Merrimack Station's thermal discharge are ameliorated due to the relatively high thermal tolerance of organisms found in the macrobenthic community and the surface-oriented nature of Merrimack Station's thermal plume. If true, this may explain why Asian clams appear to be benefitting from the thermal refuge created by Merrimack Station's thermal discharge and the ice-free conditions that exist in the lower Hooksett Pool during winter months. But benefits to this introduced invasive species may come at a cost to indigenous benthic infauna, as demonstrated by the clam's dominance in areas of the lower Hooksett Pool, in 2011. While the size of the clams in close proximity to the plant's discharge canal suggest elevated temperatures enhance their growth rate and/or allow them to live longer, the presence and prevalence Asian clams further downstream in Hooksett Pool, and even within Amoskeag Pool, their absence upstream of the discharge, appears to indicate that the surface-oriented plume, which tends to keep the section of the Merrimack River around and downstream of the thermal discharge ice-free for multiple miles during the winter when the plant is operating, increases the clam's ability to survive. Their absence directly upstream from the plant's discharge canal and in Garvins Pool, along with the understanding that they benefit from warmer water during winter, provides compelling evidence suggesting that were it not for the plant's thermal discharge, this invasive species would not be the dominant species it has become in the lower Hooksett Pool. It should be noted that thermal modeling by Enercon Services, Inc. indicate that the effects of the Facility's thermal discharge are predicted to extend down from the surface to the river bottom along the west side of the river, at least to Station S-4, throughout the winter. (*See* AR-1549, p. 25-35).

Comment 4.4.3 (iv)	**AR-872, Normandeau, pp. 46-47** **AR-846, PSNH, pp. 17-18**
See Also AR-868, Normandeau, p. 21	

Diversity

Support for diversity at all trophic levels is provided in the numerous reports detailing the ecology of Hooksett Pool over the last four decades. Detailed studies of phytoplankton, zooplankton and meroplankton were last conducted during the late 1970s and no reduction or adverse changes were detected that could be attributed to Merrimack Station's thermal discharge (Normandeau 1979b). Submerged aquatic vegetation species that dominated during the 1970s were still the dominant species during a 2003 survey (Normandeau 2011b). Diversity in the number of macroinvertebrate species as sampled by kick net has increased in Hooksett Pool, and additional metrics indicate that the observed increase is due to an increase in pollution-sensitive species, which require improved water quality to survive (Normandeau 2012a). The submerged aquatic vegetation "habitat former" species that dominated in the 1970s was still dominant as of 2003 (AR-846, p. 17).

Similarly, diversity in the fish community has also been observed in Hooksett Pool. During the 1972-2013 time period, species diversity has increased as indicated by taxa richness and Shannon Diversity Index values (Normandeau 2011a, 2017a). Moreover, when Hooksett Pool fisheries sampling during comparable periods between 2010 and 2013 is compared to sampling in the thermally uninfluenced but otherwise comparable Garvins Pool, taxa richness is similar (22 and 19 fish species, respectively) (Normandeau 2011a; 2017a). (AR-1552, p. 25).

EPA Response:

PSNH's 316 (a) thermal variance request focused almost exclusively on the fish community since it was this biological community that had been studied most extensively, covering sampling periods in the 1960's, 1970's, 1990's, and 2000's. Accordingly, EPA focused its review primarily on the fish community in assessing the merits of PSNH's variance request, and based its conclusions largely on the plant's capacity to affect the fish community and evidence of changes in that community over time. As the commenters point out, other biological studies were conducted, as well, primarily in the 1970's. These included studies on plankton, macro-invertebrates, and SAV. Some additional studies were conducted in the 2000's and 2010's, and their results were submitted to EPA during the public comment period for the 2011 Draft Permit and thereafter.

The comment states (at AR-872, p.46) that submerged aquatic vegetation (SAV) that was dominant in the 1970s was still dominant as of 2003, but species dominance is not the same as diversity.

EPA maintains that changes in the fish community over time provide critical information on whether, or the extent to which, the thermal discharge from this plant (or any plant) has impacted the BIP of the Hooksett Pool. Furthermore, fish can be particularly sensitive to changes in water temperature and their behavior can be influenced by the sub-lethal effects of heat. Nevertheless, the intent of the CWA's § 316(a) variance is to protect all parts of the BIP. EPA described in the 2011 Draft Determinations Document (AR-618, p. 36) the reasons for evaluating primarily the fish community, given that studies directed at other biological communities had not been conducted since the 1970s. Now that PSNH has completed and provided more current studies on biological communities other than fish, EPA has evaluated these studies, as well. Moreover, EPA has not only evaluated PSNH's submissions in this area, but the Agency has also conducted its own research in this area.

EPA does not consider an increase in species diversity in Hooksett Pool an appropriate argument to support PSNH's contention that its thermal discharge has not caused appreciable harm to the pool's BIP. While increased species diversity is often considered a positive indicator of habitat health in environmental assessments, this may not be the correct conclusion for assessments concerning impacts from heat on native aquatic organisms in New England, as is the case under this CWA § 316(a) thermal variance request. As mentioned in the draft Determinations Document (AR-618, p. 66), there is a tendency for warmer environments to have greater species richness than colder environments (Wehrly et al. 2003), so increased species richness is not necessarily desirable when assessing changes to naturally cool or cold-water aquatic communities. Furthermore, the intent of CWA § 316(a) is to protect the balanced, <u>indigenous</u> community of fish and other aquatic organisms within a waterbody, so the presence of *new* species may not be desirable, particularly if they compete with, or prey upon, native species. Also, it should be noted that trap net sampling conducted by Normandeau in the 1970s resulted in the capture of 18 species, while only 17 species were caught in the 2000's (2004, 2005) (Normandeau 2007a), though these numbers could potentially reflect greater sampling effort conducted in the 1970s.

Normandeau's electrofish sampling effort increased dramatically during the 2010 and 2011 sampling period compared to sampling completed in the 1970s, 1990s, and 2000s. Whereas earlier electrofish sampling in Hooksett Pool by Normandeau was conducted at 10 stations once per month (20 samples pool-wide for August and September, combined), sampling in 2010 and 2011 was conducted 10 times at each of 12 stations (on average) during August and September, for a total of 120 samples pool-wide. Moreover, the recent sampling was only conducted at 6 stations in both Garvins and Amoskeag pools versus 12 in Hooksett Pool, so that Normandeau collected only half the number of samples (60 vs. 120) in these two other pools. In addition, Garvins Pool, which is four miles longer than Hooksett Pool (9.8 miles vs 5.8 miles), was only sampled within a two-mile stretch in the mid-section of the pool. As a consequence, high-value backwater (oxbow), cobble, and boulder habitats where other species might be expected to reside were missed. Despite being designed to "…provide a current assessment of the whole fish community in Garvins, Hooksett, and Amoskeag Pools…" (AR-871, p. 91), this inconsistent sampling strategy increases the chances of finding more species in Hooksett Pool than either Garvins or Amoskeag pools. Therefore, the fish diversity comparisons presented by Normandeau between the 1970s and 2000-2010s in Hooksett Pool, as well as between the three pools during 2010-2011, does not provide reliable information for understanding actual differences in fish diversity.

The comment also suggests that macroinvertebrate diversity increased in the 2000's when compared to sampling conducted in the 1970's. During the public comment period, Normandeau submitted to EPA a report, "Comparison of Benthic Macroinvertebrate Data Collected from the Merrimack River near Merrimack Station during 1972, 1973, and 2011," dated January 2012, that documents changes in the composition of the benthic macroinvertebrate community from the 1970s to 2011, based on sampling conducted during 1972, 1973, and 2011 (AR-870, p. 1). Qualitative sampling appears to indicate improvements in the aquatic insect community with the most dramatic differences between the two decades seen in taxa richness, EPT richness, and EPT to Chironomidae abundance ratio. However, quantitative sampling of benthic macroinvertebrates revealed the presence of the invasive bivalve, Asian clam (*Corbicula fluminea*), that had never before been documented in this section of the Merrimack River, or anywhere else this far north in New England. Not only were they present, they dominated sections of Hooksett Pool at and below the plant's thermal discharge canal and were totally absent upstream from the thermal discharge (AR-870).

The dominance of this invasive species in the thermally-influenced portion of Hooksett Pool, and its documented capacity to impact indigenous benthic invertebrate species elsewhere, was initially viewed as disturbing new information. This information provides evidence that the diversity of the macroinvertebrate community in Hooksett Pool may have been negatively affected by Merrimack Station's thermal discharge. While the Facility did not introduce this species to Hooksett Pool, its thermal discharge, especially during the winter months when Asian clam mortality is typically high under ambient conditions in northern climates, appears to have provided a thermal refuge for the clams to survive and thrive. Studies and additional sampling made on behalf of PSNH in 2014 and 2016 cast doubt on the significance of Asian clam's impact on benthic communities (*See Section 5.0*) in general, and on the Hooksett Pool community, in particular. EPA concurs with comments that it does not appear that Asian clam's have caused appreciable harm to the Hooksett Pool BIP at this time, but the Final Permit requires additional studies to assess this issue more thoroughly.

Comment II.4.4.3 (v)	**AR-1552, Normandeau, pp. 25-26**
See also AR-846, PSNH, pp. 30-32, 47; AR-1174, Normandeau, pp. 4-16	

Presence of Necessary Food Chain Species

Support for the continued presence of necessary food chain species is provided through an examination of recent macroinvertebrate and fisheries data within Hooksett Pool. Benthic macroinvertebrate data collected from littoral areas of Hooksett Pool, where numerous young of year and juvenile fish reside and forage, showed that total abundance, taxonomic richness, EPT richness, and the abundance of EPT taxa to chironomid taxa were all much higher in 2011 compared to 1972. A review of recent fisheries sampling indicates that forage species such as Spottail Shiner, Fallfish, Common Shiner and Golden Shiner are important components of the Hooksett Pool fish community as they were during the 1970s (Normandeau 2011a; 2017a). Abundance of these forage species are comparable to levels observed during sampling conducted during the same years in Garvins Pool.

EPA Response:

The most common forage species in Hooksett Pool today are not the same as those in the 1970s, according to the commenter's own sampling results. In the 1970s, a total of six spottail shiners were captured in the four years of electrofish sampling Normandeau used for its trends analysis (AR-3, p. 61).The four-year mean CPUE for spottail shiner was 0.08, and relative abundance was 0.15 percent (AR-3, p. 64); this species was not an important component of the Hooksett Pool forage base. By 1995, however, Normandeau identified spottail as being the most abundant species of all in Hooksett Pool at 43.6 percent (CPUE of 58.10) based on one year of electrofish sampling. More recently, the 4-year mean relative abundance is 15.7 percent (mean CPUE of 5.5) based on sampling from 2004, 2005, 2010, and 2011 (AR-871, p. 77-78). Spottail shiner now appears to be an important component of the Hooksett Pool fish community based on its abundance as a forage species.

The other forage species listed in the comment (fallfish, common shiner, and golden shiner) were present in Hooksett Pool in the 1970s, but not abundant, either. The relative abundance of common shiner and golden shiner was always below one percent during the four years of sampling used by Normandeau in its trends analyses (1972, 1973, 1974, and 1976), with a total of 22 fish captured during electrofishing in August and September of those years (AR-3, p. 61). The relative abundance of fallfish during the same four years sampled ranged from 2.7 percent in 1972 to 0.0 percent in 1976 (AR-3, p. 61).

In its Merrimack River Monitoring Program Summary Report, dated March 1979 (AR-364), Normandeau identifies two species as being important for forage, yellow perch and golden shiners. More specifically, the report identifies yellow perch *juveniles* as being important as forage for gamefish, while the adults were themselves considered important as an abundant gamefish. Yellow perch was, by far, the most abundant species identified as forage in the 1970s, but as Normandeau's statistical trends analysis has demonstrated, its abundance significantly declined between 1972 and 2011 (AR-871, p. 225). As yellow perch numbers dropped to a record low in 1995 (CPUE = 0.2), spottail shiner abundance soared to a CPUE of 58. Similarly, bluegill, which like spottail, had a CPUE of 0.0 in 1976, also dominated in 1995 with a CPUE of 55 (AR-3, p. 64).

Regarding comparisons with the forage base in Garvins Pool, EPA agrees the two pools have similarities, except for yellow perch abundance, if they are still considered forage as juveniles as they were in the 1970s. Juvenile yellow perch abundance was greater in Garvins Pool than Hooksett Pool for young-of-year (YOY) and immature perch sampled in 2010, according to Table 2-10 of Normandeau's 2011 fisheries analysis report (AR-871, p. 35).

PSNH provides no support for its generalization that aquatic habitats adversely impacted by a thermal discharge contain a higher percentage of generalist feeders and pollution-tolerant species. The company cites Barbour et al. (1999), but this reference speaks to pollution more generally, not conditions related specifically to elevated temperatures. A species such as white sucker, which is often identified as pollution-tolerant and generalist-feeder, is also temperature-sensitive. Therefore, simply counting species identified as pollution-tolerant or generalist feeders has little value when analyzing thermal effects and can misrepresent effects that are occurring from temperature alone, or in combination with other stressors. Nevertheless, Normandeau's analysis, presented in its Fisheries Survey Analysis Report (AR-871) concludes that there were more pollution-tolerant species in Hooksett Pool in 2011 than in 1972. Furthermore, comparisons by Normandeau of the Hooksett Pool and Garvins Pool fish communities indicate that Hooksett Pool contained more pollution-tolerant species, as well as a higher percentage of generalist feeders than in Garvins Pool. But, as the commenter points out, the temperature sensitivity of these species is not necessarily consistent with their feeding habits or their broader tolerance to pollution. Therefore, EPA finds this argument to have little relevance to temperature effects on the Hooksett Pool fish community.

4.4.4 No Appreciable Harm to the Hooksett Pool Phytoplankton, Zooplankton and Meroplankton Communities

Comment II.4.4.4	**AR-1552, Normandeau, pp. 22-23** **AR-846, PSNH, pp. 31-32**

Lower Hooksett Pool is a segment of the Merrimack River that is considered a low potential impact area for phytoplankton (USEPA 1977), because it is in a portion of the Merrimack River continuum where the annual carbon cycle is typically dominated by heterotrophic activities in a detrital food chain (Hynes 1970). Annual studies of the community composition and standing crop of phytoplankton and periphyton over a four-year study period (1975-1978), demonstrated that

- no endangered or threatened species were found,
- no shift towards nuisance species was observed in either the upstream or downstream portions of Hooksett Pool, and
- there were no long-term reductions or increases in autotrophic production of the periphyton or phytoplankton components of the algal community that could be attributed to Merrimack Station's thermal discharge (Normandeau 1979a).
- the same study looked at zooplankton and meroplankton communities and found there was no appreciable harm to these communities because no endangered or threatened species were found and no reduction or adverse change was observed in exhaustive studies performed upstream and downstream of Merrimack Station
- there was minimal entrainment mortality of net zooplankton and meroplankton due to passage through the condenser cooling system and cooling canal of Merrimack Station (Normandeau 1979a), indicating that the heated discharge did not alter the standing crop,

relative abundance, natural population fluctuations or free drift of these components of the BIP.

Also, PSNH states (at AR-846, p. 31-32), that annual studies of the community composition and standing crop of phytoplankton and periphyton from 1975 through 1978 in the portion of the Hooksett Pool upstream and downstream of Merrimack Station showed no endangered or threatened species were found, no shift towards nuisance species observed in either the upstream or downstream portions of the Hooksett Pool, and no long-term reductions or increases in autotrophic production of the periphyton or phytoplankton components of the algal community that could be attributed to Merrimack Station's thermal discharge (p. 31). According to PSNH (p. 31-32), transient episodes of low productivity resolved quickly due to the short generation time (up to two cell divisions per day) of the diatoms which were dominant in the algal community and replenished rapidly during the fall season. PSNH maintains that these findings support the current existence of a BIP in the Hooksett Pool.

EPA Response:

Normandeau's comments refer only to their plankton studies from the late 1970's, but the first ecological studies conducted by Normandeau in 1967 and 1968 included plankton, as well. The conclusions listed in this first report (Normandeau, undated) regarding plankton are the following (in the order they appear):

> (1) The rise in temperature of the cooling water does have a significant effect on the plankton suspended in it; (2) This effect is related to temperature, with excess of 100ºF causing significant changes in frequency of occurrence of various groups; (3) The total effect of the power plant on the plankton of the Merrimack River is related to temperature and flows and is limited to the water passing through the plant; (4) Some groups of plankton are more susceptible to the effects of increased temperature, this is particularly true of the zooplankton; (5) Although reduction in the plankton may occur as the result of passing through the condensers, the plankton is not completely destroyed when going through the plant; (6) There is substantial recovery in numbers of plankton prior to reaching the Hooksett Dam; (7) It appears that the only affected area is the warm stratified layer south of the discharge canal; (8) It has not been established as to whether the effects of the rise in temperature on the plankton has had or could have significant adverse effects on the ecology of the Merrimack River. The available results are much too inconclusive; and (9) All things considered, however, it would seem that under the worse conditions, adverse effects on the plankton would be limited to a relatively short period of time and to a relatively small portion of the river.

NHFGD reviewed the same data at that time, and incorporated its own interpretation into the report, "Merrimack Thermal Study" (Wightman, 1971). In its discussion of the plankton study, NHFGD states, "There appears to be a reduction in the frequency of occurrence of plankton in the surface waters south of the Bow Steam Plant." The report also states, "zooplankton such as ciliates, rotifers, flagellates and cladocera appear to be adversely affected by the heated effluent while desmids, diatoms, and blue green algae indicated similar effects among the phytoplankton." In the Wightman report, NHFGD referenced a study by Trembly in Pennsylvania (Trembly, not reviewed by EPA) which states, "As temperatures increase there is a decrease in the number of organisms. As temperature increases to 80-87ºF, the number decreases by 54 percent and when the temperature increases from 87-93ºF, there is a 24 percent loss." NHFGD concluded that although the Bow Steam Plant appears to have had some effect on the plankton of the area, the supplementary flows from the Suncook River provided a partial recovery effect in the lower section of the river, although this contribution slowed considerably during periods of low flows and high seasonal temperatures (Wightman, 1971). Phytoplankton also has an ability to re-establish populations rather quickly through primary production (Normandeau, 1979b), but obviously zooplankton lacks that ability. Furthermore, while NHFGD acknowledged that the data from this two-year study does not indicate that a critical level had been reached in the study area (lower Hooksett Pool), the report emphasized the importance of plankton to the survival of certain species of fish at some life stages, and recommends that future plants should have cooling facilities incorporated in their initial plans as a protective measure to maintain the ecological balance (Wightman, 1971).

The egg and larval lifestages of certain fish species are referred to as ichthyoplankton given their small size and drifting (or weakly swimming) behavior. While many of the fish species found in the Merrimack River do not have a drifting larval stage, some do, including yellow perch, American shad, golden shiner, and white sucker. These drifting larvae are part of the broader zooplankton community, but in studies of the thermal effects on the plankton community conducted in the 1960s and 1970s, ichthyoplankton is not discussed in the analysis. (Ichthyoplankton are, however, discussed relative to the potential to entrain these organisms into and through the plant.) Although these fish species are only in this planktonic life stage for a limited period, they are especially susceptible to heat exposure. Some fish larvae, such as American shad, are attracted to sunlight and try to stay close to the surface. This behavior could put them within Merrimack Station's surface-oriented thermal plume. In the 2011 Draft Determinations Document, EPA evaluated the potential effects of the thermal discharge on fish species found to be most vulnerable to the effects of elevated temperatures (*i.e.*, yellow perch and American shad) and proposed water quality-based temperature limits designed to be protective of these species during the period when they exist as larvae. EPA was particularly concerned about the possible presence of larval American shad which could drift down from upstream stocking areas during the months of June and July when temperatures within Merrimack Station's thermal plume could reach levels that could cause mortality to larval shad after 30 minutes of exposure. *See* page 203 of the 2011 Draft Determinations Document for a more detailed discussion.

Based on studies conducted in the 1970s Normandeau concluded that there is no evidence that the Hooksett "Pond" zooplankton community has suffered any adverse changes related to the operation of Merrimack Station (Normandeau 1979b). It does state, however, that zooplankton survival studies conducted elsewhere have established lethal temperatures for zooplankton entrained into power plant condenser cooling systems. The temperatures that resulted in 100 percent zooplankton mortality ranged from 30-35ºC (86-95ºF). The report also states that zooplankton entrained in the Merrimack Station cooling system would typically be exposed to temperatures above 35ºC (>95ºF)(*i.e.*, exceeding the lethal temperature limit) during the summer, but stressed that no permanent changes in the Hooksett Pond zooplankton community were documented in their study (Normandeau, 1979b).

Zooplankton communities are considered transient members of the river community, as Normandeau mentioned in its 1979 summary report (Normandeau, 1979b), and as such, population-level effects are difficult to identify. Merrimack Station clearly has the capacity to affect a sizable portion of the Hooksett Pool zooplankton community that drifts past the plant's thermal discharge, especially during summer periods of low flow and high ambient and discharge temperatures. Furthermore, planktonic organisms that are entrained into and through the plant's condenser cooling system are even more likely to succumb to thermal stress or the physical impacts of being pumped through the entire condenser cooling system. For example, as described in the 2011 Draft Determinations Document (p. 244), EPA calculated that the plant can withdraw approximately 23 percent of the available flow under average river flow conditions in the month of August, and over 60 percent under minimum flows, based on data collected from 1993 to 2007. Therefore, approximately one quarter to over one half of the river flow (and all the planktonic organisms in it) can be redirected through the plant while being heated rapidly to temperatures that average 91ºF (33ºC). (Temperatures are likely even higher within the cooling system as the 91ºF (33ºC) value is the temperature recorded at the mouth of the discharge canal (Station S-0) during the months of July and August, after some limited cooling has already occurred from use of the plant's power spray modules.) These organisms, as well as those that were not entrained into the plant but are exposed to elevated temperatures as they drift downstream into the plant's thermal plume, may possibly remain within the buoyant plume as they drift down towards the Hooksett Dam, especially if they lack the mobility to escape it, or are attempting to remain close to the surface because they are attracted to light. EPA is aware of no additional plankton studies that have been conducted in relation to the plant's thermal discharge since the last studies completed in 1978, 36 years ago.

Based on the available information, most of it 36 years old, or older, it's unclear to what extent the plant is impacting the present plankton community in Hooksett Pool, and whether it is affecting the broader river ecosystem. Nevertheless, reducing the critical forage base that the plankton community represents for juvenile fish and other aquatic organisms in the pool can only add to the adverse effects from other stressors on the Hooksett Pool fish community, including effects from the plant's thermal discharge.

4.4.5 No Appreciable Harm to Hooksett Pool Aquatic Vegetation

Comment II.4.4.5	**AR-1552, Normandeau, p. 23**
See Also AR-869, Normandeau, pp. 4-5; AR-868, Normandeau, p. 21	

Aquatic vascular plants (i.e., "macrophytes") are the primary habitat formers in the impounded freshwater riverine ecosystem found in lower Hooksett Pool. This segment of the Merrimack River is considered a low potential impact area (USEPA 1977) for aquatic macrophytes, because no endangered or threatened species were found, and because within-year comparison of similar habitats upstream and downstream from the cooling canal discharge revealed that Merrimack Station's thermal discharge has generally had no adverse effect on the distribution and abundance of aquatic macrophytes in Hooksett Pool (Normandeau 1979a). Within-year variability among stations sampled from 1970 through 1974 in both the upstream ambient and thermally influenced portions of the study area was lower in magnitude than inter-annual variation at each station, supporting classifying the study area as one of low potential impact for habitat formers.

Trends in the abundance of submerged aquatic vegetation can be linked to changes in nutrient loading associated with impaired water quality in the system prior to the 1972 enactment of the CWA (Normandeau 2011b). Increases in system production due to algal growth have been linked to the addition of sewage to a receiving water (Mackenthun 1965). Semi-quantitative submerged aquatic vegetation data were collected in Hooksett Pool by Normandeau in 2002 and 2010. Looking at presence-absence only, a decline in overall extent of submerged aquatic vegetation in Hooksett Pool is implied between the 1970s data and the 2002 and 2010 data. This apparent decrease in submerged aquatic vegetation is likely attributable to the reduction in nutrients in the Merrimack River. Such improvement has likely resulted in corresponding changes to the river's indigenous aquatic populations.

EPA Response:

Aquatic vegetation, also known as "macrophytes," is important habitat for many fish and invertebrate species, and submerged aquatic vegetation (SAV) can also serve as an important indicator of water quality. Normandeau did not specifically address the macrophyte community in PSNH's 316(a) variance request demonstration. Therefore, EPA did not evaluate potential effects to this community when reviewing impacts to the BIP.

SAV abundance was studied in 2002 and 2010, but species identification was not conducted, only overall abundance, primarily using side scan sonar (AR-868, p.21). According to Normandeau's 2011 report (AR-868, p. 21), SAV habitat declined between the 1970s and 2000s, and again between the 2000s and 2010s. The number of sites sampled that were vegetated with SAV dropped from 76 percent in the 1970s to 60 percent in the 2000s (2002), and further down to 50 percent in 2010. Based on the information provided by Normandeau, it is unclear whether SAV diversity in Hooksett Pool has changed since the 1970's, but overall abundance has declined, which the comment acknowledges, but attributes to reduced nutrient loadings from pollutant discharges.

The comment seems to suggest that increased algal growth associated with sewage discharges would somehow be indicative of greater abundance in SAV, or that increased nutrient loadings associated with sewage discharges would promote SAV abundance just as it promotes algal growth. Yet, this seems unlikely since SAVs typically rely on good water clarity for photosynthesis which would be degraded by high nutrient levels. Also, algal growth on SAV blades would further reduce the plants' capacity to engage in photosynthesis and would increase stress levels in the plants. *See also* Response to Comment 4.3.6.

4.4.6 Merrimack's Retrospective Analysis is Insufficient

Comment II.4.4.6	AR-1573, Sierra Club et al., pp. 8-10
See Also AR-1574, Nedeau; AR-1575, Hickey	

Eversource has failed to show, under a retrospective analysis, that "no appreciable harm has resulted from the normal component of the [past thermal] discharge" at the Merrimack Station. 40 C.F.R. § 125.75(c)(1)(i).

EPA has already determined that Eversource has failed to carry their burden in showing that, in the past, the Merrimack Station's thermal discharge had not harmed the Hooksett Pool BIP. Attachment D at 116. After reviewing each analytical index provided in Eversource's Fisheries Analysis Report, which included catch per unit effort, taxa richness, rank abundance, fish community similarity, length-weight relationships, and species guild biomass, EPA concluded that "Merrimack Station has failed to demonstrate that the plant's past and current thermal discharges have not resulted in prior appreciable harm to the [BIP]…in the Hooksett Pool." *Id.* To the contrary, EPA determined that the previous thermal discharges have "appreciably harmed" the BIP. *Id.* at 116, 121.

As detailed above, none of the new information provided by Eversource is relevant to, or should alter, EPA's determination that Eversource has failed to show that its previous thermal discharges did not harm the Hooksett Pool's BIP. Eversource's clarification of the daily maximum and minimum temperatures in Appendix A of the Normandeau Report does nothing to alter this conclusion. As the Hickey Report explains, "each year's statistical summaries do not represent useful or appropriate temperature data submittals in the 316(a) context." Hickey at 10.

In addition, the Hickey Report analyzed the reported temperatures in the Hooksett Pool and found that there is a good reason that the thermal plume's high summer temperatures have resulted in changes to the BIP – because of Merrimack's thermal discharge, temperatures in the Hooksett Pool in summer surpass important survival thresholds for native fish species. Hickey Report at 12-14. Specifically, the Report describes how often the temperatures in the thermal plume exceeds the applicable fish tolerance thresholds for American Shad and Yellow Perch. *Id.* The "exceedances of acute and average weekly fish tolerances for extended time periods at Merrimack River stations" suggest that the power station is altering the BIP of the Hooksett Pool. *Id.* at 14.

The Nedeau Report provides additional evidence that Merrimack Station's thermal discharges have harmed the Hooksett Pool BIP by supporting a strong population of Asian clams down stream of Merrimack Station. Nedeau Report at 3. The Asian Clam is an invasive species, not native to New Hampshire or New England. Even though biologists believed that the cold winter waters in northern New England would prevent the Asian Clam from spreading further north, the species have expanded throughout New England to a surprising extent. The Asian Clam has survived, and spread, by relying on thermal effluent in rivers that are otherwise too cool for over winter survival, and by acclimating and adapting to the cooler waters of southern New England. Nedeau Report at 1-2. Asian Clams were first reported within Merrimack Station's thermal plume in 2012 and it now appears that their population is widespread in the lower Merrimack River watershed. Nedeau Report at 2.

According to the Nedeau Report, "Merrimack Station provided a warm and stable thermal environment; ensured locally high Asian clam growth rate, abundance, and overwinter survival and therefore a more stable source population and provided an opportunity for Asian clams to acclimated and adapt to cooler waters." Nedeau Report at 3. Sampling revealed high densities of Asian Clams and larger individuals near the mouth of the discharge canal and smaller but substantial populations downstream at Hooksett Pool and below the Hooksett Dam. No Asian Clams have been found upstream of Merrimack Station. Nedeau Report at 3. This suggests that "the strong source of population of Asian clams downstream from Merrimack Station *exists solely because of the thermal pollution*." Nedeau Report at 3 (emphasis added). Thus, because a BIP "may not include species whose presence or abundance is attributable to alternative effluent limitations imposed pursuant to section 316(a)," 40 C.F.R. § 125.71(c), Merrimack's role in sustaining a source population of Asian clams within its thermal plume shows that the past thermal discharge has not protected the Hooksett Pool's BIP.

Moreover, in 2011, in its discussion of the fisheries analysis/retrospective EPA noted that "Merrimack Station does not assess impacts to aquatic communities other than fish in the Fisheries Analysis Report." Attachment D at 36. While Merrimack claimed that the past and current operations have resulted in no appreciable harm to the balanced, indigenous populations of non-fish aquatic organisms in the segment of the Merrimack River receiving the Station's thermal discharge, this assertion was based on studies from the 1970's. *Id.* at 36-37. EPA correctly found that relying solely on data collected more than 30 years ago is insufficient to determine the current status of benthic and other non-fish species and whether these species have been protected since then. *Id.*

The Nedeau Report reinforces and highlights Eversource's failure to show that there has been no appreciable harm to benthic species – specifically mussels. Based on available temperature data, the Nedeau Report found that the thermal effluent is warm enough to cause mortality or sublethal stress for some life stages of freshwater mussels living within the thermal plume, to cause sensitive fish species (some of which may be important hosts for native mussels) to avoid the thermal plume, and to alter the river's thermal regime by eliminating the wintertime cold period and potentially disrupting natural cues for dormancy, breeding, and spawning. Significantly, Nedeau identifies temperature tolerance thresholds for various life stages of native mussels. When compared to the data interpretations in the Hickey Report, it is clear that these thresholds, like those for native fish species, are exceeded in the Hooksett Pool because of Merrimack. However, the magnitude of these effects remains unknown due to lack of data. Nedeau Report at p. 6.

Eversource has failed to carry its burden of providing adequate data to prove that there is no appreciable harm to the BIP. The available temperature data are inadequate for understanding (1) natural condition (upstream monitoring), (2) thermal regime (year-round continuous monitoring) within and outside (upstream and downstream) of the thermal plume, (3) the full spatial extent of the thermal plume under a variety of conditions (seasonal, at different river flows, etc), (4) how the spatial extent of the thermal plume relates to the distribution of mussels and mussel habitat, (5) data on other water quality parameters, such as dissolved oxygen, that could interact with temperature to affect mussels. Nedeau Report at 7.

In sum, Eversource has failed to carry its burden of showing that "no appreciable harm has resulted from the normal component of the [past thermal] discharge." 40 C.F.R. § 125.75(c)(1)(i). Nothing has changed since EPA first rejected Eversource's request for a 316(a) variance in 2011, and thus there is no reason that EPA renew a 316(a) variance now. In fact, the available data strongly support EPA's earlier determination that Merrimack Station has degraded the BIP of the Hooksett Pool.

EPA Response:

EPA has reviewed these comments and the reports they reference. EPA agrees with CLF's comment (AR-1573, CLF, et al., p. 8) that EPA has already determined that Eversource failed to carry its burden to show that, in the past, the Merrimack Station's thermal discharge did not cause appreciable harm to the Hooksett Pool BIP. EPA stands by its conclusions in this regard based on the data and analyses EPA had received prior to the release of the 2011 Draft Permit. EPA received additional information relevant to the thermal discharge evaluation both during and after the two public comment periods that EPA held related to the Facility's §316(a) thermal variance request, including four years of additional sampling in both Hooksett Pool and the pools immediately upstream and downstream. While this new information did not change our conclusions regarding the status of the BIP as of 2005, the last year standard fish sampling was conducted before the 2011 Draft Permit was released, it does suggest conditions have improved in Hooksett Pool, as reflected in fish community data. These improvements coincide with a period of reduced operations (and reduced thermal discharges) at Merrimack Station.

New evidence from recent fisheries data (2010-2013) suggests that the balance of warmwater and coolwater fish species that now (as of the 2013 data) comprise the Hooksett Pool fish community is comparable to the community that existed in the 1970s. It also compares closely to the fish community of Garvins Pool, the next adjacent, upstream impounded section of the Merrimack River, in terms of the proportions of coolwater and warmwater species. Given this evidence of improvement, which corresponds with the Facility's reduced operations, EPA concludes that the Hooksett Pool BIP will be protected now and in the future if the Final Permit includes a combination of operational and temperature limitations that ensure Facility operations maintain current operational levels and thermal discharges do not cause instream temperatures to exceed critical levels set to protect species that make up the BIP.

CLF comments (AR-1573, CLF, et al., p. 8) that the Hickey Report analyzed the reported temperatures in the Hooksett Pool and found that there is a good reason that the thermal plume's high summer temperatures have resulted in changes to the BIP – because of Merrimack's thermal discharge, temperatures in the Hooksett Pool in summer surpass important survival thresholds for native fish. EPA agrees that Merrimack Station's thermal plume has the capacity to cause temperatures downstream from the discharge to exceed the thermal tolerances of some fish species. EPA conducted additional analyses of actual temperature data, not 21-year averages, and determined that stressful thermal conditions can and do occur in the thermally-influenced portion of Hooksett Pool. *See* Section 3.4. In the 2011 Draft Determinations Document, EPA explained its concerns about thermal discharges from Merrimack Station operating as a baseload generator with open-cycle cooling. AR-618, Sections 5.0, 6.0 and 9.0.

Regarding comments related to impacts to the benthic invertebrate community (AR-1573, CLF, et al., pp. 9-10), EPA agrees that this is a segment of the BIP that was not closely evaluated before. The commenter raises concerns about the presence and abundance of Asian clams within the area of Hooksett Pool affected by Merrimack Station's thermal plume. EPA agrees with comments that there appears to be the potential for Asian clams to dominate the benthic community, possibly to the detriment of native mussels residing there. While the limited benthic sampling data that exists clearly shows the Asian clams' affinity to the elevated temperatures near the discharge canal and downstream, studies and analyses that addressed this issue appear to indicate that, at this time, mussels are not being adversely impacted by the Asian clam's presence. EPA concludes that the effects of Asian clams on the Hooksett Pool benthic community should continue to be evaluated over the next few years and has included study requirements in the Final Permit.

5.0 Asian Clam

5.1 The Presence of the Asian Clam in Hooksett Pool Should Have No Bearing on EPA's Variance Determination Because the Clam Is Not Causing Appreciable Harm to the BIP

Comment II.5.1.1	**AR-1548, PSNH, pp. 60-66; AR-1552, Normandeau, p. 24**
See Also AR- 1556, Robert F. McMahon; AR-1555, AST Environmental Inc., pp. 41-42, 163-173, and elsewhere; AR-1577, EPRI, pp. 4-1 to 4-11	

EPA seeks public comment concerning the presence and abundance of the Asian clam (*Corbicula fluminea*) in Hooksett Pool and its implications for Merrimack Station's NPDES Permit.[274] The Asian clam is a non-indigenous, invasive species that was first identified in Hooksett Pool in 2011 by PSNH and its consultant, Normandeau, as part of Normandeau's analysis of macroinvertebrate data and its ultimate determination that Merrimack Station's thermal discharge has not caused appreciable harm to the shellfish and macroinvertebrate communities in Hooksett Pool.[275] As EPA acknowledges in its Statement, it was PSNH that advised EPA of the clam's presence in Hooksett Pool in 2012, through Normandeau's submissions in response to the 2011 Draft Permit.[276]

In its Statement, EPA remarks that it found the discovery of the Asian clam "worthy of further research because of the possibility that Merrimack Station's thermal discharge was contributing to the *presence* and/or *prevalence* of the Asian clam in the Hooksett Pool and the potential relevance of such a finding to regulating the Facility's thermal discharges under CWA § 316(a) and New Hampshire water quality standards."[277] As an initial matter, the mere *presence* or *prevalence* of the Asian clam in Hooksett Pool is irrelevant to the thermal variance analysis unless it is causing appreciable harm to the BIP of the relevant waterbody (*i.e.*, Hooksett Pool). As EPA made clear in its Fact Sheet to the 2011 Draft Permit, non-indigenous species historically not present in Hooksett Pool but that appear later in time should not be included in analysis of the BIP, except to consider how their presence has affected, if at all, the balanced indigenous community.[278] Indeed, EPA has granted § 316(a) variances where Asian clams and other invasive species were present in the relevant waterbody. For example, in 2014, EPA issued its Draft NPDES Permit to the Mount Tom Generating Station located in Holyoke, Massachusetts, approximately 90 miles from Merrimack Station.[279] EPA granted Mount Tom's request for a § 316(a) variance, despite the presence of a number of invasive species, including Asian clams, in the watershed, whose effect on fish populations was identified as "currently unknown."[280]

The Asian clam is ubiquitous, as the Statement notes,[281] and found throughout the United States near power plants and elsewhere. Asian clams are prolific up major waterways in the west (e.g., Columbia River, Sacramento Delta region), up the Mississippi and Ohio Rivers and their watersheds, and along the east coast in major harbors, rivers, and their various tributaries. The figure below shows the extent of the Asian clam's presence in the United States:

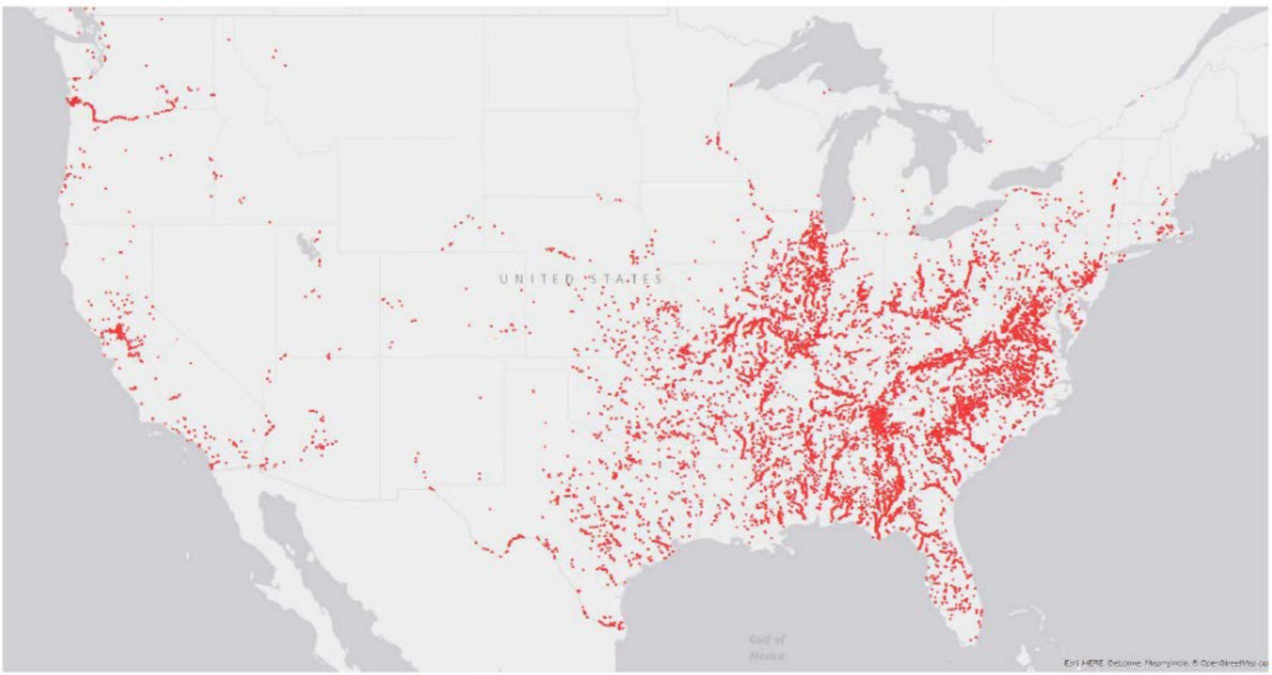

Figure - *Corbicula Fluminea* in the United States

The red dots shown on the map represent Asian clam locations reported in the United States Geological Survey (USGS) database.[282] Further, the Asian clam is extensively found near power plants (shown in green):

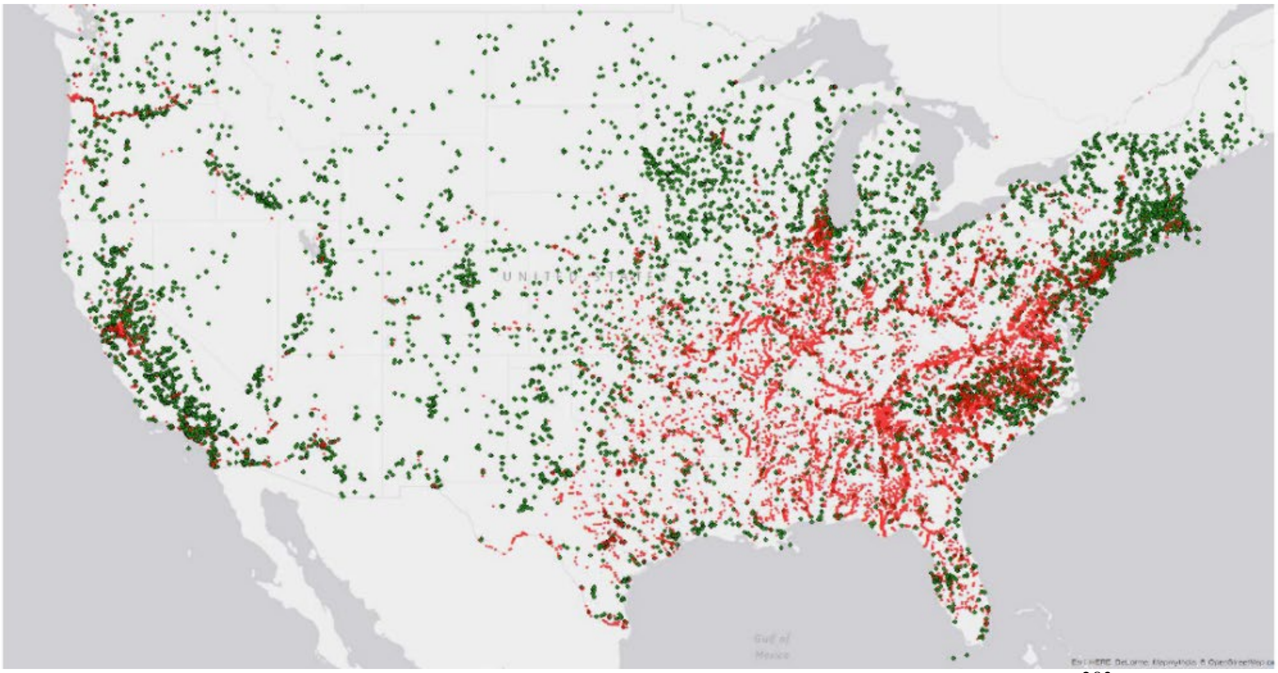

Figure - Overlay of Power Plants and Findings of *Corbicula Fluminea*[283]

Given EPA's silence concerning the Asian clam despite receiving the findings of Normandeau that Hooksett Pool hosts a healthy, BIP of fish and macroinvertebrates, PSNH did not anticipate EPA's interest in the Asian clam until learning of it by happenstance approximately three years ago. In 2014, PSNH observed EPA conducting dives, unannounced, with NHDES in the immediate vicinity of Merrimack Station. Near this same time period, EPA responded to several Freedom of Information Act ("FOIA") requests issued by PSNH concerning the Merrimack Station permit proceeding.[284] Although EPA never mentioned its interest in the Asian clam to PSNH, its permit holder, documents contained within EPA's FOIA production made clear EPA had fixed its focus on the Asian clam, almost to the exclusion of other species. As a mounting number of documents from EPA's FOIA production focused on the Asian clam, PSNH grew concerned EPA might be considering a new basis to attempt to shore up the fatally flawed Draft Permit and its denial of PSNH's § 316(a) variance request that were based on EPA's erroneous determination that the polluted Merrimack River of the 1960s hosted a BIP and was the appropriate baseline for comparison.[285] Indeed, documents included in one of EPA's FOIA productions revealed that, in September 2015, EPA had contemplated a dive study for the purpose of assessing the Asian clam's effect on the Hooksett Pool BIP.[286] As explained in this "Project Plan" document, EPA sought to improve its "understanding of the power plant's influence on this invasive species" and, in turn, to "evaluate the plant's ability to meet state and federal water quality standards, and its NPDES permit requirements, as they apply to protecting the resident biological communities."[287] Among its study objectives, EPA planned to "assess the abundance of *Corbicula* relative to native epifaunal and infaunal macroinvertebrates," in addition to "*Corbicula's* capacity to displace native invertebrates, including mussels."[288] However, EPA's study plan was abandoned and the evaluation was never undertaken.[289]

Given PSNH's concerns arising from EPA's apparent interest in the Asian clam and its undisclosed dive efforts near the Station, PSNH engaged AST Environmental, an environmental consulting firm staffed by freshwater biologists, scientists, and researchers with extensive knowledge and experience in marine ecologies, including those inhabited by non-native species such as the Asian clam. Dr. Terry Richardson, a leading expert malocologist with AST with extensive knowledge concerning the Asian clam, evaluated the Asian clam's presence in Hooksett Pool, and specifically, its relationship to the Pool's BIP. AST (in conjunction with Normandeau) conducted dive surveys in Hooksett Pool, upstream and downstream of the discharge in the Merrimack River, and in various other water bodies in New Hampshire, in accordance with strict dive protocols and scientifically accepted sampling methodologies (in contrast to EPA's limited informational dive activities in 2013 and 2014). In addition to analyzing the limited data from EPA's own dive efforts in 2013 and 2014, and conducting comprehensive research into the Asian clam's northward expansion in the United States and other parts of the world, Dr. Richardson specifically examined the effect of the clam in Hooksett Pool on other native invertebrates, and, in doing so, answered the question considered by EPA in its abandoned 2015 study plan. The results of this extensive study and investigation are contained in the attached report titled, "The Asian clam (*Corbicula fluminea*) and its relationship to the balanced indigenous population ("BIP") in Hooksett Pool, Merrimack River, New Hampshire"[290] As detailed in AST's report, a comparison of the Asian clam to native bivalve populations in Hooksett Pool and upstream of the discharge in the Merrimack River, using various EPA-approved metrics and indices, demonstrates the Asian clam has not caused appreciable harm to Hooksett Pool's BIP, and may, in fact, be positively benefitting the ecosystem of the Pool.[291]

In addition to Dr. Richardson's investigation and analyses, PSNH engaged Dr. Robert McMahon, one of the country's leading experts on Asian clams. EPA no doubt is familiar with Dr. McMahon, whose research concerning the Asian clam is referenced in EPA's abandoned 2015 study plan. Dr. McMahon peer reviewed the AST Report and confirmed its conclusions, in addition to reviewing the available literature concerning the Asian clam and its impact on native bivalve communities.[292] As discussed in these comments, Asian clams are gaining a foothold in numerous parts of New Hampshire and in northern latitudes at sites with no thermal influence, as they have done throughout the world, often introduced by boating and recreational fishing transporting clams from one waterbody to another.[293] Importantly, the Asian clam's northern expansion into areas not impacted by a thermal influence supports its ability to survive in colder climates than originally believed. Further, apart from some speculation and conjecture that has arisen from the frequently high population abundances achieved by Asian clams through its reproductive capacity, there is no credible evidence to support Asian clams causing harm to other native bi-valves and macroinvertebrates.[294] Dr. McMahon confirms the conclusions of AST that the Asian clam has not caused and is not likely to cause appreciable harm to the BIP in Hooksett Pool.[295]

Further, PSNH also is including with these comments the results of Computational Fluid Dynamics ("CFD") Modeling by Enercon Services,[296] which illustrate that thermal discharges from Merrimack Station do not materially influence the bottom of the Hooksett Pool, where the Asian clam population is located.[297] Given the demonstrated ability of Asian clams to survive throughout New Hampshire and northward in areas without thermal influence, the draconian requirement of CCC would not assure the Asian clam's removal from Hooksett Pool. In addition to substantial uncertainty concerning the effect CCC would have on the Asian clam's presence and abundance in Hooksett Pool, identification of the Asian clam in the Pool does not equate to harm to the Pool's BIP. To simply equate presence with harm absent evidence of any impact to native species would be arbitrary, capricious, and contrary to law.

[274] *See* AR-1534 at 43.

[275] *See* AR-1174.

[276] *See* AR-1534 at 41. As explained in Normandeau's Comparison of Benthic Macroinvertebrate Data Collected from the Merrimack River near Merrimack Station (AR-1174) and in Normandeau's 2012 Comments (AR-1170), Normandeau's evaluation of Hooksett Pool's macroinvertebrate community in 2012 revealed an absence of prior appreciable harm to the BIP.

[277] *Id.* (emphasis added).

[278] AR-618 at 47 ("These species, and others that appeared later, should not have been included in an analysis of the balanced, indigenous community, except to explain how their presence may have affected the indigenous community."); *id.* at 52 ("Data provided in the Fisheries Analysis Report for the 2000s included (warmer water-favoring) species not present in Hooksett Pool in the 1960s and, therefore, not considered part of the balanced, indigenous community.").

[279] *See* U.S. EPA, Region 1, Draft NPDES Permit No. MA0005339 for Mount Tom Generating Company, LLC (April 11, 2014) ("Mount Tom Permit"). This draft permit is attached hereto as Exhibit 11. After completing its analysis and finding that CCC would represent BAT for controlling thermal discharges at the Mount Tom facility, EPA "determined that it can grant a thermal discharge variance under CWA § 316(a) to authorize the thermal discharge limits proposed in the new Draft Permit for MTS" and that "thermal discharge limits based on technology and water quality standards would be 'more stringent than necessary to assure the protection and propagation of a [BIP] of shellfish, fish, and wildlife in and on the body of water into which the discharge is to be made . . . .'" *See id.*, Fact Sheet at 62 (quoting 33 U.S.C. § 1326(a)).

[280] *See id.*, Fact Sheet at 60. EPA specifically provided that "a number of invasive species are known to exist in the watershed," including, specifically, Asian clams, and further noted that "[t]he potential for these species to affect anadromous and resident fish populations is currently unknown." *Id.*

[281] *See* AR-1534 at 41.

[282] *See Nonindigenous Aquatic Species*, USGS, https://nas.er.usgs.gov/viewer/omap.aspx?SpeciesID=92 (last visited, October 31, 2017). ArcGIS was used here to plot their locations on a map of the United States.

[283] This figure overlays Asian clam locations (red dots) with power generating plants with a minimum output of 0.1 MW (green dots). Fuel sources include geothermal, hydro, solar (photo-voltaic residential installations not included), coal, nuclear, petroleum, natural gas, and bio-mass. The Energy Information Administration (EIA), a private organization funded by the Department of Energy to provide statistical data on the Energy Sector for public use, has compiled the location of every major power generating station in the U.S. This information is publicly available and can be overlaid on a map of the United States using ArcGIS. This figure shows the extent of energy generating infrastructure in the United States and Asian clam sitings reported in the USGS database.

[284] Despite the passage of time since the 2011 Draft Permit and the submission of substantial comments concerning the Draft Permit, EPA has not communicated with PSNH regarding the agency's position and has declined to have any substantive dialogue with PSNH concerning these permit proceedings. As a result, PSNH was forced to resort to FOIA requests for information on a periodic basis to determine EPA's consideration of the key issues in the Merrimack Station permit proceedings. Further, much of the information provided in response to these requests was heavily redacted or marked "deliberative process" or "attorney client privileged information." Aside from PSNH's suppositions about EPA's likely direction, PSNH had no definitive information regarding EPA's position until the Statement, which speaks to only some of the issues.

PSNH respectfully requests that the documents produced to PSNH in response to its numerous FOIA requests be added to the administrative record for this permit proceeding.

[285] These concerns are legitimized by EPA's Statement, which without citation or attribution, states "[t]he arrival of invasive Asian clams in NH represents a threat to the state's water quality." AR-1534 at 42. The suggestions and implications that arise from unsubstantiated assertions of that nature, or that are encouraged to arise from them, imperil reasoned policy-making or defensible rulemakings.

[286] *See* U.S. EPA, Draft Quality Assurance Project Plan-"Qualifying the density of Asian clams (*Corbicula fluminea*) within and beyond the influence of the thermal discharge of a power plant" (2015) ("Project Plan"). This document is attached hereto as Exhibit 12.

[287] *Id.* at 3.

[288] *Id.* at 4.

[289] *See* AST Report at 3, 33-34.

[290] *See generally* AST Report.

[291] *See, e.g., id.* at 2-3. All bivalves, including the Asian clam, are considered ecosystem engineers (i.e., organisms that can physically modify the environment in a positive way), improving substrate for epibionts, refuge from predation, reducing physical or physiological stress, and otherwise stabilizing the environment.

[292] *See* McMahon Review at 2, 8.

[293] *See, e.g.*, AST Report at 8-12; McMahon Review at 2-3.

[294] *See, e.g.*, AST Report at 36-41; McMahon Review at 3-8.

[295] McMahon Review at 8.

[296] *See* Enercon 2017 Comments, Attachment 5.

[297] *See* AST Report at 51-53.

EPA Response:

Regarding the comment (AR-1548, p 61) whether or not the mere presence or prevalence of Asian clams in Hooksett Pool represents evidence of appreciable harm to the BIP, EPA notes that 40 CFR § 125.71(c) states that a BIP is characterized by, among other things, "a lack of domination by pollution tolerant species … [and n]ormally … will not include species whose presence or abundance is attributable to the introduction of pollutants that will be eliminated by compliance by all sources with section 301(b)(2) of the Act; and may not include species whose presence or abundance is attributable to alternative effluent limitations imposed pursuant to section 316(a)." The regulation also provides that a BIP "may include historically non-native species introduced in connection with a program of wildlife management and species whose presence or abundance results from substantial, irreversible environmental modifications." *Id*. The presence of Asian clams in Hooksett Pool, is relevant to the question of appreciable harm if it is negatively impacting the BIP and the plant's variance-based thermal discharges have contributed to the clam's presence. Initial benthic survey data provided by PSNH's consultant, Normandeau Associates, Inc., in its 2012 report (AR 870, pp. 12-14), indicated that the clam's abundance was notably higher within the portion of Hooksett Pool affected by the plant's thermal discharge as compared to the unaffected portion upstream. In fact, of the 9 locations sampled within the area affected by the thermal discharge (each location sampled twice), 7 were dominated by Asian clams. Their percent composition relative to other species collected at those 7 sites ranged from 58-94 percent with a mean of 79 percent for the 14 samples collected. By contrast, Asian clams were not listed as the dominant taxa for any of the sampling locations upstream of the thermal discharge. The report did not specify whether any Asian clams were found upstream of the thermal discharge. This information suggested to EPA that the distribution of Asian clams, a highly invasive, non-native species, was influenced by Merrimack Station's thermal discharge, and that the species dominates in areas where it was found. Therefore, this new information was relevant to the question of appreciable harm to the Hooksett Pool BIP and worthy of further evaluation in EPA's §316(a) thermal variance request analysis.

The commenter remarks (at p. 62) that Asian clams are ubiquitous, occuring both near power plants and in other locations throughout the United States. In EPA's view, Asian clams are wide-spread across the country and now appear to be expanding further north in New England, but the species is clearly <u>not</u> ubiquitous within Hooksett Pool. Quantitative sampling conducted by Normandeau in 2011, and AST Environmental (AST) in 2014, and 2016, as well as semi-quantitative diver sampling in 2014 and 2016, found Asian clams throughout the lower, thermally-influenced portion of Hooksett Pool, from Station S-0 at the mouth of Merrimack Station's discharge canal down to Station S-24, just above the Hooksett Dam. They were also found in Amoskeag Pool, below the dam. Despite their wide-spread presence throughout the thermally-influenced portion of Hooksett Pool, no Asian clams were found at either the two ambient stations in Hooksett Pool upstream from the Station's discharge or in Garvins Pool, the impoundment just upstream of Hooksett Pool.

According to a report by AST Environmental referenced by the commenter and titled, "The Asian clam (*Corbicula fluminea*) and its relationship to the balanced indigenous population ("BIP") in Hooksett Pool, Merrimack River, New Hampshire" (AR-1555, pp. 41,42), states:

> Examining the results of semi-quantitative diver transect surveys (Appendix C1 and C2) indicated that Asian clams were located at survey sites S0, S4, S17, and S24. Numerous native mussels were also located at those same survey sites (and elsewhere in Hooksett Pool). From these 42 assessments, it is clear that native bivalves were as abundant and spatially distributed, i.e., near the shore, along transects without Asian clams (USR through N5) as they were along transects with Asian clams (S0-S24).

Similarly, quantitative benthic sampling conducted in 2014 and 2016 for all the sites sampled by Normandeau in 2011 revealed a total absence of Asian clams at all sites sampled upstream from Merrimack Station's discharge canal, including sites in Garvins Pool. The absence of Asian clams in the ambient portion of Hooksett Pool is barely discussed in the report, but Figure 9 (p. 45) shows where Asian clams were found in Hooksett Pool. Instead, the focus of much of the analyses presented is to look at differences in benthic species *other than* Asian clams in order to assess differences in species composition and richness. While these analyses have relevance to the question of appreciable harm, they are not the only considerations and do not provide a clear assessment of species dominance throughout Hooksett Pool *with Asian clams included* in the sampling results. These analyses are also inconsistent with Normandeau's standard approach to analyzing the potential for appreciable harm related to both invertebrates and fish. For example, Normandeau states (at AR-1552, p. 24):

> Degraded habitat conditions that might be caused by continued exposure to Merrimack Station's thermal discharge should result in a consistent pattern of

> reduced diversity and increased abundance of pollution-tolerant species for the Hooksett Pool macroinvertebrate population located downstream of Merrimack Station over time (1970s to present). That hypothesis is not supported by the data collected during 2011.

While the Asian clam has not been classified as "pollution-tolerant" per se, it is an invasive species with an affinity for warmer water temperatures than typically found in the Merrimack River under ambient conditions, and heat is a pollutant under the CWA. *See* 33 U.S.C. § 1362(9). To test the above-stated hypothesis, it would have made sense to compare the relative abundance of all species, including the Asian clam, upstream and downstream Facility's discharge canal.

Regarding the comment (at p. 64) that EPA had not mentioned its interest in the Asian clam to PSNH, EPA had no reason to do so. EPA was initially unaware of the presence of the species in Hooksett Pool and PSNH's CWA § 316(a) variance application provided no specific analysis of the species. EPA only noticed the presence of Asian clams when it was reviewing some of the biological sampling data submitted by the Facility. EPA's discovery of the Asian clam information in Normandeau's 2012 report came after the public comment period had closed during EPA's review of the comments. EPA then began its effort to assess the significance of the issue. EPA does not need to contact the Facility prior to reviewing data and evaluating its significance. Moreover, since the Facility submitted this data to EPA, it should have been aware of it, and given that the Asian clam has been the subject of multiple studies related to its presence within the influence of thermal discharges at other power plants (*See* AR-1404, 1405), it should not have been a surprise that EPA would be interested in its presence and abundance in Hooksett Pool.

The comment also twice appears to complain that EPA did not give it advanced notice of its dive survey work with the state – referring to the work as "unannounced" and "undisclosed" – to obtain direct information to inform its investigation and consideration of the Asian clam issue. EPA does not need to announce that it is considering or evaluating issues in a permit development. Moreover, as stated above, EPA's consideration of the Asian clam was prompted by data submitted by PSNH, itself. Furthermore, the Merrimack River is a public water body and EPA does not need permission from the Facility to conduct investigations in the water body. Finally, EPA's dive work was, of course, not "undisclosed." PSNH became aware of it because it was disclosed by EPA. Moreover, after EPA did enough work on the subject to decide it warranted further evaluation, the Agency specifically discussed the issue and invited public comment on it in the 2017 Statement. *See* AR 1534, p. 42.

The commenter notes that "EPA had fixed its focus on the Asian clam, almost to the exclusion of other species." This comment is plainly incorrect. The record plainly demonstrates EPA's concern about fish, SAV, and other macroinvertebrates besides Asian clam. That said, EPA *was* concerned about this new information as were state resource agencies. The discovery of Asian clams in New Hampshire prompted the development of state regulations making it illegal to import, possess or release Asian clams in the state (Administrative rules NHFG FIS 803.04, NHFG FIS 804.03, NHFG FIS 805.01). In 2012, NHDES issued the Environmental Fact Sheet, Asian Clams in New Hampshire" (AR-1408). In it, NHDES describes how large populations of

Asian clams can severely alter lake or riverine food webs by "directly competing with existing native fish and shellfish species for food and space." Thus, the Asian clam has the potential to adversely alter the BIP of Hooksett Pool and data from Normandeau's 2011 sampling that indicated not just the presence, but the *dominance,* in the lower half of Hooksett Pool, of the species prompted EPA to consider this a serious new issue potentially related to Merrimack Station's thermal discharge that warranted further evaluation.[31]

The commenter states (at AR-1548, pp. 80-81) that in 2014, EPA granted a CWA § 316(a) variance to the Mount Tom Generating Station, in Holyoke, MA, despite the presence of Asian clams. This is irrelevant, however, to the present assessment of the effect of the Asian clam on the Hooksett Pool BIP and the possible relationship of Merrimack Station's thermal discharge to that effect. With regard to the draft permit for Mount Tom Station, it is notable that EPA expressly considered the presence of Asian clams and other invasive species in the watershed in the context of its CWA § 316(a) variance analysis, but concluded that the effect of these species on the BIP was uncertain. *See* Fact Sheet for Mount Tom Station Draft NPDES Permit, p. 60 (https://www3.epa.gov/region1/npdes/permits/2015/finalma0005339permit.pdf). The abundance of Asian clams relative to other benthic organisms in the section of the river receiving the thermal discharge had not been assessed. In any event, before EPA issued the final permit to Mount Tom Station in 2015, the facility stopped generating electricity as a coal-fired power plant and terminated its associated thermal discharge *See* Final Permit for Mount Station (https://www3.epa.gov/region1/npdes/permits/2015/finalma0005339permit.pdf). The Mount Tom Station permit has no bearing on the Merrimack Station permit determination.(https://www3.epa.gov/region1/npdes/permits/2015/finalma0005339permit.pdf)..

The commenter also argues that a comparison of the Asian clam to native bivalve populations in Hooksett Pool and upstream of the discharge in the Merrimack River, using various EPA-approved metrics and indices, demonstrates the Asian clam has not caused appreciable harm to Hooksett Pool's BIP, and may, in fact, be positively benefitting the ecosystem of the Pool (*See* AR-1548, p. 82). The details of AST's report are discussed in various comments within this section, but EPA generally agrees that, based on the information provided to date, it appears that the effects associated with the Asian clams' presence and abundance has not caused appreciable harm to the Hooksett Pool BIP. (EPA does not agree, however, that the presence of this invasive species is benefiting the ecosystem. The reasons for this are discussed throughout these responses to comments.) AST's analyses looking at differences in the abundance and species richness in native invertebrates upstream and downstream of the Facility's thermal discharge suggests that impacts to the benthic community from Asian clams have not yet risen to the level that EPA would consider appreciable harm. Furthermore, temperature and operational limits in the final permit could reduce the extent to which the Facility's thermal discharge promotes Asian clam abundance in Hooksett Pool going forward.

[31] NHDES's Environmental Fact Sheet identifies the risk Asian clams pose to the cooling water intake systems (CWIS) for power-generating plants like Merrimack Station. According to the Fact Sheet, such systems can become impaired or clogged by clam shells or by juveniles that are sucked into the intake and grow in the system. So, this documented risk should concern Merrimack Station, as well. It should be noted, however, that the plant's cooling water intake structure is located well upstream of the thermal discharge so perhaps the risk to the plant's CWIS is not great since no clams have been collected in the portion of Hooksett Pool that is not affected by the plant's thermal discharge.

That said, EPA is convinced by the data provided that the abundance of Asian clams in the thermally-influenced portion of Hooksett Pool, and it's total absence in the ambient area directly upstream, is directly related to Merrimack Station's thermal discharge. Under the definition of BIC (and BIP) in 40 CFR § 125.71(c), the Asian clam is not part of the BIP and its effects species that are part of the Hooksett Pool BIP will clearly be an ongoing subject of interest while the Facility continues to operate. As a result, it is a focus of monitoring required in the Final Permit.

PSNH comments (*at* pp. 71-73) that it is including with these comments the results of Computational Fluid Dynamics ("CFD") Modeling by Enercon Services[296] that illustrate that thermal discharges from Merrimack Station do not materially influence the bottom of the Hooksett Pool. EPA discusses the findings of this model in detail at II.5.1.4 and there describes why it does not agree with this comment.

Comment II.5.1.2	**AR-1548, PSNH, p. 64**

EPA had contemplated a dive study for the purpose of assessing the Asian clam's effect on the Hooksett Pool BIP.[286] As explained in this "Project Plan" document, EPA sought to improve its "understanding of the power plant's influence on this invasive species" and, in turn, to "evaluate the plant's ability to meet state and federal water quality standards, and its NPDES permit requirements, as they apply to protecting the resident biological communities."[287] Among its study objectives, EPA planned to "assess the abundance of *Corbicula* relative to native epifaunal and infaunal macroinvertebrates," in addition to "*Corbicula's* capacity to displace native invertebrates, including mussels."[288] However, EPA's study plan was abandoned and the evaluation was never undertaken.[289]

AST (in conjunction with Normandeau) conducted dive surveys in Hooksett Pool, upstream and downstream of the discharge in the Merrimack River, and in various other water bodies in New Hampshire, in accordance with strict dive protocols and scientifically accepted sampling methodologies (in contrast to EPA's limited informational dive activities in 2013 and 2014).

EPA Response:

Regarding the commenter's description of EPA's diving activities in 2013 and 2014, and its planned (but abandoned) Asian clam study, EPA acknowledges that it completed reconnaissance dives with assistance from NHDES in 2013 and 2014 to confirm the presence of Asian clams in proximity to Merrimack Station's thermal discharge. In some cases, and at some stages of investigation, a reduced or more qualitative level of research is appropriate. That research may, in some cases, then be followed up with more extensive, quantitative analysis. Indeed, certain of Merrimack Station's array of hired consultants also conducted qualitative research in some areas. With regard to the Asian clam, EPA at one point had intended to follow up with a more comprehensive study, but due to competing priorities and resource limitations, the Agency ultimately decided not to pursue that study. The dives that EPA conducted were not intended or designed to provide quantitative evidence by themselves, but rather to collect photo documentation of the presence of Asian clams in Hooksett Pool, to determine if further work was warranted, and, to inform the development of a potential, more comprehensive future study. Ultimately, as stated above, EPA decided not to conduct the additional study.

Comment II.5.1.3	**AR-1548, PSNH, pp. 65-67**

Dr. Richardson specifically examined the effect of the clam in Hooksett Pool on other native invertebrates, and, in doing so, answered the question considered by EPA in its abandoned 2015 study plan. The results of this extensive study and investigation are contained in the attached report titled, "The Asian clam (*Corbicula fluminea*) and its relationship to the balanced indigenous population ("BIP") in Hooksett Pool, Merrimack River, New Hampshire"[290] As detailed in AST's report, a comparison of the Asian clam to native bivalve populations in Hooksett Pool and upstream of the discharge in the Merrimack River, using various EPA-approved metrics and indices, demonstrates the Asian clam has not caused appreciable harm to Hooksett Pool's BIP, and may, in fact, be positively benefitting the ecosystem of the Pool.[29]

Dr. McMahon peer reviewed the AST Report and confirmed its conclusions, in addition to reviewing the available literature concerning the Asian clam and its impact on native bivalve communities.[292] As discussed in these comments, Asian clams are gaining a foothold in numerous parts of New Hampshire and in northern latitudes at sites with no thermal influence, as they have done throughout the world, often introduced by boating and recreational fishing transporting clams from one waterbody to another.[293] Importantly, the Asian clam's northern expansion into areas not impacted by a thermal influence supports its ability to survive in colder climates than originally believed. Further, apart from some speculation and conjecture that has arisen from the frequently high population abundances achieved by Asian clams through its reproductive capacity, there is no credible evidence to support Asian clams causing harm to other native bi-valves and macroinvertebrates.[294] Dr. McMahon confirms the conclusions of AST that the Asian clam has not caused and is not likely to cause appreciable harm to the BIP in Hooksett Pool.[295]

EPA Response:

EPA is pleased that Merrimack Station agreed that researching the Asian clam issue was important and that it endeavored to follow up on EPA's initial research to gather more information. EPA has reviewed the reports from the Facility's consultants, the details of which are discussed in comments below. Also, EPA is aware that, as the comment states, PSNH had one of its consultants, MacMahon, "peer review[]" the report by another of its consultants, AST.

Comment II.5.1.4	**AR-1548, PSNH, p. 67, 73**
See AR-1549, Enercon Services, Inc.; AR-1555, AST Environmental, pp. 12-13	

While Asian clams have expanded into areas in the Northeast where they once would not have been expected to survive the prolonged low temperatures thought to cause high mortality in this species, the reason that they exist in other locations without a thermal discharge is not determinative of the reasons for their presence and prevalence in Hooksett Pool. The focus of EPA's CWA § 316(a) review is to assess whether Merrimack Station's thermal discharge is influencing the clam's ability to survive typical winter conditions in Hooksett Pool and enhancing their ability to proliferate in Hooksett Pool then and throughout the year to the point where the clams, or the effects of their presence, are adversely affecting the resident biotic community to the degree that EPA concludes it cannot set alternative thermal discharge limits under CWA § 316(a) that will assure the protection and propagation of the pool's BIP**.** Computational Fluid Dynamics ("CFD") Modeling by Enercon Services,[296] which illustrate that thermal discharges from Merrimack Station do not materially influence the bottom of the Hooksett Pool, where the Asian clam population is located.[297] Given the demonstrated ability of Asian clams to survive throughout New Hampshire and northward in areas without thermal influence, the draconian requirement of CCC would not assure the Asian clam's removal from Hooksett Pool. In addition to substantial uncertainty concerning the effect CCC would have on the Asian clam's presence and abundance in Hooksett Pool, identification of the Asian clam in the Pool does not equate to harm to the Pool's BIP. To simply equate presence with harm absent evidence of any impact to native species would be arbitrary, capricious, and contrary to law.

EPA Response:

EPA has considered this comment but notes that it is off target in certain respects. First, it argues that for EPA "[t]o simply equate presence [of the invasive Asian clam] with harm [to the BIP] absent evidence of any impact to native species would be arbitrary, capricious, and contrary to law." Yet, EPA did no such thing. The burden is on the discharger to demonstrate to EPA that limits based on technology and water quality requirements are more stringent than needed to assure the protection and propagation of the BIP. For a "retrospective demonstration," the discharger has the burden to demonstrate that its past discharges under an existing CWA § 316(a) variance have not caused appreciable harm to the BIP. In this case, the Facility's initial variance application included, among other things, data that provided potentially troubling information about the presence and prevalence of the invasive Asian clam in the portion of the Hooksett Pool affected by Merrimack Station's thermal discharge, but the application provided little discussion of that data and did not offer any evaluation of its significance, one way or another. As a result, EPA quite properly began to pursue the questions raised by the data and, as stated above, we are pleased the Facility later assessed it as well.

Furthermore, the comment that "the draconian requirement of CCC would not assure the Asian clam's removal from Hooksett Pool …" suggests a basic misunderstanding of the CWA's requirements applicable to thermal discharges. The 2011 Draft Permit's thermal discharge limits based on closed-cycle cooling were set under the application of the BAT technology standard. These limits were not set to eradicate the Asian clam from the Hooksett Pool and that is not a criterion underlying the application of the BAT standard. In addition, the closed-cycle cooling-based requirements in the draft permit were not "draconian." They were not set as penalties and they were not overly strict requirements based on the facts and analysis discussed in the 2011 Draft Determinations Document. The requirements followed in this case from the proposed denial of PSNH's CWA § 316(a) variance renewal application and the resulting application of the CWA's longstanding BAT standard. Numerous power plants around the Nation and the world use, and have for many years, used closed-cycle cooling. In some cases, closed-cycle cooling has been retrofitted to existing facilities. The question here, of course, is whether those requirements should be applied at Merrimack Station, which has been an issue of close debate since the 1970s. See AR 618, pp. 8-16.

EPA disagrees with the comment that the Computational Fluid Dynamics ("CFD") Modeling by Enercon Services illustrates that thermal discharges from Merrimack Station do not materially influence the bottom of the Hooksett Pool, where the Asian clam population is located (*See* AR-1548, p. 67). On the contrary, the report shows that the section of river bottom from the point of the plant's thermal discharge down along the west bank of the river to Station S-4 is influenced by the plant's thermal discharge. PSNH identifies 2ºC as the minimum threshold for Asian clam survival (*See* AR-1548, p.73). According to the CFD modeling report, during the months from December to March, the percentage of river bottom at Station S-4 (approximately 2,000 feet downstream from the plant's thermal discharge) that is at or above 2ºC ranges from 40% in March to 48% in February (*See* AR-1549, Attachment 5, pp. 25-31). Moreover, maximum bottom temperatures at Station S-4 in those months (December-March) were predicted to be 4.85ºC, 4.85ºC, 4.43ºC, and 3.83ºC, respectively, according to the CFD modeling results. At the mouth of the plant's discharge canal, the bottom temperatures do not appear to ever drop below 9.14ºC during winter months (*See* AR-1549, Attachment 5, pp 25-31). There is no information for the rest of the discharge canal, which could also provide thermal refuge during winter months. *See* II.5.2 for additional comments on the CFD modeling results.

Bottom temperatures upstream of the discharge canal likely remain at or below 2ºC for extended periods during the winter months, as would portions of the lower section of the pool where the thermal plume does not reach the bottom. However, since Asian clams can reproduce twice a year and release up to 3,000 larvae per day (AR-1555, pp. 12-13), areas in the lower pool where Asian clams may have suffered mortality due to lethally cold conditions can be repopulated by the portion of the Asian clam population that is able to survive and reproduce in the thermally-influenced areas upstream. While the areas downstream of the discharge canal could be repopulated as larval Asian clams drift downstream and settle on the bottom, areas upstream would obviously not be reached by the drifting larvae. This may explain the Asian clam's prevalence in downstream sections of the Hooksett Pool, and its absence upstream of the discharge canal.

5.2 The Asian Clam Is Spreading Northward to Areas Unimpacted by Thermal Influence

Comment II.5.2	**AR-1548, PSNH, pp. 67-79**
See Also AR- 1555, AST; AR-1577, EPRI, pp. 4-1 to 4-11; AR-1549, Enercon, pp. 25-31.	

In its Statement, EPA invites comment concerning several articles pertaining to the Asian clam's distribution throughout the United States and suggestions that the thermal influence is necessary for Asian clams to survive in colder climates such as the Connecticut River (Connecticut) and St. Lawrence River (Canada).[298] However, a review of the literature and the known range expansion of the Asian clam northward into areas lacking thermal influence (including New Hampshire) call into question any conclusion that thermal influence is necessary for the clam's survival in the Merrimack River.

Originally native to Southeast Asia, the Asian clam has spread worldwide over the course of the last century and reached such new habitats as North and South America, Europe, Africa, and the Pacific Islands.[299] First reported in Western Europe in the 1980s, Asian clams are now fairly widespread throughout Europe. Current reports now show the Asian clam distribution as far north as 53.9426ºN in Ireland, 52.6261ºN in the Netherlands, 52.3828ºN in Germany, and at 53.3748ºN in Poland.[300] Although Asian clams have been found in waters associated with thermal discharges from power plants and other sources, studies in Europe reveal the clam's northward and westward expansion has occurred independent of thermal discharges in the Vistula River, Kraków, Poland, and in the Crisuri and Danube Rivers and associated tributaries in Hungary.[301]

Similarly, in the U.S. and Canada, northward range extension has occurred into areas with low water temperature lacking thermal discharge influence in Lake Pend Oreille, Idaho; St. Croix River, Minnesota; Michigan River, Michigan; Lake George, Lake Champlain and Erie Canal system, New York; Gildersleeve Island, Connecticut River, Connecticut; and Long, Wash, and Cobbetts Ponds, New Hampshire.[302] In North America, live Asian clams were first documented in 1938. By 1953, the clams had spread throughout much of the U.S., especially the Southeast.[303] The Asian clam now can be found in most of the lower 48 states of the U.S., including Hawaii, three of the Great Lakes (Erie, Michigan, and Superior), and the St. Clair River in Michigan.[304] Asian clams have spread north to areas of milder winters and water temperatures such as Lake Whatcom, Washington, and Vancouver Island, British Columbia, the Asian clam's northern-most North American locations, and have recently been found in northern latitudes in North America with low water temperatures and ice formation.[305]

In its Statement, EPA writes, "[w]hen PSNH submitted its report in 2012, the presence of Asian clams in New Hampshire had only been documented in the Merrimack River south of Bow, New Hampshire, and in Cobbetts Pond, in Windham, New Hampshire, according [to] NHDES' environmental fact sheet on Asian clams (NHDES, 2012)."[306] In fact, Asian clams were detected in the Merrimack River 25 miles downriver of Merrimack Station in 2007; four years later, in 2011, Asian clams were reported in Hooksett Pool.[307] Although there is no evidence of any one particular cause of the Asian clam's arrival at Hooksett Pool, it is likely that recreational boating or fishing, at a time when the clam was spreading throughout New England, is responsible for the clam's introduction to Hooksett Pool and other locations throughout New Hampshire.[308] In addition to Cobbetts Pond and Long Pond, Asian clams have been identified in New Hampshire's upper Merrimack River, above the city of Concord.[309] This location is well upstream of Merrimack Station and lacks thermal influences.[310] Additionally, Asian clams have been reported at two other sites in Hooksett Pool upstream of Merrimack Station, as well as in New Hampshire's Beaver Lake, Great Pond, Canobie Lake, and Little Island Pond.[311] None of these sites experience thermal influence – and yet they are home to Asian clam communities.[312] As explained by Dr. McMahon:

> These data strongly suggest that thermal effluents are not required to support sustainably reproducing Asian clam populations in

New Hampshire water bodies. They also suggest that Asian clams do not require a thermal refuge to invade and thrive in New Hampshire water bodies as corroborated by a report that Asian clam populations have been found at 24 cold winter water sites in the Arkansas, Colorado, Platte, and San Juan River Basins of Colorado not receiving thermal effluents (Cordeiro et al. 2007). The Colorado water bodies and rivers supporting Asian clam infestations were at high altitudes (i.e., 1,200 to 3,200 m) where they were exposed to extremely low winter temperatures. Asian clams have also become established in Lake George, NY, which ices over every winter (Young and Wick 2017). A sustainably reproducing Asian clam population occurs in the Clinton River, Michigan, where ambient water temperatures range from 0-2°C for most of the winter (Janech and Hunter 1995). Further, an Asian clam population established in a section of the lower Connecticut River in 1990 impacted by thermal effluent discharge from the Connecticut Yankee Nuclear Power Station continued to thrive at similar densities after the Power Station was closed in 1997 and ceased to release thermal effluents (Morgan et al. 2004).

Asian clams were first discovered in Europe in 1980 in the Bass Dordogone, France, and Tage Estuary, Portugal (Mouthon 1981). They have since spread throughout Europe extending west into Germany, Poland, Ukraine and Romania (DAISIE 2017) where they have invaded freshwater habitats with very low winter ambient temperatures (Müller and Baur 2011). In a laboratory study (Müller and Baur 2011), small and large winter-conditioned specimens of Asian clam were exposed to constant water temperatures of 0° and 2°C for a period of nine weeks while recording their mortality weekly. Clams had a high level of survival (>80%) during the first four weeks of exposure to ether 0° or 2°C after which mortality rapidly increased with further exposure time. However, some larger individuals (17.5%) survived the full 9 weeks of exposure. Overall, large individuals were more cold tolerant than small individuals (Müller and Baur 2011). Since water temperatures in northern temperate lotic systems do not remain at or below 2°C throughout the winter, including the Merrimack River, NH, this result explains the survival of Asian clam populations in areas of that river not receiving thermal effluents as noted in the AST Environmental report.[313]

A study conducted jointly by EPA and NHDES in 2013 that examined range extension by Asian clams in New Hampshire sheds further light on the Asian clam's relationship to (or lack of need of) thermal discharges. AST's correct interpretation of the data from the EPA-NHDES study found no significant difference in Asian clam densities among the four New Hampshire sites surveyed: two sites with no thermal effluent, Cobbetts Pond and Long Pond; and two sites receiving Merrimack Station cooling water release, Hooksett Pool and Amoskeag Pool.[314] In fact, while there was no statistical difference among locations, the pattern actually suggests lower Asian clam densities at Hooksett Pool (with its thermal input from the station) rather than at the sites without thermal input (Cobbetts and Long ponds).[315]

Surveys and studies such as the ones discussed above, coupled with the results of CFD modeling of Hooksett Pool, disprove that presence of the Asian clam in Hooksett Pool is attributable to Merrimack Station's thermal discharges. CFD modeling simulates complex scenarios involving fluid flow, heat transfer, and interaction with surfaces.[316] CFD simulation is able to incorporate turbulent flow conditions of the river and cooling water canal effluence along with heat transfer and the thermal and density properties of the ambient river and cooling water discharge to model the dynamics of the thermal plume as it interacts with the river bottom. To help assess the questions at hand, Enercon developed a CFD model using ambient river temperature upstream of Merrimack Station, temperature of the station's cooling water discharge canal, flow of the discharge canal, and flow of the river as input parameters.[317] The modeling shows the extent to which the cooling water discharge plume into Hooksett Pool provides for >2ºC water at the river bottom during winter operations of Merrimack Station.[318]

The resulting CFD models of the thermal plume from Merrimack Station into Hooksett Pool indicate the thermal influence of cooling water discharge: (1) minimally impacts the bottom where Asian clam and other invertebrates live, and (2) perhaps more importantly, does not elevate ambient river temperatures above the 2ºC minimum threshold for Asian clam survival at station S4 and further downstream.[319] These locations are relevant because S4 and further downstream S17 are the two sites with the highest Asian clam abundances in Hooksett Pool.[320]

Using monthly averages (2010-2017) of cooling water canal temperature at the mouth of the canal, cooling water canal discharge flow, and river flow with an assumed ambient river temperature input of 33ºF (0.6ºC) in the model, it was clear that, by 950 ft. downstream of the canal:

- In the month of December, the thermal influence at the river bottom was minimal, and river temperatures did not exceed 34ºF (1.1ºC) in December.
- In the month of January, bottom contact by the thermal plume was negligible and temperatures did not exceed 34ºC (1.1ºC).
- In February, bottom contact was practically non-existent and temperature did not exceed 33.5ºF (0.8ºC).
- In March, bottom contact was minimal and temperatures did not exceed 33.75ºF (1.0ºC).[321]

Thus, under average operation and river flow conditions, the thermal release from Merrimack Station does not elevate river temperatures above the 2ºC minimum tolerance limit of Asian clams, yet the two sites with greatest clam abundances in 2014, and 2016 occur 2,000 ft and 8,500 ft downstream of the canal at S4 and S17, respectively.[322]

Recent published findings, as discussed later in these comments, suggest the successful tolerance of Asian clams to cold water, as well as their northward spread, may also be due to the previously unrecognized genetic and physiological capacity of Asian clam to tolerate colder temperatures combined than previously thought.[323] Numerous scenarios exist—including in New Hampshire—where clam populations survive without relying on thermal discharges to provide an artificial heat influent to their habitat. And every such scenario negates EPA's insinuation that clams cannot survive in New Hampshire but for thermal discharges. A wide range of scientific studies and literature increasingly question the "conventional wisdom" of the clam being unable to survive the winters of northern latitudes without thermal discharges warming the otherwise cold waters.[324]

Indeed, as explained by Dr. McMahon:

> [D]ata and reports of thriving Asian clam populations in New Hampshire, Connecticut, Colorado and northern Europe (as described above) strongly suggest that even if the release of thermal effluents from the Merrimack Station into Hooksett Pool ceased, its Asian clam population would continue to exist because it appears to be tolerating ambient winter water temperatures below 2°C as are Asian clam populations upstream and downstream of the station's localized thermal effluent plume. Further, the Asian clam's extremely high reproductive and growth rates (McMahon 1999) would allow replenishment of any winter clam mortality during summer months by the indigenous population as well as by settlement of juvenile clams hydrologically transported (McMahon 1999) into Hooksett pool from populations upstream of the Merrimack Station. Moreover, if cooling tower basins are used to replace the existing once-though cooling system at Merrimack Station, the winter thermal refugia associated with the warm water in such cooling towers and blowdown discharge of warm water from cooling tower basins into Hooksett Pool would likely support Asian clam reproductive efforts (Post et al. 2000).[325]

"Taken as a whole, these studies and the data provided in the AST Environmental report strongly suggest that Asian clams are capable of sustaining populations under very cold conditions in the Northeastern United States, belying previous laboratory studies indicating that they could not survive continuous exposures to ambient water temperatures ≤ 2.0°C."[326]

EPA's Statement refers to two peer reviewed journal articles by Simard (2012) and Morgan (2003) for their study of the relationship between Asian clams and thermal discharges from power plants.[327] According to EPA, "[b]oth studies, one conducted in the Connecticut River (Connecticut) and the other in the St. Lawrence River (Canada), found that higher winter survival rates of Asian clams occurred within the influence of the power plants' thermal discharge than in ambient areas, and that the elevated temperatures appeared to affect the clam's reproductive success, growth, and abundance."[328] While EPA's statement about the contents of these articles is generally true, EPA failed to examine a third, important and relevant peer-reviewed journal article that studied the relationship between Asian clams and thermal discharges from a power plant. Morgan (2004)[329] produced a more extensive follow-up monograph to the Morgan (2003) paper, cited by EPA, expounding on its original conclusions. After providing a more thorough examination of the relationship between the Connecticut Yankee ("CY") power plant (Connecticut River) and the Asian clam's population dynamics as well as the Asian clam's interactions with other native bivalve species, Morgan (2004) states, "[t]he importance of CY thermal discharge as a refuge for [Asian clam] survival in the Connecticut River during cold winters appears minimal."[330] Morgan (2004) adds, "[a]dditional evidence that the CY discharge was not necessary for survival of [Asian clam] populations in the Connecticut River is apparent when [Asian clam] abundance during CY operation (1991- 1996) was compared to abundance following the plant closure (1997-2000). Following closure of the CY power plant in 1996, the abundance of [Asian clams] at all sites was not significantly different than during the operational period."[331] Finally, Morgan (2004) concluded that ". . . . annual densities during plant operation . . . were not significantly different from those following the plant closure . . . . This suggests that the CY thermal discharge did not serve as an important refuge area for [Asian clams] overwintering in the vicinity of the plant."[332]

These statements indicate that Morgan (2004) did not find the thermal discharge was necessary for Asian clam overwintering in the Connecticut River. The Lake George, New York, Asian clam population thriving in iced-over waters during winter is a better example that thermal discharge is not necessary for an Asian clam winter refuge,[333] as are the high altitude ice-covered sites in Colorado.[334] The relevance of the findings of such a thorough follow-up, peer-reviewed study and other similar studies and information undermine EPA's reliance on Simard et al. 2012[335] and Morgan et al., 2003[336] for the suggestion that Merrimack Station is responsible for the presence of the Asian clam in Hooksett Pool.[337] An examination of the Asian clam's physiology, as studied and articulated by various scientists and biologists, helps to explain the species' presence and abundance in colder habitats—and debunks overly-simplified linkages between thermal discharges and clam populations.

First, the Asian clam is a self-fertilizing, highly fecund, hermaphroditic species that typically reproduces twice a year.[338] During these reproduction events, as many as 3,000 juveniles can be released per clam per day and, as a result of the species' high feeding (filtration) rate and relatively high allocation of non-respired energy toward growth, the Asian clam matures relatively rapidly.[339] Such characteristics fuel the clam's ability to spread into new habitats,[340] and, as noted previously, such spread is occurring worldwide into habitats devoid of thermal discharges.

Second, adequate dissolved oxygen ("DO") levels are important for the Asian clam, and the Asian clam is among one of the least hypoxia (*i.e.*, low dissolved oxygen) tolerant freshwater bivalve mollusks.[341] This factor, rather than thermal influences, could partially account for prevalence of the clam in well-oxygenated shallow water habitats (such as Hooksett Pool).[342] Recalling EPA is of the stated opinion that "thermal discharges may substantially alter the structure of the aquatic community by . . . reducing levels of [dissolved oxygen],"[343] it seems incongruent that a DO-reducing thermal plume is essential to the Asian clam's survival.

Third, pH parameters can also impact Asian clams as evidenced by several studies. A study in North Carolina's Roanoke River established that a pH range of between 6.1 and 6.6 was important in explaining variation in Asian clam density and biomass among different sites, a study of the blackwater Ogeechee River in Georgia suggested that it was a stressful environment for Asian clams owing, in part, to the river's low pH, and a 2002 laboratory study demonstrated biomarker responses indicative of stress in Asian clams held briefly at pH's of 4.0-5.0 and 8.0-9.0.[344] The implication here is that acceptable pH levels in a waterbody, rather than a thermal influence thereon, may be a key factor in whether the Asian clam can or will continue to propagate in such waters.

Fourth, low calcium levels can also negatively affect Asian clam biomass and densities.[345] Conductivity and salinity are also important variables in determining *C. fluminea* abundance and biomass.[346] Again, the implication here is that acceptable calcium, conductivity, and salinity levels in a waterbody, rather than thermal influences, may, like dissolved oxygen and pH levels, be controlling factors in the Asian clam's establishment and survival in a given waterbody.

Fifth, "[f]ood availability is another very important environmental variable for the Asian clam. As filter feeders, Asian clams feed on a variety of suspended particles including bacterioplankton, phytoplankton and seston . . . ."[347] Food availability, therefore, could well be a controlling factor in a particular waterbody regardless of thermal influence.

The composition of the lake or river bottom, *i.e.*, the substrate, is yet another important habitat component for the Asian clam.[348] Although *Corbicula fluminea* inhabits nearly all substrate types where other habitat requirements are met (an adaptability that is likely a contributing factor in its global spread), the Asian clam displays a preference for certain substrate types and is found more abundantly in some substrates than in others—notably fine sand as preferred over coarse sand, sand without organic matter over sand containing organic matter, and any particulate substrate over a solid substrate.[349] As explained in the AST report:

> Newly released juvenile clams preferred course sand over mud or bare concrete (Sickel and Burbank 1974). Furthermore, clams grew best in sand rather than gravel, clay or solid substrata (Halbrook 1995). Similarly, field studies have shown clam abundances to be higher in fine sand over coarser material in the New River, VA, Roanoke River, VA, and Rhine River, Switzerland (Belanger *et al.* 1985; Cooper 2007; Schmidlin and Baur 2007). Although Asian clams are known to use pedal feeding in substrata containing some organic matter (Majdi *et al.* 2014), substrata relatively high in organic matter (*e.g.,* mud and "muck"), clays and detritus-rich sediment tend to have a negative effect on clam abundance, likely due to pore water hypoxia (Belanger 1991; Belanger *et al.* 1985; Cooper 2007). The importance of substratum type to Asian clam population

> dynamics and success is further emphasized by the clams displaying an increased stress response in the form of biomarkers and elevated metabolic rates when unable to burrow (Belanger 1991; Vidal. *et al,* 2002). [350]

In summary, there are a number of variables capable of contributing to the presence or absence of Asian clams in a given water body. As Dr. McMahon concluded in 2002, Asian clams have relatively low physiological resistance.[351] To link the Asian clam's presence in Hooksett Pool solely to the introduction of thermal discharges would be "scientifically unsound" and attribute a physiological fortitude to the clam that scientists do not recognize.[352] Many different abiotic requirements must be met to support the presence of Asian clams. The Asian clam's demonstrated ability to survive low winter temperatures in North America and northern Europe, the likelihood it may find warm water refuges even in a CCC system, the rapid growth rates of Asian clams after downstream settlement, and warming of ambient water temperatures in northeastern U.S. waterways have been identified as just a few of the reasons why it is unlikely that elimination of the thermal effluent from Merrimack Station would eliminate Asian clams from Hooksett Pool.[353] Such considerations are worth careful contemplation given the questions raised by the CFD modeling analysis.

[298] *See* AR-1534 at 42.

[299] AST Report at 8.

[300] *Id.*

[301] *Id.* at 10.

[302] *Id.* at 10-11.

[303] *Id.* at 8.

[304] *Id.*

[305] *Id.*

[306] AR-1534 at 41.

[307] AST Report at 22.

[308] *Id.*

[309] *Id.* at 11.

[310] *Id.* at 28, 30.

[311] *Id.* at 11.

[312] *Id.* at 49.

[313] McMahon Review at 2-3.

[314] AST Report at 26-29.

[315] *Id.* at 30.

[316] *See* Enercon 2017 Comments, Attachment 5 at 2-3.

[317] *See generally* Enercon 2017 Comments, Attachment 5.

[318] *See id.*; AST Report at 51-53. Asian clams are thought by many to have a 2ºC minimum thermal tolerance limit that excludes them from cold water habitats; although, as recognized by NHDES, recent research concerning Asian

clam presence in Lake George, New York, suggests clams may survive even lower temperatures for sustained periods of time. *See also* AR-1408.

[319] AST Report at 53. Survey points in Hooksett Pool and the Merrimack River are designated alpha- numerically. S0 is the reference point/survey location at Merrimack Station, the prefix "N" or "S" designates whether the survey point is, respectively, north (upriver) of the station or south (downriver) of the station, and the number indicates the number of 500-foot increments from S0. Thus, Site S4 is 2,000 feet south of the Station.

[320] *Id.* at 44.

[321] *See generally* Enercon 2017 Comments at 25-34.

[322] AST Report at 52-53.

[323] *See, e.g., id.* at 17.

[324] *See generally* AST Report at 18. "For example, in a study conducted in the northeastern United States, researchers concluded '[t]he importance of [Connecticut Yankee] thermal discharge as a refuge for *Corbicula* survival in the Connecticut River during cold winters appears minimal.'" Furthermore, another study cited human population density rather than temperature as being a more important factor than thermal discharge in Asian clam densities and establishment. Looking at Asian clams on the St. Lawrence River, it concluded that, "'[p]opulation densities [of Asian clam] did not differ between natural and artificially heated waterbodies in the Americas . . . '" and, "'[t]he probability of establishment in North American rivers was positively correlated with human population density in the basin…'" *Id.*

[325] McMahon Review at 3. [326] *Id.* (citation omitted). [327] AR-1534 at 42.

[328] *Id.* (citing AR-1404 and AR-1405).

[329] D.E. Morgan, M. Keser, J.T. Swenarton, & J.F. Foertch, *Effect of Connecticut Yankee Power Plant on Population Dynamics of Asiatic Clams and Their Interactions with Native Bivalves*, AMERICAN FISHERIES SOCIETY MONOGRAPH 9, 419-439 (2004). Hereinafter, references to this document will be cited as "Morgan (2004)." This journal article is attached hereto as Exhibit 13.

[330] *Id.* at 435 (emphasis added).

[331] *Id.*

[332] *Id.* at 436 (emphasis added). The findings at CY following removal of the thermal discharge call into substantial question the effect, if any, that CCC would have on the Asian clam's presence and abundance in the Merrimack River. Indeed, AST noted that the operation of wet evaporative cooling towers used in power stations, usually bring make-up water from a raw-water source to replace evaporated water lost to the evaporative cooling process and discharge (blow down) some water from their basins back to the raw water source to prevent excessive concentration of dissolved solids. *See* AST Report at 164, Appendix D. Juvenile clams can be drawn into the basins of such cooling towers with make-up water where they grow to adults producing juveniles that can be discharged back into source waters to become adults. *Id.* Thus, cooling towers become refuges for Asian clams from which juveniles are produced to be carried out on discharge water to re-infest the raw water source. *Id.* In fact, Asian clam fouling of wet cooling towers is well documented. *Id.*; *see also* McMahon Report at 3 (providing that "the winter thermal refugia associated with the warm water in . . . cooling towers and blowdown discharge of warm water from cooling tower basins into Hooksett Pool would likely support Asian clam reproductive efforts (Post et al. 2000)").

[333] *See* AR-1404.

[334] J.R. Cordeiro, A.P. Olivero, & J. Sovell, *Corbicula fluminea (Bivalvia: Sphaeriacea: Corbiculidae) in Colorado*, THE SOUTHWESTERN NATURALIST 52(3), 424-430 (2007). This journal article is attached hereto as Exhibit 14.

[335] AR-1404.

[336] AR-1405.

[337] Appendix D to AST's Report addresses the specific items in the administrative record EPA mentions in its Statement (*see* AR-1534 at 43-44) related to the Asian clam and added after closure of the public comment period for the 2011 Draft Permit. *See generally* AST Report, Appendix D.

[338] AST Report at 12.

[339] *See id.* at 12-14.

[340] *See id.* at 16-17.

[341] *Id.* at 18.

[342] *Id.*

[343] U.S. EPA, Environmental and Economic Benefits Analysis for Proposed Section 316(b) Existing Facilities Rule, EPA 821-R-11-002, at 2-12 (March 28, 2011).

[344] AST Report at 19.

[345] *Id.*

[346] *Id.*

[347] *Id.*

[348] *See id.* at 20-21.

[349] *Id.* at 20.

[350] *Id.* at 20-21.

[351] *Id.* at 21 (citing McMahon 2002).

[352] *Id.*

[353] McMahon Review at 8-9.

EPA Response:

EPA notes first that the comment's discussion of the concept of thermal refuges for Asian clams and its recognition that "Asian clams are thought by many to have a 2ºC minimum thermal tolerance limit that excludes them from cold water habitats," confirms the wisdom and appropriateness of EPA's decision to further explore the Asian clam issue after discovering the data in PSNH's submission that revealed the presence of species in the Hooksett Pool downstream of Merrimack Station's thermal discharge. As far as EPA has been informed, it was only after EPA began investigating the issue that PSNH undertook, and submitted to the Agency, its own evaluations.

The commenter again describes (AR-1548, pp. 67-71) how Asian clams have expanded in range throughout the country and in New Hampshire, and EPA recognizes this and again responds that this expansion is not determinative of this CWA § 316(a) review. *See response at Comment II.5.1.1.* The commenter repeatedly states that its research indicates that Asian clams can establish and survive without the presence of a power plant discharge of waste heat. EPA agrees and never stated otherwise. The question is what effect Merrimack Station's thermal discharge is having on Asian clams in the Hooksett Pool and how that relates to whether past thermal discharges have appreciably harmed the BIP and whether variance-based limits can assure the protection and propagation of the BIP in the future.

The commenter (at pp. 72-73) again refers to the findings of the CFD thermal modeling. Please see EPA's response to the same comment at Comment 5.1.4, above. The commenter states that:

- Using monthly averages (2010-2017) of cooling water canal temperature at the mouth of the canal, cooling water canal discharge flow, and river flow with an assumed ambient river temperature input of 33°F (0.6°C) in the model, it was clear that, by 950 ft. downstream of the canal:
  - In the month of December, the thermal influence at the river bottom was minimal, and river temperatures did not exceed 34°F (1.1°C) in December.
  - In the month of January, bottom contact by the thermal plume was negligible and temperatures did not exceed 34°C (1.1°C).
  - In February, bottom contact was practically non-existent, and temperature did not exceed 33.5°F (0.8°C).
  - In March, bottom contact was minimal and temperatures did not exceed 33.75°F (1.0°C).[321]
  - Thus, under average operation and river flow conditions, the thermal release from Merrimack Station does not elevate river temperatures above the 2°C minimum tolerance limit of Asian clams, yet the two sites with greatest clam abundances in 2014, and 2016 occur 2,000 ft and 8,500 ft downstream of the canal at S4 and S17, respectively.[322]

The commenter has not established the relevance of its references to a location "950 ft downstream of the canal," as referenced in the comment above, since the model provides results for Station S4, which is 2,000 ft downstream. Beyond that, EPA's review of the same modeling report (AR-1549, Attachment 5, pp. 25-31) differs substantially from the commenter's. For example, the commenter states (at p. 72) that, "[i]n the month of December, the thermal influence at the river bottom was minimal, and river temperatures did not exceed 34°F (1.1°C) in December." However, the report (at p. 26) states for December, "The maximum water temperature at the riverbed is approximately 4.85°C, and, as shown in the figure below, approximately 56% of the river bottom remains at a temperature below 2°C." This would mean that 44% of the river bottom is at a temperature between 2-4.85°C, which is not minimal.

Similarly, according to the comment (at p.72), "In the month of January, bottom contact by the thermal plume was negligible and temperatures did not exceed 34°C (1.1°C)." However, the modeling report states (AR-1549, p. 28) that for January, "The maximum water temperature at the riverbed is approximately 4.85°C, and, as shown in the figure below, approximately 55% of the river bottom remains at a temperature below 2°C." Therefore, approximately 45% of the river bottom is between 2-4.85°C, which, again, is not minimal since almost half of the river width at S4 is at or above the critical 2°C mortality threshold.

Once more, according to the comment (*at* p. 72), "In February, bottom contact was practically nonexistent and temperature did not exceed 33.5°F (0.8°C)." However, the modeling report states (at AR-1549, p. 28) that for February, "The maximum water temperature at the riverbed is approximately 4.34ºC, and, as shown in the figure below, approximately 52% of the river bottom remains at a temperature below 2ºC." Therefore, approximately 48% of the river bottom is between 2-4.34ºC, which is even closer to half of the river width at S4 being at or above the critical 2ºC mortality threshold.

Finally, according to the comment (at p. 72), "In March, bottom contact was minimal and temperatures did not exceed 33.75ºF (1.0ºC)." However, the modeling report states (at AR-1549, p. 32) that for January, "The maximum water temperature at the riverbed is approximately 3.83ºC, and, as shown in the figure below, approximately 60% of the river bottom remains at a temperature below 2ºC." Therefore, approximately 40% of the river bottom is between 2-4.34ºC, which again is not minimal since is 40% of the river width at S4 is at or above the critical 2ºC mortality threshold.

These comments appear to be at odds with the modeling report they reference. The modeling report seems to confirm that bottom temperatures on the west side of Hooksett Pool, where Asian clams have been found to be abundant (S-4), are sufficiently elevated throughout the winter months to provide a thermal refuge from water temperatures that drop below the critical minimum temperature of 2ºC.

The commenter concludes that surveys and studies completed, coupled with the results of thermal modeling of Hooksett Pool, disprove that presence of the Asian clam in Hooksett Pool is attributable to Merrimack Station's thermal discharge. (*See* AR-1548, p. 74). As stated in EPA's response at 5.1, EPA's analysis has not focused on the *mere presence* of Asian clams in Hooksett Pool, and EPA is not attempting to prove Merrimack Station's thermal discharge is the "sole" reason for the presence of Asian clams, as alleged (p. 79). What is important in this review is why Asian clams are not only present in the thermally-influenced portion of Hooksett Pool, but dominant there relative to other invertebrates, while at the same time being absent throughout the ambient portion of Hooksett Pool.

The commenter describes various physical and chemical parameters in addition to water temperature that can influence the presence and prevalence of Asian clams in any particular waterbody (*See* pp. 76-79), and also suggests (at p. 77) that sensitivity to low DO, rather than thermal influences, could partially account for the prevalence of the clam in well-oxygenated shallow water habitats, such as Hooksett Pool. The commenter recalls (at p. 77) that EPA is of the stated opinion that "thermal discharges may substantially alter the structure of the aquatic community by . . . reducing levels of [dissolved oxygen],"[343] and, therefore, suggests that it seems incongruent that a DO-reducing thermal plume would be essential to the Asian clam's survival. EPA disagrees, however, with the suggestion that Asian clams could not benefit from Merrimack Station's thermal plume without also suffering from hypoxic conditions. While Merrimack Station's thermal plume has the capacity to affect DO levels and has been identified as possibly causing or contributing to low DO events under low-flow summer conditions (*see II.4.2.2*) just above the Hooksett Dam, such conditions are likely temporary and limited to the area of the pool just upstream from Hooksett Dam. The thermal effects of the plume exist year-round when the Facility is operating and likely benefit the Asian clam mostly in the winter months when the plume's effects on DO are expected to be minimal. Clearly, DO levels or other physical or chemical parameters could explain why Asian clam exists in one location versus another, but it does not explain why it is present throughout the lower portion of Hooksett Pool, yet totally absent in the ambient area upstream from the Facility's discharge canal.

The commenter also suggests (at p. 78) that food availability could be a controlling factor that affects the presence of Asian clams in certain waterbodies. EPA agrees, and considers this to be another way in which Asian clam's presence and abundance in the thermally-influenced segment of Hooksett Pool should be considered when assessing appreciable harm. If food, which for Asian clams is largely plankton and suspended organic particles (*see* p. 78), is limited in the lower portion of Hooksett Pool, then the clams would be competing with native mussels, also filter feeders, for food. As noted in the comment at p. 76:

> First, the Asian clam is a self-fertilizing, highly fecund, hermaphroditic species that typically reproduces twice a year.[338] During these reproduction events, as many as 3,000 juveniles can be released per clam per day and, as a result of the species' high feeding (filtration) rate and relatively high allocation of non-respired energy toward growth, the Asian clam matures relatively rapidly.[339] Such characteristics fuel the clam's ability to spread into new habitats,[340] and, as noted previously, such spread is occurring worldwide into habitats devoid of thermal discharges.

Thus, the clam's ability to reproduce rapidly could give it a competitive advantage over native mussels and other bivalves. In addition to this potential competitive advantage, the waters downstream from the Facility's discharge canal have less live plankton than the waters upstream of the Facility's cooling water intake structure (located at N-5) due to the water withdrawal when the Facility is operating Unit 1 and/or Unit 2. While phytoplankton may be able to regenerate following that loss, zooplankton would not.

EPA understands that current information indicates that Asian clams exist in some northern locations that are not influenced by thermal discharges, and it agrees that the clam's presence in Hooksett Pool should not be attributed to Merrimack Station's operations alone. As stated, previously, the important question to EPA concerning this §316(a) thermal variance request review is not whether Merrimack Station's thermal discharge is the sole reason for the presence of Asian clams in Hooksett Pool, but rather whether the clam's presence and abundance in Hooksett Pool is negatively affecting native species such that EPA cannot set variance-based limits under CWA § 316(a) that will assure the protection and propagation of the BIP.

5.3 Careful Review of the Literature (and the Evidence) Reveals the Absence of Prior Appreciable Harm Resulting from Presence or Abundance of the Asian Clam in the Water Bodies They Inhabit

Comment II.5.3	AR-1548, PSNH, pp. 80-88
See Also AR-1555, AST; AR-1556, Robert F. McMahon, pp. 1-10; AR-1577, EPRI, pp. 4-1 to 4-11	

Although EPA's Statement seeks comment concerning whether Merrimack Station's thermal influence is causing or contributing to the presence or abundance of the Asian clam, even assuming some, unknown impact on the clam, the question for purposes of NPDES permitting is whether the Asian clam is causing appreciable harm to the Hooksett Pool BIP. It is not. Despite some speculation and conjecture associated with the frequently high population abundances achieved by Asian clams, there is no support for the supposition that Asian clams have impacted abundance and diversity of native bivalves in general, and unionids specifically, in North America.[354] As explained by Dr. Richardson:

> Despite the occurrence and recitations of such suppositions and misleading statements, the degree to which the Asian clam causes appreciable damage to the BIP, however, remains largely speculative, anecdotal, rarely quantitative, and largely scientifically unsubstantiated. Most touted negative impacts of Asian clams on the ecosystem they invade have simply not been scientifically confirmed or validated. When referring to effects on native bivalves, for example, Strayer (1999) subsequently states, "[u]nfortunately, the evidence for *Corbicula*'s impacts is weak, so its role…is unresolved," (emphasis added) and Vaughn and Hakenkamp (2001) point out, "[t]he invasion of *Corbicula* has been speculated to have negatively impacted native bivalve abundance and diversity in North America" (emphasis added). Still more recently, Ilarri and Sousa (2012) conclude for ecological impacts that, "[t]he majority of these effects remain speculative and further research is needed to clarify these interactions" (emphasis added).[355]

Indeed, as EPA itself recognized in granting Mount Tom's request for a § 316(a) thermal variance in 2014 for its Mount Tom Generating Station in Holyoke, Massachusetts, on the Connecticut River, only 90 miles away from Merrimack Station, the potential for Asian clams to affect other species is largely unknown:

> [A] number of invasive species are known to exist in the watershed. Some have been introduced to the Connecticut River watershed inadvertently by humans, while others have been purposefully introduced. These species include non-native fish, common reed, purple loosestrife, Eurasian milfoil, water chestnut, mute swans, Asiatic clams, and wooly adelgids. The potential for these species to affect anadromous and resident fish populations is currently unknown.[356]

Dr. McMahon also observed that the postulated impacts of Asian clams on unionids have not been supported by empirical studies:

Indeed, as indicated in the AST Environmental report and my own extensive literature search for this review, there appears to be scant published empirical evidence for negative impacts of Asian clams on native unionids and other freshwater bivalves. Thus, the main empirical reports of negative impacts of Asian clams on native unionid mussels have involved reported declines in unionid densities after Asian clam invasion of their habitats (Gardener et al. 1976, Sousa et al. 2005, Cordeiro et al. 2007). However, these reports are observational and did not ascertain the actual interaction with Asian clams that caused the observed native mussel density declines. Fuller and Richardson (1977) described Asian clams potentially dislodging native unionids from the substratum in the Savannah River (Georgia and South Carolina) but did not observe actual unionid dislodgement or unionid mortality resulting from it.

In contrast, most empirical studies have found no negative impacts of Asian clams on native unionid mussel or sphaeriid populations supporting the observation of no impact in the AST Environmental report. For example, Asian clams were first documented in the Connecticut River near the Connecticut Yankee Power Station in 1990. When sampled along with native unionid mussels and sphaeriid clams from 1991-2000, no significant trends in unionid, sphaeriid or Asian clam abundance occurred across the entire sampling period including when the plant was operational and generating a thermal effluent during 1991-1996 and after it was shut down from 1997-2000 suggesting that Asian clam invasion had not negatively impacted either the unionid or sphaeriid communities (Morgan et al. 2004). In a study of 30 stream reaches in eight rivers in the Ouachita Highlands of central and western Arkansas and eastern Oklahoma, Vaughn and Spooner (2006) found that, when measured at the entire site scale rather than as separate quadrates, Asian clam densities were not significantly correlated with mean unionid mussel densities ($p = 0.95$) or biomass ($p = 0.76$) indicative of no Asian clam impact. Similarly, Leff et al. (1990) in a study of bivalve distribution and abundance in 79 perpendicular transects separated by 100 m along a stretch of a backwater stream tributary to the Savannah River, found no significant correlation between the densities of Asian clams and the unionid, *Elliptio complanata*. Instead, their densities across sites appeared to vary independently from each other. These three empirical studies have all indicated that Asian clam infestations do not impact either sphaeriid or unionid density or biomass (BIP) including that of the unionid species, *E. complanata* that was also found not to be impacted by the

> presence of Asian clams in Hooksett Pool by the AST Environmental study.[357]

Similarly, based on his extensive review of the literature concerning the effects of the Asian clam on benthic macroinvertebrates, Dr. McMahon found the limited empirical studies performed "have overwhelmingly shown that Asian clams either have no impact or a positive impact on macroinvertebrate communities."[358] After analyzing these studies, Dr. McMahon concluded as follows:

> Thus, the available empirical studies all show that Asian clams either increase or do not impact benthic macroinvertebrate density, species richness or diversity. They increase habitat heterogeneity by deposition of hard shell substrata to soft sand/silt sediments, reworking sediments or transfering energy attained through their filter feeding on pelagic phytoplankton and bacterioplankton into benthic sediments with their feces and pseudofeces providing additional food resources to benthic macroinvertebrates. In contrast, my extensive literature search revealed no studies that showed the presence of Asian clams significantly negatively impacted benthic macroinvertebrate community species abundance, richness, or diversity.[359]

Accordingly, concerns and caveats regarding speculation and the need for further research on Asian clam impacts are well founded. A thorough review of the published literature and unpublished reports (where available) revealed no studies that provided a substantive or scientifically valid causative link for a negative impact of Asian clam presence on native bivalve abundance and diversity.[360] At best, studies were only suggestive of the causative links between Asian clams and any observed declines in native bivalves. As one scientist correctly recognized:

> [E]vidence for impacts of Asian clams on native bivalves is derived largely from examining non-overlapping, spatial distributions of bivalves or, less frequently, from changes in populations of native bivalves over time. Most of this evidence is anecdotal and not quantifiable with little or no experimental evidence, thus making it impossible to be precise about the impacts Asian clams may have on native bivalves.[361]

Negative correlations between Asian clams and native bivalves may be explained by the spatial scale at which the relationship is examined. A study by Vaughn and Spooner (2006)[362] that considered different spatial scales concluded that Asian clam densities varied widely in areas without native mussels or where native mussels were in low abundance, but Asian clam density was never high in areas where native mussels were dense.[363] As explained by Dr. Richardson, Vaughn and Spooner pooled patch-scale density and biomass information to represent entire stream reaches.[364] In doing so, the negative relationship between native mussels and Asian clams disappeared and there was no significant relationship between native mussels and Asian clams.[365] Rather than Asian clams impacting native bivalves, the Vaughn and Spooner study suggests native bivalves may impede Asian clam establishment.[366] Thus, the study hypothesized that the likelihood of successful Asian clam invasion may decrease with increasing abundance of native mussels.[367] As explained in the AST Report:

> Vaughn and Spooner (2006) suggested lack of space for Asian clams to colonize, physical displacement by actively burrowing native mussels, and locally reduced food resources in patches where native mussels feed as possible explanations for the likely impediment. Taken altogether, the results from Vaughn and Spooner (2006) suggest that the often observed negative correlations between native bivalves and Asian clams may exist simply because Asian clams do not successfully colonize where native bivalves are abundant.
>
> Similarly, Asian clams may only preferentially invade sites where native unionids have already been decimated (Kraemer 1979; McMahon 2001; Strayer 1999) or these nonnative clams take advantage of underutilized benthic habitat not preferred or utilized by native bivalves (Diaz 1994; McMahon, *pers. com*., Professor Emeritus, University of Texas-Arlington). Nonetheless, competition between native bivalves and Asian clams is still often, and perhaps erroneously, cited as contributing to the observed negative relationship between Asian clams and native unionid bivalves.[368]

Very few studies have actually examined competitive interactions between Asian clams and native mussels.[369] In one study that examined this competitive interaction, Belanger *et al.* (1990) concluded that Asian clam densities had no significant effect on growth or density of *Elliptio* sp, a native unionid. [370] Likewise, Karatayev *et al.* (2003) reported that native unionids and Asian clams were both abundant and observed to occupy the same areas with completely overlapping distributions.[371] Asian clams and native unionids have been observed to occur together in relatively high abundances.[372] Morgan *et al.* (2004) state that, "*Corbicula* has established a permanent population in the Connecticut River with little impact on native bivalves."[373] In fact, in northern, cold water populations like the Connecticut River, Asian clam abundances reached > 3,000 clams/m^2 over a nine year period.[374] Also, a study conducted in the Czech Republic—a colder, more northern location—concluded "there was no visible negative impact to original molluscan communities," although abundances of the Asian clams were comparatively low. [375] As explained by Dr. Richardson, "if Asian clams are detrimental to native bivalves, examples of overlapping distributions, especially when accompanied by relatively high abundances of both clams and native bivalves, should be rare when, in fact, they are common."[376]

Notably, the Morgan (2004) authors not only questioned the significance of thermal influence on Asian clam survival, they also went onto state that "[w]hile [the Asian clam] quickly established itself as the dominant bivalve in the Connecticut River, there was little change in native bivalve abundance found in the same sediments."[377] Further, "these [Asian] clams took advantage of underutilized benthic resources."[378] Morgan (2004) concluded that, "[t]he lack of correlation between presence of [Asian clam] and abundance of native clams and mussels suggest no detrimental effect of [Asian clam] on native species in the Connecticut River."[379] Morgan (2004) concludes that Asian clams were not harming the native bivalve fauna and certainly were not causing appreciable harm to the native mussels.[380]

EPA's Statement also refers to NHDES' Final 2014 Surface Water Quality Assessment (AR-1409) listing "non-native fish, shellfish or zooplankton" as a parameter that rated a "3- PNS," or "insufficient data/potentially not attaining standard," for the section of Hooksett Pool downstream from Merrimack Station (referencing NHIMP700060802-02).[381] EPA notes the same rating was applied to the Hooksett Pool bypass, just below the Hooksett Dam and in the Amoskeag Pool of the Merrimack River.[382] By comparison, EPA notes there is no such listing for the section of the Merrimack River immediately upstream of the Merrimack Station discharge canal or for the section upstream of Merrimack Station in the southern end of Garvins Pool.[383]

EPA's Statement omits NHDES' assessment from the water quality report card for the section of Hooksett Pool downstream from the Station (NHIMP700060802-02). As described below, NHDES explained its assessment as follows:

> The Asian clam, native to the freshwater of Southern and Eastern Asia, was documented at multiple locations within [the] Merrimack River from the Bow Power Plant to the Massachusetts border in 2011. While clams can form dense clusters of over 5,000 clams per square meter, dominating the benthic community and altering the benthic substrate[,] that has not yet been demonstrated here and have therefore been assessed as a potential problem.[384]

Notably, NHDES also recognized the ability of Asian clams to overwinter, surviving temperatures below 1ºC for months at Lake George in New York.[385] Furthermore, in 2016, NHDES noted, "[n]o control actions implemented, densities remain the same."[386]

Obviously, NHDES does not believe that Asian clams are currently causing appreciable harm to the BIP either through densities or through domination and only considers the Asian clam as a potential problem. As such, NHDES' assessment is comparable to EPA's assessment in its Fact Sheet granting Mount Tom's variance requests—that the potential of the Asian clams to affect other species is currently unknown. As discussed below, however, there is ample support that the Asian clams are not causing appreciable harm to Hooksett Pool's BIP based on the data collected since EPA and NHDES' initial sampling effort.

Thus, "the evidence for Asian clam impacts on BIPs in general, and native bivalves in particular, is, at best, weak and largely correlative."[387] There are "very few studies addressing the actual cause and effect of Asian clam establishment on the invaded ecosystem; furthermore, none support or report appreciable damage to the BIP," according to Dr. Richardson.[388] For that reason, an analysis of these very issues with respect to Hooksett Pool is particularly compelling—and such an analysis is described and recounted below.

[354] AST Report at 42.

[355] *Id.* at 37-38.

[356] Mount Tom Permit, Fact Sheet at 60 (emphasis added).

[357] McMahon Review at 4-5.

[358] *Id.* at 6.

[359] *Id.* at 7-8.

[360] AST Report at 38; McMahon Review at 4-5.

[361] AST Report at 38 (citation omitted). Dr. Richardson further provides:

More specifically to the point identified above, studies simply link or correlate declines in native bivalves; unionids and, more commonly, fingernail clams (Sphaeriidae); with the arrival of Asian clams in that area (Crumb 1977; Gardner *et al.* 1976). Further, numerous studies (*e.g*., Belanger *et al*. 1990; Clarke 1986, 1988; Kraemer 1979; Sickel 1973) have reported that Asian clams and native bivalves, especially unionids, have non-overlapping spatial distributions, so that unionids are abundant only where Asian clams are rare, and *vice versa*. However, most of these studies were conducted during a time of unprecedented decline in native bivalves across North America independent of Asian clams. It is likely that any such noted correlation would have been confounded with other more notable factors like habitat destruction, overutilization for commercial or other purposes, disease, predation, introduction of non-indigenous species other than Asian clams, pollution, hybridization, and restricted ranges (Williams *et al.* 1993). Any or all of these factors may have contributed to observed declines in native bivalves while allowing the spread of Asian clams (Strayer 1999).

Id. at 38-39.

[362] *Id.* at 39 (citing C.C. Vaughn & D.E. Spooner, *Scale-Dependent Associations between Native Freshwater Mussels and Invasive Corbicula,* HYDROBIOLOGIA 568(1), 331-339 (2006)).

[363] *Id.*

[364] *Id.*

[365] *Id.*

[366] *Id.*

[367] *Id.*

[368] *Id.* at 39-40.

[369] *Id.* at 40.

[370] *Id*.

[371] *Id.*

[372] *Id.*

[373] Morgan (2004) at 419.

[374] AST Report at 40.

[375] *Id.*

[376] *Id.*

[377] Morgan (2004) at 436.

[378] *Id*.

[379] *Id*.

[380] *Id*.

[381] AR-1534 at 42.

[382] *Id.* (citing AR-1409).

[383] *Id.* (citing AR-1409).

[384] Assessment from the 2014 Water Quality Report Card for NHIMP700060802-02, NHDES. This document was located through a search at the following interactive website http://nhdes.maps.arcgis.com/apps/webappviewer/index.html?id=aca7a13dced5426aa54°62b1ea10d0c by entering "Merrimack River-Hooksett Hydro Pond" as the location, clicking on the Merrimack River image, and referencing the "Waterbody Data (Aquatic Life and Swimming Uses)" pop-up hyperlink. The "Sum_Final_Table" tab of this document, attached hereto as Exhibit 15, includes NHDES' comments concerning the "3-PNS" designation.

[385] *See* AR-1408 at 1.

[386] Assessment from the 2016 Water Quality Report Card for NHIMP700060802-02, NHDES. *See* Exhibit 15

[387] AST Report at 41.

[388] *Id*.

EPA Response:

The commenter (at p. 80-85) cites various studies that question the actual versus perceived impacts from Asian clams on native mussels. While casting some doubt on why Asian clams have been broadly viewed as invasive species that negatively impacts native bivalves, these comments do not adequately address whether Asian clams are negatively impacting native mussels in Hooksett Pool, specifically.

The commenter suggests (at pp.80-81) that EPA itself recognized in granting Mount Tom's request for a § 316(a) thermal variance in 2014 for its Mount Tom Generating Station in Holyoke, Massachusetts, on the Connecticut River, only 90 miles away from Merrimack Station, the potential for Asian clams to affect other species is largely unknown. EPA disagrees that these assessments are comparable. First, it should be noted that the commenter cites to EPA's Fact Sheet supporting release of a Draft Permit for public review and comments; it was not a final permit or a final CWA § 316(a) variance determination. Second, for Mount Tom, while the presence of Asian clams in the watershed was known, there were no studies designed to assess the clam's presence and prevalence, or impacts to native bivalves, within the influence of the plant's thermal discharge. As it turned out, Mount Tom Station stopped generating electricity as a coal-fired power plant in 2014, and EPA did not grant a final CWA § 316(a) variance to the facility. CWA § 316(a).

The commenter points (at pp. 86-87) to EPA's reference to NHDES's 2014 Surface Water Quality Assessment that indicates the NHDES's concern about the presence of Asian clams in Hooksett Pool, but that NHDES concluded that the clam's prevalence had not reached densities (e.g., 5,000 clams per square meter) found at other locations in the country and that, therefore, according to the report, that Asian clam remains a "potential" problem. Apparently, Asian clam densities <u>did exceed</u> 5,000/m², according to comments at (AR 1548, p. 92) that state:

> *Following the 2013 population decline at Hooksett Pool, Asian clam densities rebounded to over 5,000/m² at S4, 4,100/m² at S17, and back to around 1,000/m² at S0 in 2014 only to precipitously crash again in 2016.*[406]

The commenter also suggests that NHDES's assessment of the presence of Asian clams in Hooksett Pool is comparable to EPA's assessment of invasive species (including Asian clams) for the Mount Tom thermal variance request. EPA disagrees with this comparison since it did not conduct a focused assessment on Asian clam's effects for Mount Tom. Like NHDES, however, EPA is concerned that the presence of Asian clams could become a problem in the future, but has concluded that the data provided to date suggest that despite the present prevalence in the thermally influenced section of Hooksett Pool of the Asian clam, the species is not significantly changing the macroinvertebrate community of the Pool.

That said, EPA remains concerned that Merrimack Station's continued operation could contribute to the Asian clam's ability to survive and flourish in Hooksett Pool to such a degree that it could possibly cause appreciable harm to the BIP in the future. Therefore, EPA has included in the Final Permit requirements for Granite Shore Power to develop a comprehensive multi-year study to continue to assess the status of the BIP. This study, the plan for which must be approved by EPA, will include a quantitative assessment of the distribution and abundance of Asian clams and other bivalves in Hooksett Pool. It will also assess potential impacts to the benthic community associated with the Asian clam's presence in Hooksett Pool and its impacts, if any, on the BIP. This study will be designed and undertaken in close coordination with EPA, NHDES, and NHFGD.

5.4 Analysis of the Effect, If Any, of the Asian Clam on Native Bivalves and the Hooksett Pool BIP Demonstrates the Lack of Prior Appreciable Harm

Comment II.5.4	**AR-1548, PSNH, pp. 88-90**
See Also AR-1555, AST; AR- 1556, Robert F. McMahon, pp. 1-10, AR-1577, EPRI, pp. 4-1 to 4-11	

Putting aside the question whether Merrimack Station's thermal discharges are contributing to the Asian clam's presence or numbers in Hooksett Pool, the pertinent question for purposes of EPA's § 316(a) "appreciable harm" analysis is whether the Asian clam is causing harm to the native species in Hooksett Pool (*i.e.*, the BIP). As recognized previously in these comments, § 316(a) authorizes EPA to grant variances for thermal discharges from "any point source otherwise subject to the provisions of section [301] . . . of [CWA]."[389] Specifically, § 316(a) permits EPA to grant a variance for thermal discharges whenever:

> [T]he owner or operator . . . can demonstrate . . . that any effluent limitation proposed for the control of the thermal component of any discharge from such source will require effluent limitations more stringent than necessary to assure the protection and propagation of a [BIP] of shellfish, fish, and wildlife in and on the body of water into which the discharge is to be made . . . .[390]

Although BIP is not defined by statute or regulation, the regulations state that "balanced, indigenous community" is synonymous with BIP.[391] Balanced, indigenous community is defined as:

> [A] biotic community typically characterized by diversity, the capacity to sustain itself through cyclic seasonal changes, presence of necessary food chain species and by a lack of domination by pollution tolerant species. Such a community may include historically non-native species introduced in connection with a program of wildlife management and species whose presence or abundance results from substantial, irreversible environmental modifications. Normally, however, such a community . . . may not include species whose presence or abundance is attributable to alternative effluent limitations imposed pursuant to section 316(a).[392]

For purposes of EPA's BIP analysis, the Asian clam, as a non-native species introduced to Hooksett Pool later in time should not be included in the analysis of Hooksett Pool's indigenous community, except to consider how its presence may have affected the BIP.[393] In other words, even assuming Merrimack Station's thermal influence is contributing to the presence or numbers of the Asian clam, the issue for purposes of PSNH's variance request is whether the Asian clam has caused appreciable harm to the balanced indigenous community.

To demonstrate that alternative limits "will assure the protection and propagation of a [BIP]," existing sources typically show there is an "absence of prior appreciable harm" to the BIP.[394] EPA guidance directs parties to study impacts to various plant and animal species, including: habitat formers, phytoplankton, zooplankton, macro invertebrates and shellfish, fish, and other vertebrate wildlife.[395] "[I]n attempting to judge whether the effects of a particular thermal discharge are causing the system to become imbalanced, it is necessary to focus on the magnitude of the changes <u>in the community as a whole and in individual species</u>; *i.e.*, whether the changes are 'appreciable.'"[396]

Here, a study of the community as a whole leads to only one conclusion—the Asian clam has not caused prior appreciable harm to the BIP of Hooksett Pool and may, in fact, be benefitting it. If anything, its presence has diminished in comparison to other species since Normandeau's macroinvertebrate analysis in 2011. Multiple EPA approved analyses applied to data concerning Asian clams and native bivalve populations in Hooksett Pool—collected by scientists held in high regard in their areas of expertise—demonstrate the Asian clam is simply co-existing with, and not displacing, native bivalves. The only evidence concerning the Asian clam in Hooksett Pool that is based on sound science and established scientific collection methods proves the Merrimack Station thermal discharge is not causing *any* harm, much less appreciable harm, to the BIP of Hooksett Pool.

[389] 33 U.S.C. § 1326(a).

[390] *Id.* (emphasis added).

[391] *See* 40 C.F.R. § 125.71(c).

[392] *Id.*

[393] AR-618 at 47 ("These species, and others that appeared later, should not have been included in an analysis of the balanced, indigenous community, except to explain how their presence may have affected the indigenous community."); *id.* at 52 ("Data provided in the Fisheries Analysis Report for the 2000s included (warmer water-favoring) species not present in Hooksett Pool in the 1960s and, therefore, not considered part of the balanced, indigenous community.").

[394] 40 C.F.R. § 125.73(a), (c)(1).

[395] *See generally* AR-444.

[396] *Wabash*, 1 E.A.D. at *7 (emphasis added).

EPA Response:

EPA agrees with the comment (at p. 88) that the pertinent question for purposes of EPA's CWA § 316(a) analysis is whether the Asian clam has harmed or will harm the Hooksett Pool BIP. More specifically, for a retrospective demonstration, the question is whether the applicant has demonstrated that the thermal discharge has not appreciably harmed the BIP despite the presence and prevalence of the invasive Asian clam, whereas for a prospective demonstration, the question is whether alternative thermal discharge limits will assure the protection and propagation of the BIP despite the presence and prevalence of the Asian clam. For the 2011 Draft Permit, EPA found that Merrimack Station's thermal discharge had caused appreciable harm to the BIP entirely apart from the Asian clam, because PSNH's variance application had not identified or discussed the Asian clam and EPA was not independently aware of its presence in Hooksett Pool. When EPA became aware of the species' presence in the Pool after reviewing data included in PSNH's comments on the 2011 Draft Permit, the Agency began to evaluate the issue so that it could be factored into the analysis. EPA also identified the issue and invited public comment on it in the Agency's 2017 Statement. AR 1534. Such comments were submitted by PSNH and others and EPA has considered these comments in its analysis for the Final Permit, as discussed above and below.

First, PSNH"s argument that the Asian clam is not part of the BIP and should not be considered in the CWA § 316(a) analysis except to consider how its presence may have affected the BIP in the past, or will affect the BIP going forward, appears to be inconsistent with some of Normandeau's analyses of the Hooksett Pool fish community. Asian clam was most likely included in comparisons of taxa richness in Normandeau's 2102 report (AR-870, pp. 8-11). If so, Normandeau's argument of improved richness and diversity in Hooksett compared to data from the 1970s would be based, in part, on the presence of Asian clams in 2011. In that sense, Normandeau would have included the Asian clam within the BIP by including its presence and abundance in the figures it uses to support arguments that the BIP's health has improved since the 1960s. While the introduction of new non-native species is often unavoidable, their presence should not necessarily be viewed in a positive way (*e.g.*, increase in species abundance), especially if their abundance can be attributed to elevated water temperatures associated with the alternative thermal discharge limits under a CWA § 316(a) variance.

The commenter (at p. 89) argues that, even if Merrimack Station's thermal discharge *is contributing* to the presence and abundance of Asian clams in Hooksett Pool, its studies demonstrate that the community "as a whole" does not reflect evidence of appreciable harm. To be clear, if EPA concluded that Merrimack Station's thermal discharge had contributed, or was contributing, to the presence and abundance of Asian clams in Hooksett Pool and that this invasive species had appreciably harmed, or was expected to harm in the future, the benthic portion of the Hooksett Pool BIP, then that finding would be sufficient to support denial of the Permittee's CWA §316(a) variance request, regardless of EPA's conclusions with regard to other biotic communities in the pool.

Even specific to the benthic community, attention needs to be given to how different groups of invertebrates occupy different habitats and how they are sampled. Two different sampling techniques were used to study the benthic invertebrate community in Hooksett Pool, which EPA agrees is appropriate for a large river system like the Merrimack. EPA also agrees that there appears to be no appreciable harm to the entire benthic invertebrate community based on both sampling techniques over the years sampled (*i.e.*, 2011, 2014, 2016). Had EPA found, instead, sufficient evidence to indicate that appreciable harm *had* occurred to either one of these rather distinct groups of organisms, but not the other, and that such harm was expected to continue in the future, then the Agency would have properly concluded that the benthic invertebrate community was not protected and, therefore, the Hooksett Pool BIP was not protected.

EPA notes that the commenter cites to a 1977 Draft guidance document on CWA § 316(a) reviews jointly issued by EPA and the Nuclear Regulatory Commission (NRC), AR 444, that has often been cited to by permittees and regulators alike in CWA § 316(a) variance demonstrations and determinations, respectively. EPA and the NRC never issued a final guidance document to replace the draft and, as a result, the draft guidance continued to be cited. Since issuance of the 2017 Statement, however, EPA's Office of Water has rescinded all draft guidances more than two years old. *See* AR-1739. Therefore, the draft guidance is no longer an appropriate reference. Nevertheless, EPA agrees with commenters points here, which is that the analysis should consider different components of the BIP (*e.g.*, fish, shellfish, macroinvertebrates, habitat formers, etc.), that the community as a whole and individual species should be considered, and that the magnitude of any harm should be evaluated.

5.5 The 2011 Normandeau benthic macroinvertebrate survey does not support an implication of appreciable harm.

Comment II.5.5	**AR-1548, PSNH, pp. 90-99**
See Also AR-870, Normandeau	

In the Statement, EPA remarked on the "notabl[e] concentrat[ion]" of Asian clams "in areas of Hooksett Pool with water temperatures directly affected by the plant's thermal discharge," noting Normandeau's survey conducted in 2011 (published in 2012) had revealed survey sites in Hooksett Pool where Asian clams were numerically dominant *vis a vis* native benthic macroinvertebrates.[397] In considering that information, EPA noted:

> Of the 18 samples taken at or downstream of the plant's discharge . . . Asian clams were the dominant taxon in 14 of them, ranging in relative abundance from 58 to 94 percent, with a mean of 78.6 percent at the sites where they were dominant. EPA found this

> discovery worthy of further research because of the possibility that Merrimack Station's thermal discharge was contributing to the presence and/or prevalence of the Asian clam in the Hooksett Pool and the potential relevance of such a finding to regulating [Merrimack Station's] thermal discharges . . . .[398]

As noted in the preceding subsection, EPA believes the "potential relevance" of such a finding is that "CWA § 316(a) variance-based temperature limits must assure the protection and propagation of the [BIP] of organisms" in Hooksett Pool.[399] EPA implies the Asian clam numbers from Normandeau's survey suggest continuation of PSNH's thermal variance from the 316(a) requirements may not assure the protection and propagation of the BIP in Hooksett Pool,[400] apparently notwithstanding that (1) Normandeau found no appreciable harm to the Hooksett Pool BIP based on its 2011 benthic macroinvertebrate analysis, (2) there is no evidence suggesting the Asian clam is displacing or impacting native species, and (3) Asian clam populations, as a rule, may fluctuate greatly from year-to-year before reaching an equilibrium.

In 2011, when Asian clams were first identified and sampled by Normandeau, their densities totaled around 1,100 clams/m^2 at Merrimack River Station S0, near 2,400/m^2 at S4, and just under 1,900/m^2 at S17.[401] Such numbers are not surprising considering Asian clam populations grow rapidly due, in part, to the clam's high allocation of energy to growth and reproduction that is typical of invasive species.[402] "This high allocation of energy to growth and reproduction is responsible for the relatively high fecundity (25,000-75,000 per lifetime of a hermaphroditic individual []) and, due to relatively low physiological tolerances, [Asian] clams depend on this elevated fecundity for invasive success and rapid population recovery."[403]

Within two years of the 2011 sampling, however, *C. fluminea* densities fell dramatically to less than 250, 113, and 54 clams/m^2 at S0, S4, and S17, respectively.[404] As recounted in the AST Report, such large fluctuations in population density are typical with Asian clams: "Asian clam populations may rapidly reach high abundances, but a low juvenile survivorship and a high mortality rate throughout adult life leads to considerable annual, seasonal, and site-to-site variability and fluctuations in abundances and frequent population mortality events."[405]

Following the 2013 population decline at Hooksett Pool, Asian clam densities rebounded to over 5,000/m^2 at S4, 4,100/m^2 at S17, and back to around 1,000/m^2 at S0 in 2014 only to precipitously crash again in 2016.[406] Eventually, Asian clam population abundances at Merrimack Station are expected to reach a quasi-equilibrium, as is typical with other Asian clam populations, with annual abundances commonly fluctuating as much as 2-3 orders of magnitude.[407]

These dramatic population fluctuations highlight the importance for multi-year surveys and assessments of clam populations in order to correctly ascertain numerical dominance and appreciable harm to the BIP. Dr. Richardson explains:

> For example, of the nine sites sampled in 2011 that had Asian clams, Normandeau (2012) assessed seven of those sites as having Asian clam percent composition >50%, *i.e.*, [Asian] clams were the numerically dominant benthic invertebrate (Table 3).

> Conversely, due to dramatic invertebrate population fluctuations and inherent variability in Asian clam population densities, by 2014 the percent composition of Asian clam had declined in seven of the nine sample locations and in six of the nine locations Asian clams were no longer numerically dominant (*i.e.*, <50%). By 2016, Asian clams were no longer numerically dominant at any of the nine sites including the sites directly within the cooling water plume.
>
> Clearly, therefore, whether or not the Asian clam is the numerically dominant benthic invertebrate of the BIP in Hooksett Pool depends entirely upon which year's data are examined. These data clearly point out that numerical dominance of the BIP by a nonindigenous species with a life history such as that of the Asian clam cannot be assessed based on 2011 data alone.[408]

And if such dominance cannot be accurately assessed, then one certainly should not use such population figures to assert the Asian clam is causing appreciable harm to Hooksett Pool's BIP.

Ironically, however, a thorough analysis of the results of Normandeau's 2011 survey (articulated in its 2012 report) provides insight as to the relationship of the Asian clam with Hooksett Pool's BIP.[409] While greater numbers of Asian clams existed at certain locations in Hooksett Pool compared to others, Normandeau concluded that mean taxa richness, mean EPT richness, and mean EPT/Chironomidae abundance ratio all increased in Hooksett Pool from 1973 to 2011. These EPA recommended indicators of BIP health all increased with the addition of the Asian clam.[410]

Further, the numerically dominant taxon collected during Normandeau's bankside kick sampling was a species that prefers unpolluted, clear cold waters (the freshwater arthropod *Gammarus fasciatus*) and, for that matter, "'kick sample data collected from the aquatic insect community . . . showed dramatic improvements in the aquatic insect community composition between 1972 and 2011.'"[411]

In conclusion, therefore, the Normandeau report, as based on the 2011 survey work, does not establish a scientific basis for concluding the Asian clam is the numerically dominant taxon in Hooksett Pool. In fact, if one did want to draw conclusions from the Normandeau report (for that particular time period), the more relevant conclusion would be that, despite the presence of large numbers of Asian clams at certain survey sites in Hooksett Pool, overall BIP health in Hooksett Pool is trending in a positive, rather than an adversely impacted, direction.

[397] AR-1534 at 41.

[398] *Id.*

[399] *Id.*

[400] *See id.* at 41-43.

[401] AST Report at 22.

[402] *Id.*

[403] *Id.* (citing McMahon 2002).

[404] *Id.* at 23.

[405] *Id.* (citations omitted).

[406] *See id.*

[407] *Id.*

[408] *Id.* at 23-24 (emphasis added and in original, respectively).

[409] *See* AR-1174.

[410] AST Report at 24-25.

[411] *Id.* at 25 (quoting AR-1174).

EPA Response:

EPA agrees with the comment (at p. 91) that the Agency's 2017 Statement indicated that the new information about the presence and prevalence of the newly discovered invasive Asian clam could factor into EPA's assessment of Merrimack Station's thermal variance request and the question of appreciable harm to the BIP from past discharges and/or whether the protection and propagation of the BIP would be assured going forward. The comment concurs with EPA's view that it is appropriate under CWA § 316(a) to consider other aspects of the BIP, such as macroinvertebrates, in addition to fish. While not conclusive, the new information about Asian clams raised questions about what impact this invasive species might be having on the BIP, if any, and whether the plant's thermal discharge was facilitating the species' survival, growth and reproductive success.

The commenter states that Normandeau found no appreciable harm to the Hooksett Pool BIP based on its 2011 benthic macroinvertebrate analysis, but EPAdoes not agree that the results of the 2011 sampling alone support a conclusion of no appreciable harm. The quantitative benthic invertebrate data clearly indicated that Asian clams were the dominant taxa in the thermally-influenced portion of Hooksett Pool, but were not dominant – or even present – in the upstream portion unaffected by the Facility's thermal discharge. That does not demonstrate a lack of appreciable harm, but instead raises the possibility that appreciable harm may be occuring. Still, as the text quoted by the commenter indicates, EPA had not reached final conclusions at the time of the 2017 Statement. *See* AR 1534, p. 41 ("EPA found this discovery worthy of further research because of the possibility that Merrimack Station's thermal discharge was contributing to the presence and/or prevalence of the Asian clam in the Hooksett Pool and the potential relevance of such a finding to regulating [Merrimack Station's] thermal discharges ….")

The commenter states (at p. 90) that there is no evidence suggesting the Asian clam is displacing or impacting native species, but in EPA's view, species dominance would evidences the potential for Asian clam to be displacing or otherwise adversely impacting native species. Moreover, species dominance, when evaluating relative abundance, is a commonly used metric for evaluating changes in biological communities. Thus, EPA defines "balanced indigenous population" as a community characterized by (1) diversity at all trophic levels, (2) the capacity to sustain itself through cyclic seasonal changes, (3) the presence of necessary food chain species, and (4) <u>non-domination by pollution-tolerant species.</u> 40 CFR § 125.71(c) (emphasis added).

At the same time, EPA agrees with the comment (at p. 92) that Asian clam populations may fluctuate greatly from year to year before reaching equilibrium, but also notes that maintenance of a thermal refuge due to the plant's thermal discharge could result in lower mortality rates during winter conditions compared to sections of the Hooksett Pool unaffected by the plant's thermal plume, if any Asian clams are present in the latter areas.

The commenter argues (at p. 93) that if dominance by the Asian clam cannot be accurately assessed because of varying abundance values from year to year, then one should not use population figures solely from 2011 to assert the Asian clam is causing appreciable harm to Hooksett Pool's BIP. EPA based its assessment on the status of the BIP as of the 2011 Draft Permit primarily on the data provided by the Permittee, which at the time did not include Asian clam information. Therefore, EPA's proposed determination under CWA § 316(a) for the 2011 Draft Permit did not consider the Asian clam. When Normandeau's comments on the 2011 Draft Permit included the 2012 macroinvertbrate report (AR-870) as evidence that Merrimack Station's thermal discharge was not causing appreciable harm to the Hooksett Pool BIP, EPA reviewed the report and became aware of the presence of the Asian clam. At that point, although Normandeau did not provide analysis of the significance of the Asian clam data, EPA began to consider the import of this invasive species. EPA notes that Normandeau did not describe its submission as an interim report or indicate that it would be collecting additional date to investigate possible population fluctuations. It also did not caution that the Asian clam data in the report should not be used in assessing the BIP because population figures could be variable. Nothing in the report suggested that the information provided would be insufficient for assessing the status of the Hooksett Pool invertebrate community. Therefore, EPA began to factor the information into its analysis. However, when PSNH/Normandeau became concerned that EPA was independently evaluating a finding evidenced in the report (*i.e.*, the presence and dominance of Asian clams in Hooksett Pool downstream of the Facility's thermal discharge), PSNH launched additional studies and now it and Normandeau argue that EPA should not rely the 2011 data results alone since sampling in later years revealed different results.

EPA notes, however, that decisions on the status of the BIP and permit limits need to be made in a timely way with the data available even if they may not represent as much information as the Agency might prefer. That said, EPA welcomes the additional data that PSNH later provided and agrees that all relevant data available for review should be considered and, as such, it has included the 2014 and 2016 data in its evaluation. EPA regards consideration and collection of additional data to be particularly important in this case because Merrimack Station's operations and attendant thermal discharges have been substantially reduced in more recent years and newer data may illustrate different or changing impacts. EPA also notes that fish abundance can also vary dramatically from one year to the next. Therefore, as is required for fish, the Final Permit requires continued sampling for Asian clams and the resident invertebrates they can impact (*e.g.*, mussels), to provide further information for assessing the status of the BIP going forward. Indeed, the comment suggests that multi-year surveys are important for the Asian clam (though none had been carried out at the time of PSNH's CWA § 316(a) variance application).

Normandeau's 2012 report (AR-870) does not explain why Asian clams dominate in the thermally-influenced portion of Hooksett Pool but are completely absent in ambient portions of the pool. The report suggests that the *qualitative* aquatic insect data that were collected are better than the *quantitative* benthic invertebrate samples (where Asian clams were collected) for purposes of comparing samples taken between the 1970s and 2011 because organisms along the littoral zones are typically more pollution sensitive than those found in sand substrates. While EPA agrees aquatic insects in the littoral zones are important for fish that forage there, both sets of sampling data are important for understanding the status of the entire macrobenthic community of Hooksett Pool.

The commenter stated (at p. 93) that Normandeau concluded that mean taxa richness, mean EPT richness, and mean EPT/Chironomidae abundance ratio all increased in Hooksett Pool from 1973 to 2011. It also notes (at p. 93) the numerically dominant taxon collected during Normandeau's bankside kick sampling was a species that prefers unpolluted, clear cold waters (the freshwater arthropod *Gammarus fasciatus*) and, for that matter, "'kick sample data collected from the aquatic insect community . . . showed dramatic improvements in the aquatic insect community composition between 1972 and 2011.'" EPA reviewed this analysis, but does not consider the EPT/Chironomidae abundance ratio to be particularly useful to the assessment of Asian clam impacts since these communities are not well-represented in Ponar sampling. This analysis seems more appropriate for the results from kick sampling along the wadeable riverbank.

The commenter also suggests (at pp. 93-94) that if one did want to draw conclusions from the Normandeau report (for that particular time period), the more relevant conclusion would be that, despite the presence of large numbers of Asian clams at certain survey sites in Hooksett Pool, overall BIP health in Hooksett Pool is trending in a positive direction. EPA needs to draw conclusions based on the data provided. While there do seem to be improvements in the aquatic insect community in comparisons between the 1970s and 2011 data, particularly with kick sampling results, the results are more mixed with the benthic community sampled with the Ponar grab. According to Normandeau's 2012 report (AR-870, p. 8-14), in 2011, taxa richness was higher on the east side of Hooksett Pool than in the 1970s, but about the same abundance in samples collected in the middle of the river (5.18 ('70s) vs. 5.74 ('11), and lower on the west side (8.07 ('70s) vs. 6.75 ('11)).Also, the 2011 taxa values most likely include the presence of Asian clams, which is not a resident species and did not exist in Hooksett Pool in the 1970s. EPA is wary of putting too much emphasis on one year of qualitative kick sampling data. This cautious approach is consistent with the commenter's recommendation not to rely on 2011 data alone for Ponar sampling results.

Additional Ponar sampling data were collected in 2014 and 2016. Analysis based on these new data are presented in AST's 2016 report (AR-1555), but unfortunately the actual data are not provided. Therefore, a comparison of the relative abundance of all benthic invertebrates sampled between all years and locations (1972, 1973, 2011, 2014, 2106) is not possible. Unfortunately, kick sampling was not conducted in 2014 or 2016. Additional kick sampling would have provided an opportunity to compare how representative the 2011 qualitative data were and increased the number of years sampled in the 2010s to the number used in the 1970s.

5.6 EPA's and NHDES' 2013 and 2014 Asian clam studies fail to demonstrate appreciable harm to Hooksett Pool's BIP or New Hampshire Water Quality.

Comment II.5.6	AR-1548, PSNH, pp. 94-99

EPA, in coordination with NHDES, conducted limited study and investigation of the Asian clam in certain New Hampshire waters in 2013 and 2014.[412] In the Statement, EPA observes, "[t]his qualitative sampling revealed both higher densities of clams and larger individuals near the mouth of the discharge canal, as compared to clams collected farther downstream in Hooksett Pool, and in Amoskeag Pool below the Hooksett Dam" and that "[n]either benthic sampling conducted by NHDES during 2013 (AR-1414), nor EPA dive investigations in 2014 (AR-1412), found evidence of Asian clams upstream from [Merrimack Station] in Hooksett Pool or Garvins Falls Pool."[413] Following these statements, EPA leaps to the (uncited and unsubstantiated) conclusion in the Statement that "[t]he arrival of invasive Asian clams in NH represents a threat to the state's water quality."[414]

As acknowledged by EPA, when required by the FOIA to do so, EPA provided PSNH with data derived from the 2013 and 2014 studies. As discussed below, EPA's and NHDES' collection and analysis of the relevant Asian clam data did not follow established scientific processes and, for that matter, suffered from other significant deficiencies (such as a failure to fully appreciate the expanding range of the Asian clam in the northern United States).[415]

First, EPA's 2013 study of Asian clams in New Hampshire, conducted in coordination with NHDES, erroneously reported the abundance of Asian clam at three New Hampshire sites. More than one-third of the samples collected in the Merrimack River during the study that did not contain any Asian clams were inappropriately excluded from density calculations and other analyses, skewing the entirety of the data.[416] Specifically, the elimination of this data incorrectly inflated densities to almost twice what they should have been based on actual EPA field data sheets.[417] Compounding the error, EPA took this faulty density data from the Merrimack River and compared it to Asian clam abundances in the nearby Cobbetts and Long Ponds. This led to the erroneous conclusion that clam abundances in the Merrimack River were greater than those found in the two other ponds, when, in actuality, a correct analysis reveals the Asian clam's presence in the Merrimack River is not significantly different than found elsewhere.[418]

EPA's second error in this 2013 study in the Merrimack River stems from its inclusion of samples containing only native unionid bivalves that were counted as Asian clams.[419] This too led to an improper inflation in the estimates of Asian clams within the waterbody.[420] Furthermore, EPA broke from accepted scientific protocol by utilizing replicate means instead of means calculated directly using sample replicates to generate and report its means for the study[421]—calling into question the agency's conclusions.

In contrast, when the analysis is performed correctly, the EPA data from the 2013 study supports the conclusion that the Asian clam's presence in the Merrimack River is not significantly different than found elsewhere and, in fact, demonstrates that the Asian clam's presence in these waters is part of the clam's naturally occurring, worldwide northern range extension often taking place in the absence of thermal discharges.[422]

EPA's 2014 study of Asian clams is similarly faulty. As explained in the AST report,

> A review of the sampling design that EPA utilized in 2014 indicates that it also was not based on acceptable scientific practices. As a result, the inappropriate sample design led to inaccurate and inappropriate conclusions about the significance of the Asian clam and native bivalve species. Specifically, EPA's 2014 study employed an inappropriate sample design for the Asian clam in Hooksett Pool. EPA excavated Asian clam samples and conducted video observations along a single transect at station S0. The sample design located the survey transect parallel to the shore and within and along a known, high-density Asian clam area. This approach was contrary to well-established scientific protocol for river sampling of bivalves that dictates that (1) multiple transects be used, (2) transects be located perpendicular to the shoreline, and
> (3) transects span the width of the river when possible. Utilizing its flawed sampling design, all EPA-excavated samples and video were taken from areas known to have high clam concentrations. Where EPA did employ multiple transects for ponar samples in 2014, the samples were limited to the west and middle of the transects, all locations of known high clam abundance and were not indicative of conditions in Hooksett Pool. Such an approach adversely affected the accuracy of any impact or assessment of Asian clam[s] on the [BIP] in Hooksett Pool.[423]

Both studies suffer from one additional flaw: neither attempted to gather data on the resident benthic invertebrate community of Hooksett Pool, meaning they fail to provide any basis for analysis on whether the Asian clam is causing appreciable harm to the BIP.[424] Based on AST's review, there was no data or information produced through PSNH's FOIA and New Hampshire Right-to-Know requests that attempted to assess the benthic invertebrate community Hooksett Pool beyond clams.[425]

The result of these errors is that EPA's 2013 and 2014 sampling artificially inflated the abundance and significance of Asian clams in Hooksett Pool. The data derived from these efforts is, therefore, invalid for assessing the abundance of clams in the Merrimack River or their impact (or lack of impact) to the BIP.[426] Further compounding these data collection issues, EPA's analysis of the results of the 2013 and 2014 surveys also omitted relevant range extension data and could lead to erroneous connections between the Asian clam and Merrimack Station.[427] Specifically,

> [O]f the 11 documented locations of Asian clam in New Hampshire (USGS 2017), only one, Hooksett Pool, Merrimack River, receives cooling water discharge. . . . EPA developed data

> on clam presence at several sites in New Hampshire. EPA's data, however, show no significant differences (ANOVA, P = 0.687) among sites in Asian clam numbers with and without thermal discharge (Figure 1). Unlike other EPA data sets and analyses, these data were collected using multiple sample replicates and, in the case of the Merrimack River, using shore-to-shore transects as is standard protocol; there is no indication that EPA's information using this sampling protocol is incorrect. Asian clam densities among all four New Hampshire sites surveyed by NHDES for EPA were similar when comparing two sites with no thermal effluent, Cobbetts Pond and Long Pond; and two sites receiving Merrimack Station cooling water, Hooksett Pool and Amoskeag Pool (Figure 1). The pattern suggests Asian clam densities may even be lower at Hooksett Pool receiving cooling water discharge from Merrimack Station compared to the two sites lacking any thermal input, *i.e.*, Cobbetts and Long ponds. Such a discernable pattern warrants recognition; however, such analysis was not provided.[428]

For that matter, EPA also omitted information on Asian clams from (1) Wash Pond, (2) the upper Merrimack River north of Concord, and (3) below Amoskeag Dam at the Pennichuck Water Works pipeline in the Merrimack River, all sites that also do not receive cooling water discharge.[429]

Although perhaps admittedly beyond the scope of EPA's and NHDES' immediate studies, had they conducted a broader geographic review of the Asian clam's range in the northern United States, they would have likely discerned the species' spread into bodies of water lacking thermal input is well-documented and "strongly supports the position that thermal discharge is not a requirement for spread and establishment of the Asian clam."[430] For example:

- There are at least 25 documented locations of established Asian clams at locations as far north, or nearly so, as is Hooksett Pool of the Merrimack River (Table 6).
- Twelve of these documented locations are in the New England area of the U.S.
- Eleven of these documented locations are in New Hampshire and one in Maine.
- Four of these New England locations are as far or farther north than Hooksett Pool of the Merrimack River.[431]

In light of the foregoing issues with data collection and analysis, EPA's and NHDES' work in 2013 and 2014 does little more than illustrate the Asian clam's presence in Hooksett Pool and certainly does not support the Asian clam in Hooksett Pool as "a threat" to the Pool's water quality.[432] AST's more comprehensive analysis of the issue, as detailed below, leads to a far different conclusion.

[412] AR-1534 at 42.

[413] *Id.*

[414] *Id.*

[415] *See* AST Report at 26-33.

[416] *Id.* at 26.

[417] *Id.*

[418] *See id.* at 26-29.

[419] *Id.* at 27.

[420] *Id.*

[421] *Id.*

[422] *Id.* at 27-28.

[423] *Id.* at 28.

[424] *Id.* at 29.

[425] *Id.* Dr. Richardson noted that there was some limited information in these agency materials regarding sampling for native mussels. *Id.* However, the sampling design provided was inappropriate for native unionid mussels and could only suffice for an analysis of native fingernail clams, which was not apparent within the four- corners of the materials. *Id.* The agency materials were clearly aimed at sampling Asian clams only, according to Dr. Richardson, and therefore do not allow for an assessment of appreciable harm—if any—to the BIP of Hooksett Pool. *Id.*

[426] *Id.*

[427] *Id.* at 30.

[428] *Id.*

[429] *Id.*

[430] *Id.*

[431] *Id.* at 31.

EPA Response:

In response to comments regarding studies conducted by EPA and NHDES in 2013 and 2014, these studies were designed primarily to evaluate differences in the abundance and size of Asian clams known to exist in the Merrimack River and two New Hampshire ponds, Cobbett's Pond and Long Pond. During these studies, NHDES took all benthic samples, processed the results, and conducted all the comparative analyses. EPA collected water quality sampling at the locations where benthic samples were taken. EPA was provided an opportunity to review a draft of the report but did not use the data to demonstrate appreciable harm, as the commenter alleges (p. 96). The Agency did, however, verify the data collected and presented by Normandeau in its 2012 invertebrate report (AR-1465), which indicated that Asian clams were indeed present in the river immediately downstream from the Facility, the area most affected by the thermal discharge. Indeed, the comment complains that EPA's data collection was focused in the areas most affected by the thermal discharge, which are "known high clam areas." EPA's initial data collection effort was also intended to provide the basis for EPA potentially to develop a more comprehensive study to evaluate the distribution of Asian clams in Hooksett Pool, as well as differences in their abundance and size at various locations upstream, downstream, and adjacent to the discharge canal. After working on development of such a study, EPA ultimately decided not to carry out the more detailed study in light of competing work priorities and resource limitations.

EPA disagrees with the comment's claim that EPA, in its 2017 Statement, AR 1534, p. 42, "leaps to the (uncited and unsubstantiated) conclusion in the Statement that '[t]he arrival of invasive Asian clams in NH represents a threat to the state's water quality.'" EPA's discussion of the issue in the 2017 Statement was reasonable and properly supported. Placed in fuller context, EPA's 2017 Statement explained that:

> [t]he arrival of invasive Asian clams in NH represents a threat to the state's water quality. Their presence is regulated in New Hampshire, and it is illegal to import, possess or release Asian clams in the state, according to NHDES (NHDES 2012) (AR-1408).

AR 1534, p. 42. Moreover, this statement was appropriately included within the context of a larger discussion of the Asian clam issue. *Id*. at 41-43.

5.7 AST's comprehensive investigation and analysis of Asian clams and native species in Hooksett Pool demonstrates an absence of prior appreciable harm to the BIP.

Comment II.5.7	AR-1548, PSNH, pp. 99-107

AST, in coordination with Normandeau, performed extensive investigation into the presence of the Asian clam and its relationship to the Hooksett Pool BIP, specifically the native benthic macroinvertebrates. The investigation included a two-year study of the Asian clam in Hooksett Pool to assess how, if at all, it has been impacted by Merrimack Station's thermal discharges and whether it is causing appreciable harm to the BIP of Hooksett Pool. Multiple dives were conducted excavating 0.25 m^2 samples and performing semi-quantitative assessments, and numerous ponar grab samples were taken along multiple transects in November/December 2014 and again in July 2016, leading to the collection of numerous clam and macroinvertebrate samples.[433] The samples were analyzed following scientifically accepted methods and led to the following overall conclusion by Dr. Richardson: "[T]he indigenous ecology of Hooksett Pool, supported by an apparently viable and self-sustaining food chain, is typical of what one would expect to find in a New Hampshire river system – and . . . represents a marked improvement over the river's pollution-impacted state in the first half of the 20th century."[434]

In addition to assessing the health and viability of Hooksett Pool's indigenous ecology, Dr. Richardson analyzed whether or not the indigenous populations or communities found in Hooksett Pool's ecology are threatened by harmful imbalance caused by the Asian clam's introduction to the water body. In order to derive actual data on the Asian clam in Hooksett Pool on which scientific conclusions regarding the clam and its ecological impact could be based, Dr. Richardson compared "abundances and size-frequency distributions of native bivalves at designated river sampling sites with Asian clams and those without clams . . . to see if Asian clams were in any way causing appreciable harm to the native mussel community."[435] Using SCUBA, dive assessments were performed in 2014 and 2016 that followed scientifically approved collection methods.[436] These studies revealed that native bivalve abundance was unaffected by the presence of Asian clams and an absence of appreciable harm. As explained in the AST Report:

> Analysis of the diver excavated 0.25 m^2 quadrates indicated a significant difference among native bivalve species (2-way ANOVA; P = 0.014), but did not reveal a significant difference among stations (P = 0.227), and there was no significant station by species interaction (P = 0.251) (Figure 3). ***No significant station by species interaction means that native bivalve abundance was unaffected by presence of Asian clams and certainly no appreciable harm was indicated.*** Notably, native bivalves, mostly *Elliptio complanata* and sphaeriids, had densities at Station N10, where no clams occurred, similar to those of Station S24, where clams were fairly abundant (Figure 3).
>
> Examining the results of semi-quantitative diver transect surveys (Appendix C1 and C2) indicated that Asian clams were located at survey sites S0, S4, S17, and S24. Numerous native mussels were also located at those same survey sites (and elsewhere in Hooksett Pool). From these assessments, it is clear that ***native bivalves were as abundant and spatially distributed, i.e., near the shore, along transects without Asian clams ([Upstream Reference Site] through N5) as they were along transects with Asian clams*** (S0-S24). Also, the native bivalves appear to avoid the mid-channel area of the river. As suggested by Vaughn and Spooner (2006), it is highly likely that Asian clams in Hooksett Pool are mostly exploiting the highly disturbed mid-channel shifty and loose sand substrate generally uninhabited by native bivalves. These areas are largely unsuitable and inappropriate for most native bivalve species, especially members of the Unionidae, but provide typical habitat for Asian clams (McMahon 2002 and *pers. comm.*).[437]

Recognizing this reality is important, because "ignorance of the spatial distribution of native bivalves and Asian clams . . . would lead one to a spurious negative correlation between native bivalve abundance and Asian clam density [and,] subsequently[,] to an incorrect conclusion of a negative impact of Asian clams on native bivalves . . . which is simply not the case."[438]

Furthermore, if Asian clams were causing appreciable harm to the native bivalves through competition, there would be differences in population size structure between stations with Asian clams versus those without Asian clams.[439] Specifically, if negative competitive interactions between native bivalves and Asian clams were occurring (with the subsequent appreciable harm), one would expect to see smaller native bivalves in those locations where Asian clams are present (as compared to those locations where they are absent).[440] But in Hooksett Pool, a comparison of the size-frequency distribution of native bivalves from stations with Asian clams to stations without Asian clams did not reveal significant differences.[441] This is indicative of no appreciable harm.[442] Further, if Asian clams were causing appreciable harm to native bivalve recruitment by impacting glochidia and settling juveniles, one would expect to see a corresponding lack of smaller individuals at stations with Asian clams compared to stations without Asian clams.[443] Again, however, no difference was detected between the two distributions. These findings show that Asian clams are not causing appreciable harm to native bivalves through negative impacts on recruitment.[444]

Dr. Richardson not only compared and analyzed Asian clams to native bivalve populations in the course of his work, but also utilized various EPA-approved metrics to fully analyze appreciable harm, or lack thereof, to the Hooksett Pool BIP. Such analysis further demonstrated the Asian clam is not causing appreciable harm to the BIP of Hooksett Pool, according to Dr. Richardson.[445] A summary of the key analyses that led to Dr. Richardson's ultimate conclusion are summarized below.

First, although Normandeau's 2012 study shows Asian clams were abundant in 2011, when this 2011 data is compared against data Normandeau collected in 1972 and 1973, taxa richness, EPT richness, and EPT to *Chironomidae* abundance ratio all increased in the Hooksett Pool despite the presence of the Asian clam.[446] This indicates an improvement in the BIP, not harm.[447] "If clam presence and abundance caused appreciable harm to the BIP, these metrics should have decreased from 1972 and 1973 compared to 2011 rather than increased," as they did.[448]

Second, the abundance of all other benthic invertebrates in the Hooksett Pool was the same or higher at sampling stations at which Asian clams were also present compared to sampling stations that did not include any Asian clams.[449] "Interestingly, there were even higher invertebrate abundances at S17, one of the sites with the highest Asian clam densities. For Asian clam presence and abundance to have caused appreciable harm to the benthic macroinvertebrate BIP, the abundance of other benthic invertebrates should have been reduced at stations without clams."[450] No such reductions were identified, according to Dr. Richardson.[451]

Third, BIP taxa richness—an assessment EPA has recognized is the best candidate benthic invertebrate community metric—was the same or higher among all sampling stations at which Asian clams were present compared to those at which they were not.[452] "For Asian clam presence and abundance to have caused appreciable harm, the taxa richness of other benthic invertebrates should have been significantly reduced at sites with clams."[453] There were, however, no such reductions.[454]

Fourth, the BIP Shannon Community Diversity Index, which focuses on quantifying the uncertainty in predicting the species identity of an individual that is taken at random from the dataset, was the same among many stations at which Asian clams were present compared to those at which they were not.[455] "For Asian clam presence and abundance to have caused appreciable harm, the Shannon Community Diversity of other benthic invertebrates should have been significantly reduced at sites with clams."[456] As explained by Dr. Richardson, that was not the case.[457]

Fifth, Dr. Richardson assessed Hooksett Pool in terms of the Hilsenhoff Biotic Index ("HBI"), another EPA-approved benthic macroinvertebrate BIP metric.[458] A lower HBI means the benthic community is healthier and comprised of invertebrates that are less tolerant to pollution.[459] The HBI's were the same or lower among stations with versus those without Asian clams. In particular, the HBI's "were the same or lower at the two stations with highest Asian clam abundance (S4 and S17) in 2011, 2014 and 2016 following Asian clam establishment compared to 1972 or 1973, prior to Asian clam establishment."[460] The HBI of the Hooksett Pool benthic invertebrate community should have significantly increased at site with Asian clams if the species have caused appreciable harm to the BIP. No such increases occurred.[461]

Sixth, recognizing EPA considers EPT taxa richness another of the best metrics for assessing the health of benthic invertebrate communities, Dr. Richardson utilized it in his analysis and found the richness in the Hooksett Pool to be "the same or higher among stations with *versus* those without Asian clams."[462] EPT "derives its name from its reliance on counting the presence of three benthic insect groups: *Ephemeroptera* (mayflies), *Plecoptera* (stoneflies), and *Trichoptera* (caddisflies)."[463] EPT taxa richness at S4 and S17 (again, the two sites with the highest abundance of Asian clams) was the same or higher in 2011, 2014 and 2016, compared to 1972 or 1973, prior to the time the clams became established in the waterbody.[464] "For Asian clam presence and abundance to have caused appreciable harm, the EPT taxa richness should have been significantly reduced at sites with clams."[465] But no such reduction was evident.[466]

Seventh, HBI, Shannon Diversity Index, taxa richness, and total invertebrate abundance (minus Asian clams) estimates per sample were each analyzed for correlation with Asian clam abundances using samples taken in 2011 and 2014.[467] As explained in the AST Report,

> There was no significant correlation between Asian clam abundance and HBI [], Shannon diversity [], taxa richness [], or total invertebrate abundance []. For Asian clam presence and abundance to have caused appreciable harm, the Shannon diversity index, taxa richness, and total invertebrate abundance (minus Asian clams) of benthic invertebrates would be expected to have significant negative correlations with Asian clam abundance; HBI would be expected to have a significant positive correlation.[468]

Those correlations, however, were not identified.[469]

Eighth, Dr. Richardson utilized the Bray-Curtis Community Similarity Index to assess the health of the benthic invertebrate community in the Hooksett Pool. The "cluster analysis clustered stations into three groups, each containing stations with and without Asian clams."[470]

This indicates the macroinvertebrate communities among the sampling stations with and without Asian clams were very similar.[471] "For Asian clam presence and abundance to have caused appreciable harm, the Bray-Curtis Community Similarity clusters of benthic invertebrates should have separated sites with clams from sites without clam. Such separation was not encountered," however.[472]

Finally, the MDS Community Ordination (utilizing analyses from the Bray-Curtis Similarity Index), "lumped stations into three groups, each containing stations with and those without Asian clams indicating similar macroinvertebrate BIPs among stations with and without Asian clams."[473] This too supports a finding that Asian clams are not causing appreciable harm to the Hooksett Pool BIP. For, if they were, the MDS Community Ordination would have "separated sites with clams from sites without clams. Such separation was not encountered," however.[474]

Dr. McMahon concurred with each of these conclusions by Dr. Richardson and further provided: "All of the above described results consistently suggest that benthic macroinvertebrate abundance and diversity in areas of Hooksett Pool with Asian clams have either remained unchanged or have significantly increased resulting in no change to or an increase in biotic integrity as measured by the [HBI]."[475]

In summary, over a dozen analytical exercises, relying on the application of EPA- approved metrics to data scientifically derived from Hooksett Pool, generated results that demonstrate the Asian clam is not causing harm to the BIP in Hooksett Pool. This undisputed evidence, coupled with the in-Pool evidence that the Asian clam is simply co-existing with, rather than replacing, native bivalves, demonstrates an absence of prior appreciable harm to the Hooksett Pool BIP.

[432] *See* AR-1534 at 42. In follow-up to its limited investigation in 2013 and 2014, EPA developed a plan to study the presence and abundance of the Asian clam in the Merrimack River in order to improve the agency's "understanding of the power plant's influence" on the Asian clam and, in turn, "to further evaluate the plant's ability to meet state and federal water quality standards, and its NPDES requirements, as they apply to protecting the resident biological communities." Project Plan at 3. EPA's planned 2015 study, however, was not undertaken. *See* AST Report at 3, 33.

[433] *See* AST Report at 34.

[434] *Id*. at 35.

[435] *Id.* at 41.

[436] *Id.*

[437] *Id.* at 41-42 (emphasis in bold and italics added).

[438] *Id.* at 42.

[439] *Id.*

[440] *Id.*

[441] *Id.* at 43.

[442] *Id.*

[443] *Id.*

[444] *Id.*

[445] *Id.*

[446] AR-1174 at 18.

[447] AST Report at 43.

[448] *Id.*

[449] *Id.* As explained in the AST Report, there was no statistically significant difference (P>0.05) among these sites. *Id.*

[450] *Id.* at 43-44.

[451] *See id.* at 44. At S4 and S17, the two stations with the highest Asian clam abundance, the abundance of all other benthic invertebrates were generally the same in 2011, 2014 or 2016, compared to 1972 or 1973. "For Asian clam presence and abundance to have caused appreciable harm, the abundance of other benthic invertebrates should have been significantly reduced in 2011, 2014 and 2016." *Id.* There were no such reductions.

[452] *Id.*

[453] *Id.*

[454] *See id.* BIP taxa richness was the same at S4 and S17 (the two stations with highest Asian clam abundance) in 2011, 2014 or 2016, compared to 1972 or 1973. "For Asian clam presence and abundance to have caused appreciable harm, the taxa richness of other benthic invertebrates should have been reduced in 2011, 2014 and 2016." *Id.* at 45. No such reductions occurred.

[455] *Id.*

[456] *Id.*

[457] *See id.* Dr. Richardson provides:

BIP Shannon Community Diversity Indices were the same (ANOVA, P = 0.157) at the two stations with highest Asian clam abundance (S4 and S17) in 2011, 2014 and 2016 following Asian clam establishment compared to 1972 or 1973, prior to Asian clam establishment (Figure 10). For Asian clam presence and abundance to have caused appreciable harm, the Shannon Community Diversity of other benthic invertebrates should have been significantly reduced in 2011, 2014 and 2016.

Id. However, no such reductions were revealed through Dr. Richardson's analyses.

[458] *Id.* at 46. "The HBI estimates the overall pollution tolerance of the community in a sampled area, weighted by the relative abundance of each taxonomic group." *Id.*

[459] *Id.*

[460] *Id.*

[461] *See id.*

[462] *Id.*

[463] *Id.* (emphasis added).

[464] *Id.* at 47.

[465] *Id.* at 46-47.

[466] *See id.*

[467] *Id.* at 47.

[468] *Id.*

[469] *See id.*

[470] *Id.* at 48.

[471] *See id.*

[472] *Id.*

[473] *Id.*

[474] *Id.*

[475] McMahon Review at 6 ("Thus, the data support AST Environmental's conclusions that Asian clams are not negatively impacting the BIP of the Hooksett Pool benthic macroinvertebrate community.").

EPA Response:

The commenter states (at AR-1548, p. 99) that AST, in coordination with Normandeau, performed extensive investigation into the presence of the Asian clam and its relationship to the Hooksett Pool BIP, specifically the native benthic macroinvertebrates. The commenter further states (at p. 99) that the Facility's contractors collected 0.25 m^2 samples, performed semi-quantitative assessments, and gathered numerous Ponar grab samples along multiple transects in November/December 2014 and again in July 2016, leading to the collection of numerous clam and macroinvertebrate samples. EPA finds it unusual for studies designed to make comparisons of abundance between years and locations to sample at different times of the year, especially for organisms whose abundance can fluctuate dramatically. Normandeau's benthic invertebrate sampling was conducted between October 25-November 9 in 2011, December 2-23 in 2014, and July 25-27 in 2016. This sampling approach is also at odds with concerns expressed by Normandeau about comparison sampling between Garvins Pool and the thermally-influenced portion of Hooksett Pool, in 2011. According to Normandeau's comments (at AR-872, p. 46):

> A direct comparison of kick net and Ponar sampling data collected in Garvins Pool and Hooksett Pool downstream of Merrimack Station was not conducted due to concerns over the effect of varied seasonal timing of the sampling.

The above-mentioned sampling in Garvins Pool that Normandeau expressed concerns about took place in November 2011, only one month after the sampling for Hooksett Pool (AR-870, p. 2). Yet, Normandeau expresses no similar concern about seasonal macro-invertebrate sampling conducted in 2014 and 2016 that varied by up to five months (summer versus winter). EPA is concerned that the results of these comparisons are or may be confounded by the effect on sampling results of such a large shift in the months of sampling.

The commenter also suggests (at p. 100) that the indigenous ecology of Hooksett Pool, supported by an apparently viable and self-sustaining food chain, is typical of what one would expect to find in a New Hampshire river system, and that it represents a marked improvement over the river's pollution-impacted state in the first half of the 20th century. EPA agrees that there is evidence of improvement in water quality from reduced pollution thanks to implementation of the Clean Water Act, but does not agree that the ecology of lower Hooksett Pool is typical of what one would expect to find in a like New Hampshire river system, or even typical for other sections of the Merrimack River, given that the dominant species, at least in some years, is an invasive, non-indigenous species. In addition, the fact that certain improvements in water quality may result from the removal of other pollution sources over time does not establish whether or not thermal discharges have appreciably harmed the BIP in the past or will allow for assurance of the protection and propagation of the BIP going forward. Analysis of the effects of the thermal discharge, in combination with other stresses on the BIP, is needed.

The commenter also states (at p. 100) that PSNH's consultants compared "abundances and size-frequency distributions of native bivalves at designated river sampling sites with Asian clams and those without clams . . . to see if Asian clams were in any way causing appreciable harm to the native mussel community."[435] The commenter further states that, using SCUBA, they performed dive assessments in 2014 and 2016 that followed scientifically approved collection methods.[436] The commenter describes that these studies revealed that native bivalve abundance was unaffected by the presence of Asian clams and there was no appreciable harm. EPA considers this analysis helpful in understanding general trends in where Asian clams are found relative to native invertebrates, especially bivalves. The commenter also points out (at p. 101) that a comparison of the size-frequency distribution of native bivalves from stations with Asian clams to stations without Asian clams did not reveal significant differences. This comparison also provides encouraging evidence that the Asian clam's presence is not adversely affecting native mussels, but there has not been a sufficiently long study of the mussel community in Hooksett Pool to know if its abundance is stable.

The commenter again (at p. 102) compares more recent data with data Normandeau collected in 1972 and 1973, and indicates that taxa richness, EPT richness, and EPT to *Chironomidae* abundance ratio, all increased in the Hooksett Pool despite the presence of the Asian clam. The commenter urges that this provides evidence of no appreciable harm from Merrimack Station's thermal discharge. *See* EPA's response at Comment 5.5. Yet, the commenter has not submitted its actual sampling data for this analysis. Having the actual data to see just what was caught in each sample taken in 2014 and 2016 might make this information more meaningful for EPA in its assessment of impacts of Asian clams on the benthic community.

The commenter also notes (at pp.102-03) that the abundance of all other benthic invertebrates in the Hooksett Pool was the same or higher at sampling stations at which Asian clams were also present, as compared to sampling stations that did not include any Asian clams. EPA agrees that this suggests a lack of adverse effect from Asian clams. EPA also notes, however, that the commenter's report also indicated that total abundance of all invertebrates was considerably lower in 2011, 2014, and 2016 than in 1973, at Stations S4 and S17, especially at Station S4 (AR-1555, Figure 6, p. 73). Total abundance in 1972 was lower than in 2014, comparable to 2016, and higher than in 2011. These findings do not seem consistent with what would be expected with improved water quality conditions over time.

According to the commenter (at pp. 103-06), analyses on BIP taxa richness, Shannon Community Diversity Index, Hilsenhoff Biotic Index, and Bray-Curtis Similarity Index all suggested a lack of appreciable harm when sampling data from 2011, 2014 and 2016 were compared to data from 1972 and 1973. EPA would agree these findings suggest an absence of appreciable harm, though it still questions how results may have been influenced by the significant timing disparity of samples taken in the 1970s (October) with those taken in 2014 (December) and 2016 (July). Further, the commenter points to comparisons of EPT taxa richness as additional supporting evidence, but other than as evidence suggesting that overall water quality is improving, EPA questions the utility of this comparison of mayflies, stoneflies, and caddisflies with Asian clams given their differing habitat preferences (See AR-1555, p. 20). This analysis too could be affected by the differences in when sampling occurred.

What was not included among the numerous analyses performed was a simple assessment of percent contribution of the dominant taxon with all species, including Asian clams, comparing the ambient section upstream of Merrimack Station's discharge to the thermally-influenced section downstream. As described by Normandeau (See AR-870, p. 3), "The percent contribution of the most abundant taxon to the total number of organisms found in a sample is a measure of balance in the benthic community. If the dominant taxon accounts for a large percentage of the individuals present, it is an indication of stress because the community is dominated by one taxon, whereas unstressed communities typically exhibit a more evenly balanced abundance among several taxa." EPA could not complete such an assessment itself from the data provided in the comments. The Agency expects to require data collection under the Final Permit that will permit such an assessment in the future.

5.8 Asian clams may even be positively impacting Hooksett Pool and its BIP.

Comment II.5.8	**AR-1548, PSNH, pp. 107-108**

"Despite the popular conclusions and suppositions to the contrary . . . Asian clams may actually have *positive*, rather than negative, effects on their ecosystems."[476] This is because all bivalves—even the Asian clam—are considered ecosystem engineers (*i.e.*, organisms that can physically modify the environment). This trait has been recognized as important in scientific journal articles.[477] As explained in the AST Report:

> Asian clam shells can be abundant, persistent, and ubiquitous, thereby improving the physical structure of the substratum of the aquatic habitat for other species. It is commonly accepted that Asian clam shells have positive effects through providing substrate for epibionts, refuge from predation, reducing physical or physiological stress, control transport of solutes and particles in the benthic environment, stabilization of sediment, and through bioturbation of sediments. For example, clam shells form a more stable, complex, sheltered, and heterogeneous habitat that is attractive for several species including other mollusks, algae, freshwater sponges, crustaceans, and insects.[478]

In fact, areas of the Tennessee River with silty sediments previously unsuitable for native bivalves have been transformed by Asian clams into suitable, more stable substrate increasing the presence of native unionid mussels, and other scientists have found that Asian clam shells provided valuable hard substrate for other benthic organisms.[479]

The presence of the Asian clam can be beneficial in other ways, as well:

> Asian clam movement within the top layer of sediments leads to bioturbation. Such bioturbation contributes to substantial changes in abiotic conditions like dissolved oxygen, redox potential, amount of organic matter, particle size, and the like, in a manner typically enhancing habitat conditions for other organisms. Furthermore, high filtration rates by Asian clams remove a wide range of suspended particles having important repercussions for water clarity and subsequent light penetration that apparently benefit submerged plants.[480]

In fact a team of researchers found "'[t]here was no evidence of a negative impact on the distribution of the native bivalve in spite of high measured rates of water clearance by *C. fluminea*'" in one of the few experimental studies examining Asian clam filter feeding effects on native bivalves.[481] Dr. Richardson concludes his analysis on this positive impact from the Asian clam as follows: "In general, consideration of studies on the ecosystem engineering of bivalves, including Asian clams, overwhelmingly suggest that they either have no effect on native benthic invertebrates, *i.e.*, the BIP, or they '. . . mainly have positive effects on the density of benthic invertebrates' and conclude that invasive bivalve species, in general, ' . . . have positive effects on invertebrate density, biomass and species richness.'"[482]

[476] AST Report at 49.

[477] *Id.* (citing three scientific articles).

[478] *Id.* at 49-50 (citation omitted).

[479] *Id.* at 50 (citations omitted).

[480] *Id.* (citations omitted).

[481] *Id.* (quoting L.G. Leff, J.L. Burch, & J. McArthur, *Spatial, Distribution, Seston Removal, and Potential Competitive Interactions of the Bivalves Corbicula fluminea and Elliptio complanata, in a Coastal Plain Stream*, FRESHWATER BIOLOGY 24(2), 409-416 (1990)).

[482] *Id.* at 50-51 (quoting R. Sousa, J.L. Gutiérrez, & D.C. Aldridge, *Non-Indigenous Invasive Bivalves as Ecosystem Engineers*, BIOLOGICAL INVASIONS 11(10), 2367-2385 (2009)).

EPA Response:

The comments suggesting Asian clams may have beneficial effects to Hooksett Pool have not been supported with any site-specific evidence. Benefits could result in some respects, but the only relevant questions are whether Merrimack Station's thermal discharges have contributed to the Asian clams presence and/or prevalence in Hooksett Pool, whether the clams have caused or contributed to appreciable harm to the Hooksett Pool BIP, and whether in light of the Asian clam's presence, variance-based thermal discharge limits will assure the protection and propagation of the BIP going forward. The question of what, if any, the Asian clam's impact on Hooksett Pool's BIP may be is one that will continue to be assessed during the next NPDES permit cycle, as required in the Final Permit.

5.9 Conclusion

Comment II.5.9.1	**AR-1548, PSNH, pp. 109-110**

There is no evidence that the Asian clam's presence in Hooksett Pool is causing harm to the BIP or negatively impacting New Hampshire water quality. First, based on its analysis of the benthic macroinvertebrate community as set forth in its 2012 report, Normandeau confirmed the absence of prior appreciable harm to the Hooksett Pool BIP. Subsequent investigation by EPA and NHDES did not result in a different conclusion. In addition to the flaws in the EPA and NHDES sampling effort and analyses in 2013 and 2014, this very limited investigation did not consider the impact of the Asian clam on native species in Hooksett Pool. The analyses, when performed correctly, reveal the significant fluctuations in Asian clam population from year to year.

While a study to consider the impact of the Asian clam in Hooksett Pool was contemplated by EPA in 2015, the study ultimately was abandoned. AST, in coordination with Normandeau, performed an extensive investigation of the Asian clam in Hooksett Pool to determine the effect of the Asian clam on the BIP of Hooksett Pool. Based on an extensive two-year study following scientifically approved methods and utilizing various EPA approved metrics, Dr. Richardson found a healthy benthic macroinvertebrate community that showed no signs of any harmful impact of the Asian clam on native species or otherwise. This undisputed evidence, coupled with the in-Pool evidence that the Asian clam is simply co-existing with, rather than replacing, native bivalves, demonstrates an absence of prior appreciable harm to the Hooksett Pool BIP or New Hampshire's water quality. As such, there is no lawful or legitimate basis to establish thermal discharge limits for Merrimack Station and/or under New Hampshire water quality standards based on the presence of the Asian clam in Hooksett Pool. The findings of no appreciable harm to the BIP, coupled with substantial questions concerning whether CCC would materially impact the clam's presence in Hooksett Pool, should require no action with respect to CWA § 316(a) except possibly the continued monitoring of the clam's presence in Hooksett Pool.

EPA Response:

EPA disagrees with the comment that there is "no evidence" that the Asian clam's presence in Hooksett Pool has caused harm to the BIP or negatively impacted New Hampshire water quality. Normandeau's 2012 report presents evidence suggesting that this invasive species dominates (or has dominated) Hooksett Pool's benthic habitat sampled by Ponar in the thermally-influenced portion downstream from the plant's discharge (AR-870, p. 14). In its 2016 Water Quality Assessments, NHDES identified this section of Hooksett Pool (Assessment Unit ID NHIMP700060802-02) as (3-PNS) which means "Insufficient information/Potentially Not Attaining Standard." So, while there may be insufficient information to conclude that Asian clams are negatively impacting water quality or the BIP, EPA and NHDES do not agree that there is "no evidence" of possible such effects and both agencies find the existing data sufficiently concerning to warrant additional monitoring.

EPA also disagrees with the comment (at AR-1548, p. 109) that Normandeau confirmed the absence of prior appreciable harm to the Hooksett Pool BIP based on its analysis of the benthic macroinvertebrate community, as set forth in its 2012 report. The <u>quantitative</u> analysis based on Ponar data collected in 2011 of the benthic invertebrate community upstream and downstream of the plant's thermal discharge clearly does not support an absence-of-appreciable-harm finding. Additional data collected in 2014 and 2016 suggest that the clam's dominance in the lower half of Hooksett Pool has diminished but also that their abundance has fluctuated dramatically in those years, so increases in dominance might or might not occur in the future. At the same time, as Asian clam abundance has fluctuated in recent years, Merrimack Station's thermal discharges have been substantially reduced as the Facility has evolved from a baseload generator to one more similar to a peaking facility. It is unclear whether the reduced thermal discharges have affected Asian clam abundance.

After reviewing the reports and comments received, including the report from AST Environmental (AR-1555), as well as other data, including the most recent data, related to Asian clams in Hooksett Pool, EPA has concluded that, on balance, the available evidence suggests Asian clams have not caused or contributed to appreciable harm to the Hooksett Pool BIP, and that concerns about the Asian clam do not prevent EPA from concluding that the Final Permit's thermal discharge limits based on a CWA § 316(a) variance will assure the protection and propagation of the BIP. EPA agrees, however, with the comment (at pp. 109, 110) that additional monitoring of Asian clams in Hooksett Pool is warranted, and as indicated in the comments above, the continued monitoring and assessment of Asian clam's presence, prevalence, and impacts on the BIP will be required to support any future request to renew the Facility's CWA § 316(a) thermal variance. Thus, the Final Permit includes monitoring requirements to address these issues.

Comment II.5.9.2	**AR-1573, CLF et al, p. 9-10**
See Also AR-1574, Nedeau, p. 1-9; AR-1555, AST; AR-1556, PSNH; AR-1548, PSNH; AR-1576, Mitchell et al. (1996)	

The Nedeau Report provides additional evidence that Merrimack Station's thermal discharges have harmed the Hooksett Pool BIP by supporting a strong population of Asian clams down stream of Merrimack Station. Nedeau Report at 3. The Asian Clam is an invasive species, not native to New Hampshire or New England. Even though biologists believed that the cold winter waters in northern New England would prevent the Asian Clam from spreading further north, the species have expanded throughout New England to a surprising extent. The Asian Clam has survived, and spread, by relying on thermal effluent in rivers that are otherwise too cool for over winter survival, and by acclimating and adapting to the cooler waters of southern New England. Nedeau Report at 1-2. Asian Clams were first reported within Merrimack Station's thermal plume in 2012 and it now appears that their population is widespread in the lower Merrimack River watershed. Nedeau Report at 2.

According to the Nedeau Report, "Merrimack Station provided a warm and stable thermal environment; ensured locally high Asian clam growth rate, abundance, and overwinter survival and therefore a more stable source population and provided an opportunity for Asian clams to acclimated and adapt to cooler waters." Nedeau Report at 3. Sampling revealed high densities of Asian Clams and larger individuals near the mouth of the discharge canal and smaller but substantial populations downstream at Hooksett Pool and below the Hooksett Dam. No Asian Clams have been found upstream of Merrimack Station. Nedeau Report at 3. This suggests that "the strong source of population of Asian clams downstream from Merrimack Station *exists solely because of the thermal pollution*." Nedeau Report at 3 (emphasis added). Thus, because a BIP "may not include species whose presence or abundance is attributable to alternative effluent limitations imposed pursuant to section 316(a)," 40 C.F.R. § 125.71(c), Merrimack's role in sustaining a source population of Asian clams within its thermal plume shows that the past thermal discharge has not protected the Hooksett Pool's BIP.

EPA Response:

EPA has reviewed the Nedeau report (AR-1574) agrees with many of CLF's comments. While it's unclear how Asian clams found their way into Hooksett Pool, the abundance of Asian clams downstream from Merrimack Station's thermal discharge appears to be directly related to the Facility's discharge.Despite this apparent relationship, however, studies and analyses submitted to EPA (*see* AR-1555, AR-1556, AR-1548) suggest that the Asian clam has not caused or contributed to appreciable harm to the BIP in Hooksett Pool. In addition, new temperature and operational limits established in the Final Permit should further reduce the potential beneficial influence of the Facility's thermal discharge on Asian clams going forward. That said, the Final Permit includes monitoring requirements to enable further evaluation of this issue in the future, as appropriate.

Comment II.5.9.3	**AR-1688, Super Law Group (on behalf of Sierra Club and CLF), p. 16**

Super Law Group comments that in its 2017 public notice EPA stated that the agency had become "aware of the presence of non-native organisms in Hooksett Pool; in particular, the Asian clam (*Corbicula fluminea*) . . . notably concentrated in areas of Hooksett Pool with water temperatures directly affected by the plant's thermal discharge."[37] EPA stated that it "found this discovery worthy of further research because of the possibility that Merrimack Station's thermal discharge was contributing to the presence and/or prevalence of the Asian clam in the Hooksett Pool and the potential relevance of such a finding to regulating the Facility's thermal discharges" under the Clean Water Act and the requirements in New Hampshire water quality standards for the protection of local aquatic life.[38]

EPA also noted that when the Station is operating, one of its most visible thermal effects can occur during periods in the winter when the river just upstream of the discharge canal is completely ice-covered, but the river is ice-free for miles downstream of the discharge canal, including in the waters of Amoskeag Pool below Hooksett Dam.[39] EPA reviewed scientific publications on the relationship between Asian clams and thermal discharges from power plants, which found that higher winter survival rates of Asian clams occurred within the influence of the power plants' thermal discharge than in ambient areas, and that the elevated temperatures appeared to affect the clam's reproductive success, growth, and abundance.[40]

EPA thus invited public comments addressing the presence of the Asian clam in the Hooksett Pool and the import of this information for setting thermal discharge limits for the Merrimack Station permit under the CWA and/or New Hampshire water quality standards.[41]

EPA Response:

EPA notes that this comment just summarizes EPA's 2017 public notice that addressed, among other things, new information related to the presence of Asian clams in Hooksett Pool, and invited the public to comment on this new information.

6.0 Additional Comments Submitted by Super Law Group LLC (on behalf of Sierra Club and Conservation Law Foundation) Regarding Thermal Discharges After the 2017 Comment Period (AR-1688)

6.1 Executive Summary

Merrimack Station's antiquated once-through cooling system withdraws extremely large volumes of water – nearly 200,000 gallons a minute at its peak – from the Merrimack River and discharges waste heat back to a shallow, confined section of the river, resulting in thermal plumes that harm its fish populations, habitat, and aquatic ecology.

In 2011, EPA issued a draft NPDES permit for the Station. Based on the agency's independent assessment of "compelling evidence of appreciable harm to the balanced, indigenous fish community of Hooksett Pool" caused by the Station's thermal discharge, EPA stated that it must deny the company's application for a variance under CWA section 316(a). The draft permit thus contains thermal discharge requirements commensurate with the Best Available Technology (BAT), closed-cycle cooling, that limit the amount of heat the Station may discharge to the river monthly and annually, as well as additional limitations on the thermal plume. EPA explained the extensive evidence, its decisonmaking process, and why the proposed requirements are necessary to protect water quality in the Hooksett Pool in an extremely detailed and comprehensive discussion spanning more than 200 pages of its permit determinations document.

In 2014, while making other changes to other aspects of the permit, EPA issued a new draft NPDES permit for the Station containing exactly the same thermal discharge provisions as the 2011 draft permit.

In 2017, without issuing a new draft permit, EPA sought public comment on a limited set of questions relating to the 2011 and 2014 draft permits. In particular, EPA stated that it was considering strengthening the permit to add shorter-term thermal conditions (in addition to the monthly and annual heat limits) in order to protect indigenous species that are especially sensitive to short-term temperature excursions. EPA also expressed concern that by heating the river during the winter the Station was increasing the reproductive success, growth, and abundance of an invasive species in the Hooksett Pool, the Asian clam.

In 2018, Granite Shore Power (GSP)[1] acquired the Station. Since then, rather than finalizing the NPDES permit, EPA has instead met with GSP frequently to discuss possible changes to the permit. Documents obtained through the Freedom of Information Act indicate that EPA and GSP have exchanged "discussion drafts" of new thermal discharge requirements for possible inclusion in a revised version of the Station's NPDES permit. Those "discussion draft" provisions differ dramatically from the thermal discharge requirements in the 2011 and 2014 draft permits.

EPA should proceed to issue a final NPDES permit for Merrimack Station with thermal discharge requirements matching those in EPA's 2011 and 2014 drafts. If, however, EPA proposes to depart from its previous drafts and issue a permit fundamentally different from what it proposed twice before, the agency must subject the new draft thermal discharge requirements –

as well as any new evidence, rationale, and conclusions – to public notice and comment. A permit resembling the "discussion draft" recently exchanged between EPA and GSP would plainly not be a "logical outgrowth" of the 2011 and 2014 draft permits. Sierra Club and Conservation Law Foundation hereby request, and are legally entitled to, a formal opportunity to review (with the assistance of their technical experts) and submit comments on any new draft permit provisions that are not a logical extension of the prior drafts.

Furthermore, one set of effluent limitations contained in the Station's existing, 1992, permit – *i.e.*, the limitations restricting the Station's thermal plume, which were continued (with one addition) in the 2011 and 2014 draft permits – must be included in any future draft or final permit for the Station, regardless of any other thermal requirements EPA decides to include. The CWA's anti- backsliding rule prohibits renewed, reissued, or modified NPDES permits from containing effluent limitations less stringent than those in the previous permit.

Accordingly, EPA is foreclosed from removing the thermal plume effluent limitations that have been in the Station's permit since at least 1992 (and which are also in all or virtually all other EPA-issued NPDES permits for power plants located on rivers in New England).

Finally, to avoid decisionmaking that is arbitrary and capricious and therefore impermissible under the APA, EPA must have supporting evidence in the record, make a reasoned determination, and provide an explanation that rationally connects the facts found to the choice made. These essential features of proper agency decisionmaking currently exist for the 2011 permit, but have not been provided for any substantially different permit.

[1] Granite Shore Power LLC and GSP Merrimack LLC are referred to collectively as "GSP."

[2] 40 C.F.R. § 125.84(b)(1).

EPA Response:

In part, this comment recounts some of the history of this permit proceeding's effort to develop thermal discharge limits for the new Merrimack Station permit. While EPA generally agrees with the comment's description of major steps in this history, a few points bear response. The comment focuses on the Facility's maximum rate of water withdrawal and thermal discharge. While EPA agrees that such maximum rates should be considered, and the Agency has done so, EPA also thinks it important to account for when a cooling system operates and when it does not, in addition to considering the rates at which it operates. A facility that operates at a maximum rate every day, as Merrimack Station frequently used to do as a baseload generator, is different from a facility that operates only intermittently, and not necessarily at maximum levels, as Merrimack Station now does and has for the last several years. In EPA's view, these facts should be taken into account in the analysis. Thus, EPA looked hard at the Facility's effects given its varied levels of operations during the year.

In addition, while the comment discusses EPA's analysis in support of the 2011 Draft Permit, the Agency has also explained in these responses to comments that it came to a better understanding of the thermal data *after* 2011. EPA also discussed its new understanding of the data, and invited public comment on the data and its import, in the 2017 Statement. AR 1534, pp. 4, 7, 37-41.

With regard to EPA's 2014 Revised Draft Permit, the Agency expressly stated that the Revised Draft Permit only addressed issues related to setting effluent limits for discharges of Flue Gas Desulfurization (FGD) wastewater. EPA explained that it was doing so because after it issued the 2011 Draft Permit, it learned in 2012 that Merrimack Station had installed a new evaporative treatment system for that wastewater. *See* AR 1135, p. 3. The Agency did not revisit or reissue draft thermal discharge limits at that time. With regard to the 2017 Statement, the comment incorrectly states that "EPA stated that it was considering strengthening the permit to add shorter-term thermal conditions (in addition to the monthly and annual heat limits)." While EPA indicated that it was reconsidering both short-term and long-term thermal effects and how those should be factored into setting permit limits, *see* AR 1534, pp. 39-40, it did not indicate that it had decided that limits on such shorter-term exposures would "strengthen" the permit. EPA simply indicated that it was considering whether such limits should be added to the permit. *Id.*

The commenter then states that after GSP acquired the Facility, EPA met with the company "rather than finalizing the NPDES permit …." While it is true that after GSP acquired Merrimack Station (and other power-generating facilities) from PSNH, EPA met with the company and until now did not issue the Final Permit, EPA disagrees with any implication in the comment that EPA could have defensibly issued the permit at that time if it had chosen to do so and had not met with GSP. The comment period for the Statement of Substantial New Questions did not close until December 18, 2017, *see* AR 1692 (Public Notice of Second Extension of Public Comment Period (Nov. 28, 2017)), and EPA then had to consider the voluminous public comments submitted, including comments submitted by the present commenter. EPA discussions with the company also were needed to clarify for EPA what the new owners' plans were for the Facility, as well as clarifying the record in a variety of respects to help EPA develop a technically sound, legally defensible permit. EPA also notes that while it had discussions and shared information with GSP, it also had discussions and shared information with the commenter. *See* AR-1619; AR-1635; AR-1637; AR-1680; AR-1773; AR-1735; AR-1818. Indeed, EPA also notes that EPA did not require the commenter to submit Freedom of Information Act (FOIA) requests to obtain information concerning EPA's discussions with GSP. Regarding the discussions with GSP, EPA had already created public records documenting these discussions and provided them to the commenter whenever requested, whether the requests were made under the auspices of the FOIA or not. Moreover, to be clear, the law does not prohibit EPA from having such discussions with GSP or the commenter under these circumstances.

As the Final Permit indicates, EPA does not agree with the comment stating that the Final Permit's thermal discharge limits should simply match the 2011 Permit's limits. As explained herein, the facts of Merrimack Station's operations changed, EPA has gathered and received new information and new comments, and the Agency has conducted new analysis in response to this information. To the extent that some of this information was collected or submitted after closure of the last public comment period, EPA could perhaps have chosen to ignore it, but EPA's decision under the facts of this case to consider this information into account was rational and not prohibited. Also, some late-breaking information plainly had to be considered and addressed by the Final Permit, such as the federal court decision that vacated certain of the national ELGs for pollutant discharges from steam-electric power plants. *See Southwestern Elec. Power Co. v. United States Env'l Prot. Agency*, 920 F.3d 999 (5th Cir. 2019).

The commenter also argues that if the Final Permit is patterned after limits identified in "Discussion Drafts" exchanged by EPA and GSP, and reviewed by the commenter, then such limits are "fundamentally different" from the 2011 Draft and would "not be a logical outgrowth" of the 2011 Draft Permit. As a result, according to the commenter, EPA must again reopen the comment period so that it can further review and comment on the limits in the Final Permit and the facts and analysis underlying them. EPA disagrees. Regardless of what was in the Discussion Drafts, the Final Permit's thermal discharge limits are a logical outgrowth of the 2011 Draft Permit and the record developed over the course of this permit proceeding, including the 2017 Statement and the public comments submitted throughout the proceeding.

EPA previously discussed the "logical outgrowth" issue, in general, in the Statement of Substantial New Questions. AR 1534, pp. 10-12. The APA does not require that conditions in a final permit necessarily be subject to a new round of public comment whenever they vary from the conditions proposed in the earlier draft permit. If that was the rule, then agencies would be unable to change permit conditions in response to public comments without first holding a new round of public comment. Such a rule could discourage agencies from fairly considering public comments that might lead changed permit conditions for fear of repeatedly having to reopen the public comment period. *See Conn. Light & Power Co. v. Nuclear Regulatory Com.*, 673 F.2d 525, 533 (1982); *Weyerhaeuser Co. v. Costle*, 590 F.2d 1011, 1031 (1978). What the APA requires is that an agency's notice of a proposed rulemaking set forth "the terms or substance ... or a description of subjects and issues involved" in the proposed rule. *Chemical Manufacturers Ass'n v. U.S. Env'l Prot. Agency*, 80 F.2d 177, 200 (5th Cir. 1989). Put differently, the public notice must "adequately frame the issues for discussion." *Connecticut Light & Power Co. v. NRC*, 218 U.S. App. D.C. 134, 673 F.2d 525, 533 (D.C. Cir. 1982).

EPA's public notices regarding the thermal discharges at issue in this case easily meet this standard. For the 2011 Draft Permit, EPA evaluated the option of controlling thermal discharges by limiting power plant operations but rejected it because Merrimack Station was then a baseload generator and thermal discharges could be controlled technologically without curtailing generation. AR 618, pp. 144-45. EPA also rejected the Facility's request for renewal of its existing CWA § 316(a) variance-based thermal discharge limits reflecting baseload operations, *id.* at 118-21, and, instead, set limits based on the BAT technology standard. *Id.* at 210-16. EPA also determined protective instream temperatures based on the most sensitive fish species (at various life stages) present during the year to ensure satisfaction of New Hampshire water quality standards, *id.* at 212-14, and expressly indicated that it was still considering, and affirmatively invited public comment on the idea of, using these protective instream temperatures to craft water quality-based and/or CWA § 316(a) variance-based limits. *Id.* at 216-17. In addition, in the 2017 Statement, EPA expressly identified that it was considering the import of Merrimack Station's reduced operations for the permit limits, provided notice of data reflecting such reduced operations, and requested public comment on these subjects. AR 1534, pp. 5, 8, 34-36, 39-41, and 68-70. The 2017 Statement also provided notice of, and invited public comment about, new thermal data, EPA's revised understanding of existing thermal data, and additional thermal biological effects analysis addressed in prior public comments and submissions. *Id.* at 36-41.

The Final Permit limits are based on a combination of operational limitations designed to mirror the Facility's current operating profile, along with the critical temperatures to ensure the protection of fish in the river. The effectiveness of EPA's notice is at least partly evidenced by the fact that the commenter provided comments on these subjects in response to the 2017 Statement, which EPA has responded to above. *See* AR 1573. *See also, e.g.,* Comment/Response II.3.2.3 and II.3.4.4. Indeed, the commenter urged that limits could only be based on reduced operations if permit limits restricted the Facility to maintain such reduced operations, which is exactly what the Final Permit does. The commenter also, of course, has submitted the present comment which, although it was submitted outside of the comment period and EPA is not legally required to respond to it, the Agency *has* considered and responded to it here.

In addition, EPA regulations authorize EPA to reopen a comment period when permit changes or additions to the record result in "substantial new questions" that warrant seeking additional public comment. *See* 40 CFR § 124.14. Whether to reopen a comment period for substantial new questions is discretionary with the permitting agency and the EPA's Environmental Appeals Board (EAB) reviews such decisions under an "abuse of discretion" standard. Furthermore, the EAB has explained that it considers the following factors in such a review:

> [i]n exercising its discretion to reopen (or decline to reopen) a public comment period, factors that may inform a permitting authority's decision include: "whether permit conditions have changed, whether new information or new permit conditions were developed in response to comments received during prior proceedings for the permit, whether the record adequately explains the agency's reasoning so that a dissatisfied party can develop a permit appeal, and the significance of adding delay to the particular permit proceedings." *Dominion II*, 13 E.A.D. at 416 n.10 (citing *NE Hub*, 7 E.A.D. at 584-88; *Old Dominion*, 3 E.A.D. at 797-98).

In re City of Palmdale, 15 E.A.D. 700, 715 (2012). For the Merrimack Station permit, the Final Permit's thermal discharge limits are different from those proposed in the Draft Permit but many aspects of the limits have not changed. For the 2011 Draft Permit, EPA rejected a CWA § 316(a) variance request based on renewal of existing limits based on baseload operations. This has not changed. For the 2011 Draft Permit, EPA considered water quality-based limits based on critical temperatures for fish species but ultimately set thermal limits based on the BAT technology standard which led to more stringent requirements. Nevertheless, for the 2011 Draft Permit, EPA indicated that it was still considering the water quality-based limits based on critical temperatures and expressly invited public comment on that option. *See* AR 618, pp. 210-17. For the Final Permit limits, EPA has set thermal limits that are based partly on critical temperatures and partly on operational restrictions to match the Facility's currently limited operations. While the Final Permit limits are new, EPA specifically requested comment on critical temperature-based limits and on the significance of Merrimack Station's reduced operations for setting permit limits. In addition, the new permit limits are based on new information submitted in comments and supporting materials from the public and on information that EPA made available for public review and comment. Furthermore, EPA has well explained its reasoning so that a party can develop an appeal of this decision, if it so chooses. Finally, it is important to avoid any further delay to this permit. The comment itself complains about past delays, and the commenter (Sierra

Club) sued EPA in 2016 complaining of unreasonable delay in issuing the Merrimack Station permit. AR 1534, pp. 8-9. This case was ultimately dismissed by the First Circuit Court of Appeals, but EPA agreed that finalizing this permit was an important priority and the Agency is trying to do just that. Reopening the comment period at this time is neither necessary nor in the public interest.

The comment also states that EPA is barred by CWA "anti-backsliding" requirements from removing the permit's "thermal plume requirements" from the Final Permit. While the comment does not specify which permit provision it is referring to, EPA understands the comment to be referring to Part I.A.1.g of the 1992 Permit, *see* AR 236, p. 3, as well as Part I.A.23 of the 2011 Draft Permit. *See* AR 609, p. 24. EPA disagrees with the comment under the facts of this case. The CWA's anti-backsliding requirements are found in CWA § 402(o), 33 U.S.C. § 1342(o), and, as the comment indicates, these requirements do in many instances preclude new permit provisions less stringent than the corresponding conditions in the prior permit. (The anti-backsliding rule does not, of course, apply to changes between a draft and final permit.) EPA disagrees, however, with the suggestion that the Final Permit's thermal discharge limits are less stringent than the limits in the 1992 Permit. In both cases, the limits are based on a CWA § 316(a) variance but while the 1992 Permit allowed for open-cycle cooling with baseload power plant operations and did not have directly enforceable temperature limits on the discharge, the new Final Permit includes specific temperature and operational limits reflecting the Facility's current, much reduced operations.

In addition, even if the commenter was correct that the Final Permit's thermal discharge limits are less stringent than those in the 1992 Permit, the CWA specifies certain exceptions to the anti-backsliding requirements and one of those exceptions applies here. Specifically, CWA § 402(o)(2)(D), 33 U.S.C. § 1342(o)(2)(D), provides that a subsequent permit may be issued with less stringent conditions if "the permittee has received a permit modification under section … 316(a)." That is what has happened here. The Final Permit changes the thermal discharge limits from those included in the 1992 Permit, as well as from the limits proposed in the 2011 Draft Permit, and the new limits are based on a variance under CWA § 316(a). EPA has determined that the Final Permit's stringent numeric thermal discharge limits will assure the protection and propagation of the BIP and that the narrative thermal plume provisions are not needed and could create confusion over whether the Facility is in compliance with the permit. For example, in a case in which the Facility is meeting the permit's numeric limits and the BIP is protected, but data indicates that the thermal plume has reached the surrounding shoreline, there could be uncertainty over whether the permittee has violated the permit. EPA believes the central issue under CWA § 316(a) is to assure the protection and propagation of the BIP and EPA concludes that the Final Permit's stringent numeric permit limits will do so. EPA's decision is based on a careful, site-specific analysis for this permit under CWA § 316(a). Whether such narrative thermal plume provisions may be appropriate for other permits is a separate question to be addressed for each individual permit on a case-specific basis.

EPA's record provides a fully adequate, rational basis for the Final Permit.

6.2 EPA Should Issue a Final NPDES Permit Consistent with its 2011 Thermal Determinations and the 2011/2014 Drafts, Without Further Delay

For the following reasons, we ask that EPA proceed to finalize the thermal discharge permit requirements the agency first issued in draft form in 2011.

The Merrimack Station, built in the 1960s, utilizes an antiquated, once- through cooling system. Since 2001, virtually all new power plants have been required to have closed-cycle cooling systems.[2] But even before that requirement became law, the power industry was rapidly moving to closed-cycle cooling. Roughly three-quarters of the coal-fired power plants and all of the large combined- cycle power plants built in the 1980s and 1990s have closed-cycle cooling systems.[3] As we enter the third decade of the 21st century, the Merrimack Station still lacks cooling technology that became commonplace in the last quarter of the last century.

Once-through cooling systems like that at the Station withdraw massive volumes of water from natural waterbodies and discharge their waste heat back to the same waterbody, creating thermal plumes that cause adverse environmental effects. The once-through cooling system at Merrimack Station withdraws nearly 200,000 gallons per minute (287 million gallons per day) from the Merrimack River and returns that water, heated well above ambient temperatures, to the River's Hooksett Pool, where it causes extensive harm to aquatic life and its habitat.

[3] 66 Fed. Reg. 28853, 28855-56 (May 25, 2001).

EPA Response:

EPA agrees that once-through cooling system operations can potentially harm aquatic ecosystems and aquatic life, but the type and extent of the effects vary based on site-specific considerations. In addition, to be clear, EPA notes that the general requirement for closed-cycle cooling for new facilities cited by the comment, *see* 40 CFR Part 125, Subpart I, is related to cooling water intake structures, not thermal discharges, and does not apply to Merrimack Station, which is an existing facility. That said, retrofitting from open-cycle to closed-cycle cooling is possible and could be required on a case-by-case basis to address either cooling water intake structures, thermal discharges, or both. *See* 40 CFR § 125.3(c) (setting effluent limits on a BPJ basis) and 40 CFR § Part 125, Subpart J (cooling water intake structure regulations for existing facilities). Therefore, consistent with applicable legal requirements, EPA has considered on a site-specific basis setting NPDES permit requirements based on closed-cycle cooling for Merrimack Station's thermal discharges, cooling water intake structures, or both.

Indeed, for the 2011 Draft Permit, EPA proposed technology-based thermal discharge limits based on retrofitted closed-cycle cooling constituting the BAT for the Facility, while also indicating that it was still considering additional options. After considering public comments, changed circumstances since the 2011 Draft Permit, and additional data and analysis, EPA has now decided instead to set thermal discharge limits for the Final Permit based on a CWA §

316(a) variance with stringent limits that recognize and require Merrimack Station's operation like a peaking plant, rather than as a baseload plant, as it was at the time of the 2011 Draft Permit. EPA's variance decision for the Final Permit is explained in these Responses to Comments. EPA's decision under CWA § 316(b) is also discussed in these Responses to Comments.

6.2.1 The Hooksett Pool's Aquatic Habitat Is "Particularly Vulnerable" to the Effects of the Station's Thermal Discharges

The Merrimack River is an important public resource, prized by communities in New Hampshire and Massachusetts for its wildlife, aesthetic values, prominent role in the history of the region, and for the fishing, boating and other recreational opportunities it affords. The Hooksett Pool is a relatively shallow, short, and slow- moving river impoundment, extending approximately 5.8 miles downstream from Garvin's Falls Dam to Hooksett Dam. As EPA itself has explained: "These characteristics make the aquatic habitat in Hooksett Pool particularly vulnerable to the effects of Merrimack Station's thermal discharge."[4]

Because the river's flow in Hooksett Pond is sometimes less than the 200,000 gallons per minute withdrawn by the Station's cooling system, the Station has the capacity to utilize more than 100 percent of the river volume during coincident periods of low flow and maximum power generation.[5] While the Station has not reported an incident recently where 100 percent of the pool's available flow was required for cooling water purposes, EPA calculated that the plant may have withdrawn approximately 95 percent of the available river flow at times.[6] More typically, the Station redirects up to 62 percent of the available river flow under low-flow conditions. "EPA regards this to be a large fraction of the available river flow."[7] The enormous volumes of water withdrawn from the river by the Station are discharged back into Hooksett Pool at temperatures up to 104°F (40°C) under peak summer conditions.[8]

[4] EPA Region 1 - New England, 2011 Fact Sheet, Attachment D, *Clean Water Act NPDES Permitting Determinations for the Thermal Discharge and Cooling Water Intake Structures at Merrimack Station in Bow, New Hampshire, NPDES Permit No. NH 0001465* (hereinafter, "2011 Thermal Determinations") at 37.

[5] 2011 Thermal Determinations at 37. In such conditions, water from the Station's discharge canal may flow upstream. *Id*. at 37-38.

[6] 2011 Thermal Determinations at 38.

[7] 2011 Thermal Determinations at 38.

[8] 2011 Thermal Determinations at 38.

EPA Response:

EPA agrees with this comment's characterization of both the importance of the Merrimack River and the character of the Hooksett Pool as a relatively shallow, slow-moving impounded section of the river. With respect to Merrimack Station's potential to use for cooling a large portion of the Hooksett Pool's flow during low-water periods in the river, EPA agrees that when operating at full capacity the Facility could do that under low river flow conditions, but it must also be understood that the Facility is no longer a baseload power plant and such withdrawals would be unusual now. Discharge monitoring reports from 2012 through 2019 indicate that on a daily basis (*i.e.*, maximum daily flow), the Facility has on occasion withdrawn up to 257 MGD (398 cfs or 68% of the 7Q10 low flow) during April through September. The Facility's average monthly flow for this period is substantially less, however, and supports EPA's conclusion that withdrawals as high as 62% of the low flow are no longer at all typical. For the months of April through September from 2012 through 2019, Merrimack Station's average monthly withdrawal was typically less than 10% of the 7Q10 low flow. As a result, EPA does not expect this to be a problem for the Hooksett Pool going forward.

6.2.2 The Station's Existing Permit Is Based on a CWA § 316(a) Variance Granted by EPA in 1992 without Independent Evaluation and Lack Numeric Maximum Temperature Limits, but Includes Important Effluent Limitations on the Thermal Plume

GSP currently operates Merrimack Station under the terms of a 1992 NPDES permit (the "1992 Permit") that expired in 1997, but has been administratively continued for more than twenty-two years. The thermal discharge provisions in the 1992 Permit were based on a variance EPA granted in 1992 under CWA section 316(a), which permits the Station to operate without complying with numeric effluent limitations on thermal discharge based on the level of control achievable through use of the best available technology (BAT). The 1992 Permit also regulates thermal discharges under New Hampshire water quality standards.

EPA has frankly admitted that "EPA's previous 316(a) variance request determinations appear to have relied heavily on Merrimack Station's interpretation of its own data in assessing thermal impacts to Hooksett Pool" and that the agency had not, until 2011, "conducted a detailed independent evaluation."[9]

[9] 2011 Thermal Determinations at 28; *see also id*. at 27 (agency's prior CWA "§ 316(a) variance determinations seem to have relied predominantly on the plant's assessment of the thermal discharge's impacts to Hooksett Pool based on the facility's assessment of its own data").

EPA Response:

EPA agrees that the 1992 Permit's thermal discharge requirements were based on a CWA § 316(a) variance and state water quality standards. AR 618, p.14; AR 112, p. 10. Specifically, the 1992 Permit includes certain narrative provisions based on state water quality standards and that address thermal discharges, and other aspects of the facility's operations. *See, e.g.,* AR 618, p. 14 ("Among other limitations, the permit again specified that discharges should not violate any applicable water quality standards. See 1992 Permit, Part I.A.1.b.").

Finally, EPA agrees that it did a careful analysis of thermal discharges for the 2011 Draft Permit. The Agency has done so again for the Final Permit.

6.2.2 (i) The 1992 Permit lacks numeric maximum discharge temperature limits.

The 1992 Permit contains no numeric maximum discharge temperature limits. As EPA admits, the absence of numeric maximum discharge temperature limits is "unusual, perhaps even unique" as compared with the permits for other large power plants in New England.[10] EPA Region 1 has issued NPDES permits with numeric maximum discharge temperature limits for the Brayton Point station in Massachusetts, the Vermont Yankee station in Vermont, and the Seabrook Station and Newington Energy station in New Hampshire, among others.[11]

[10] 2011 Thermal Determinations at 27.

[11] 2011 Thermal Determinations at 27.

EPA Response:

EPA agrees with this comment, which simply recounts matters that EPA discussed in the record for the 2011 Draft Permit. *See* AR 618, p. 27. EPA also notes, however, that the new Final Permit contains stringent numeric thermal discharges limits.

6.2.2 (ii) The 1992 Permit's "power spray module" conditions are inadequate, do not prohibit excess temperatures, and have not been complied with.

Instead of numeric temperature limits above which discharges are prohibited, the 1992 Permit contains other temperature-related provisions. One such permit provision requires that when temperature criteria specified in the permit are reached, the plant must operate its "power spray module" (PSM) system designed to cool the heated water in the Station's discharge canal before it reaches the main stem of the river.[12] This condition was originally included in the Station's 1979 NPDES permit, retained in later permits, and "intended to protect cold water fisheries."[13]

However, the PSM condition does not prohibit thermal discharges when certain temperature thresholds are exceeded; it only requires operation of the PSMs under such circumstances. Moreover, as EPA has acknowledged, the PSM system has "limited cooling capacity"[14] and in-river temperature criteria in the PSM provision "have regularly been exceeded in the summer."[15]

EPA Response:

In response, EPA notes that the new Final Permit contains stringent numeric thermal discharges limits. *See* Response to Comment II.3.4 (and associated sub-comments). The temperatures limits are more stringent than the 1992 Permit's conditions on operation of the power spray module. The Permittee may operate the PSMs in order to meet the in-stream temperature limits but the Final Permit requires compliance with the numeric temperature limits.

6.2.2 (iii) The 1992 Permit contains important effluent limitations on the thermal plume designed to protect the Merrimack River and achieve compliance with water quality standards.

While it lacks numeric maximum temperature limits, the 1992 Permit does contain important effluent limitations restricting the thermal plume. Specifically, the permit requires that "[t]he combined thermal plumes for the station shall: (a) not block the zone of fish passage, (b) not change the balanced indigenous population of the receiving water, and (c) have minimal contact with the surrounding shorelines.[16]

These effluent limitations are a common – indeed, nearly ubiquitous – feature of EPA-issued power plant NPDES permits in New England, especially for power plants that discharge thermal plumes into rivers, whether or not those permits contain numeric maximum temperature limits. (See further discussion below.)

The 1992 Permit also specifies that discharges should not violate any applicable water quality standards. The permit states:

> The discharges shall not jeopardize any Class B use of the Merrimack River and shall not violate applicable water quality standards. Pollutants which are not limited by this permit, but which have been specifically disclosed in the permit application, may be discharged at the frequency and level disclosed in the application, provided that such discharge does not violate section 307 or 311 of the Act or applicable water quality standards.[17]

Permit provisions like this, prohibiting violations of state water quality standards, are also a standard feature of NPDES permits, not only for thermal discharges from power plants but also for pollutant discharges from facilities of all kinds. They serve an important function by explicitly incorporating state water quality standards into NPDES permits, especially where the balance of the permit's provisions does not otherwise assure compliance with those standards. In New Hampshire, applicable water quality standards for Class B waters like the Merrimack River include narrative protections for aquatic life, species diversity, habitat, and recreational uses like fishing, as well as numeric limits on dissolved oxygen.[18]

[12] 2011 Thermal Determinations at 27. Specifically, the 1992 Permit states: "The power spray module system (PSM) shall be operated, as necessary, to maintain either a mixing zone (Station S-4) river temperature not in excess of 69°F, or a station N-10 to S-4 change in temperature (Delta-T) of not more than 1°F when the N-10 ambient river temperature exceeds 68°F. All available PSM's shall be operated when the S-4 river temperature exceeds both of the above criteria." *Id*., 1992 Permit at 11.b.

[13] 2011 Thermal Determinations at 27.

[14] 2011 Thermal Determinations at 134 ("The limited cooling capacity of the PSM system is illustrated by the hypothetical permit conditions that PSNH says Merrimack Station could meet. According to PSNH, if a new permit were written with an enforceable limit on the ΔT between Stations N-10 and S-4, the allowed temperature differential would have to be *at least 19°F* in order for the plant to be able to comply with the permit at bounding low river flow conditions with the existing canal and PSM configuration. PSNH November 2007 CWA § 308 Response at ix.") (emphasis in original).

[15] 2011 Thermal Determinations at vii. *Id*. at 28 ("[T]he permit record does not indicate that any attempt was ever made to verify that the target temperatures were being achieved. EPA's present review of over 20 years of temperature monitoring data has demonstrated that, at least during summer months, the target temperatures have not been maintained.").

[16] 1992 Permit, Part I.A ("Effluent limitations and Monitoring Requirements") atI.A.1.g.

[17] 1992 Permit, Part I.A ("Effluent limitations and Monitoring Requirements") atI.A.1.b.

[18] *See, e.g.,* N.H. Rev. Stat. Ann. § 485-A:8(II); N.H. Code R. Env-Wq § 1703.01(b), 1703.07(b), 1703.19(a), (b).

EPA Response:

EPA agrees that the permit condition quoted in the comment, which requires compliance with applicable water quality standards and not jeopardizing designated uses of the receiving water, was in the 1992 Permit, the 2011 Draft Permit, and is frequently, if not always, included in NPDES Permits issued by EPA Region 1. *See* AR 609, p. 23 (Part I.A.14); AR 236, p. 2 (Part I.A.1.b). EPA received no written comments asking for this permit provision to be dropped from the 2011 Draft Permit and EPA has retained it for the Final Permit. GSP has verbally suggested to EPA, in discussions after the close of the comment period, that the narrative water quality-related provisions are not needed if EPA sets thermal discharge limits based on a CWA § 316(a) variance *from water quality standards*. EPA agrees with GSP's comment in this regard as far as it goes, but the permit provision in question, however, addresses compliance with water quality standards beyond those related to thermal conditions and effects. The permit provision pertains to New Hampshire's water quality standards other than thermal discharges, which includes requirements such as, for example, maintaining certain levels of dissolved oxygen in the water and not discharging pollutants that would cause odors. *See* N.H. Code R. Env-Wq 1703.7 and 1703.12. This broad narrative provision is also consistent with, though not mandated by, CWA § 301(b)(1)(C), 33 U.S.C. § 1311(b)(1)(C) and is commonly included in NPDES permits issued by Region 1. EPA has decided to retain it here (see Final Permit, I.A.12), with some small changes to the language to match the Region's current practice with its permits, generally.

The comment also refers to the additional, multi-part narrative provision specifically addressing the Facility's thermal discharge that was included in the 1992 Permit and, somewhat modified, in the 2011 Draft Permit. The 1992 Permit, AR 236, p. 3 (Part I.A.1.g), provides that:

> [t]he combined thermal plumes for the station shall; (a) not block zone of fish passage, (b) not change the balanced, indigenous population of the receiving water; and (c) have minimal contact with the surrounding shorelines.

Similarly, the 2011 Draft Permit, AR 609, p. 25 (Part I.A.23), provided that:

> [a]ny thermal plume from Outfall 004D (intake de-icing water) or 003 (Discharge Canal) at Merrimack Station shall (a) not block zone of fish passage, (b) not change the balanced, indigenous population of organisms utilizing the receiving water, (c) have minimal contact with the surrounding shorelines, and (d) not cause acute lethality to swimming or drifting organisms, including those entering the discharge canal at Outfall 003.

These narrative permit conditions provided additional requirements specifically for the Facility's thermal discharge and, in essence, "backstopped" the permits' other thermal requirements in certain ways. *See* AR 112, p. 10. Based on its CWA § 316(a) variance determination, however, EPA has decided that these narrative conditions are no longer needed for the Final Permit.

The additional backstopping provisions made some sense for the 1992 permit because a CWA § 316(a) variance was being granted in the absence of detailed thermal data and analysis, as the commenter has noted farther above. *See also* AR 112, p. 10. Indeed, due to the limited available information, the 1992 Permit clearly also required a great deal of information gathering to support developing an understanding of the thermal discharge and its effects. *See* AR 236, pp. 18-20 (Parts I.A.11.a, I.A.16-20). Under these circumstances, EPA and NHDES included the additional provisions to support the CWA § 316(a) variance determination.

The 2011 Draft Permit's proposed thermal discharge limits were not, however, based on a CWA § 316(a) variance. They were based on the application of BAT technology-based requirements and water quality requirements. More specifically, the 2011 Draft Permit included technology-based numeric thermal discharge limits, but also proposed the narrative provisions to ensure that state water quality thermal requirements would also be satisfied, as required under CWA § 301(b)(1)(C). *See* AR 608, pp. 50-51.

Now, for the Final Permit, EPA has set stringent, specific thermal discharge limits based on a CWA § 316(a) variance that recognizes and is premised on the Facility's much reduced operations over the last several years. EPA has also determined after an extensive, detailed analysis that these thermal discharge limits will assure the protection and propagation of the Hooksett Pool's BIP. As a result, EPA concludes that the additional narrative, water quality-based provisions are no longer needed. The Final Permit also requires significant thermal and biological monitoring. If it turns out that the Final Permit's thermal discharge limits are not adequately protective, they can be appropriately tightened in the future.

The commenter suggests that retaining the narrative provisions "… serve[s] an important function by explicitly incorporating state water quality standards into NPDES permits, especially where the balance of the permit's provisions does not otherwise assure compliance with those standards." As discussed above, with regard to satisfying state water quality standards generally, EPA agrees with the comment and has retained the general narrative provision requiring compliance with state water quality standards. With regard to the narrative provisions focused on thermal discharge, however, EPA has not retained those provisions for the reasons explained above. The Final Permit's thermal discharge limits are based on a CWA § 316(a), 33 U.S.C. § 1326(a), variance *from* technology-based and water quality-based requirements under CWA § 301, 33 U.S.C. § 1311. As a result, narrative provisions designed to ensure compliance with thermal impact-related state water quality standards are not needed. EPA notes that, as discussed in the 2011 Draft Determinations Document, AR 618, pp. 216-17, the standards of CWA § 316(a) and the biologically-oriented criteria in New Hampshire's water quality standards overlap considerably. Therefore, in deciding that the Final Permit's thermal discharge limits satisfy CWA § 316(a), EPA expects that these biologically-oriented water quality criteria will also be satisfied. Notably, New Hampshire's certification under CWA § 401(a), 33 U.S.C. § 1341(a), does not call for those provisions to be retained.

Finally, the comment suggests that the narrative provisions addressing thermal discharges should be retained because they are a "nearly ubiquitous" feature of EPA permits regulating thermal discharges. While EPA agrees that they have been a common provision, the Agency also notes that they have in the past not been included in other permits with thermal limits based on detailed analysis under CWA § 316(a), such as, for example, for the permit for Brayton Point Station. EPA's reasoning for the Brayton Point Station permit is similar to that provided above for the Merrimack Station permit. https://www3.epa.gov/region1/npdes/braytonpoint/pdfs/finalpermit/BraytonPointFinalPermit.pdf . *See also* Final Permits for Kendall Station (Cambridge, MA), https://www3.epa.gov/region1/npdes/permits/2010/finalmodma0004898permit.pdf, and General Electric Aviation (Lynn, MA), https://www3.epa.gov/region1/npdes/permits/2015/finalma0003905permitmod.pdf.

In sum, the narrative permit requirement calling for compliance with water quality standards generally is, indeed, a common feature of EPA Region 1 permits and is being retained in the Final Permit (*see* Final Permit I.A.12) to address non-thermal water quality considerations. With regard to thermal discharges, however, the Final Permit's limits are based on a CWA § 316(a) variance (from technology-based and water quality-based requirements) and, therefore, there is no need to retain the 2011 Draft Permit's thermally-oriented narrative provisions. Instead, the Facility will need to comply with the Final Permit's specific thermal variance-based requirements.

6.2.3 In 2011, EPA Rejected Merrimack Station's Request for a Thermal Discharge Variance and Issued a Draft NPDES Permit Setting Maximum Temperature Discharge Limits Based on the Best Available Technology, Closed-Cycle Cooling.

The Station's former owner, Public Service of New Hampshire ("PSNH"), now doing business as Eversource Energy, requested renewal of its thermal discharge variance under CWA section 316(a) and requested a new permit "with thermal discharge conditions matching those in the existing permit."[19] In reviewing the Station's renewal application and issuing a draft permit in 2011, EPA noted that, rather than merely relying on the company's interpretation of its own data in assessing thermal impacts to Hooksett Pool (as it had done in the past), the agency "considered the plant's data and analyses, but . . . also . . . conducted a detailed independent evaluation of existing and new information . . . [and] coordinated with both state and federal scientists and regulators."[20]

EPA's "detailed independent evaluation" yielded numerous important conclusions and findings of fact, including that:

- PSNH failed to demonstrate that Merrimack Station's thermal discharge has not caused appreciable harm to the Hooksett Pool's "balanced indigenous population" of shellfish, fish, and wildlife in and on the body of water into which the discharge is made (hereinafter, the "BIP");

- To the contrary, the "evidence as a whole indicates that Merrimack Station's thermal discharge *has* caused, or contributed to, appreciable harm to Hooksett Pool's BIP."

For example:

- "The Hooksett Pool fish community has shifted from a mix of warm and coolwater species to a community now dominated by thermally- tolerant species";

- "The abundance for all species combined that comprised the BIP in the 1960's has declined by 94 percent;" and

- "The abundance of some thermally-sensitive resident species, such as yellow perch, has significantly declined."

- PSNH did not demonstrate that thermal discharge limits consistent with once-through (or open-cycle) cooling would reasonably assure the protection and propagation of the BIP.

- PSNH did not demonstrate that thermal discharge limits based on applicable technology-based and water quality-based requirements would be more stringent than necessary to assure the protection and propagation of the BIP.[21]

EPA therefore "determined that it *must reject* Merrimack Station's request for a CWA § 316(a) thermal discharge variance."[22]

EPA's 2011 analysis was described at length over more than 200 pages in a permitting determination document for the Station's thermal discharges (and cooling water intake structures). In that assessment EPA found "*compelling evidence of appreciable harm to the balanced, indigenous fish community of Hooksett Pool*."[23] EPA elaborated on this "compelling evidence" as follows:

> EPA concludes that the capacity of the plant's thermal discharge to adversely impact the balanced, indigenous fish community of Hooksett Pool is significant. The weight of evidence provided in Merrimack Station's Fisheries Analysis Report and earlier reports points to a significant shift in the fish community away from what was the balanced, indigenous community of the 1960s and early 1970s, to the more heat-tolerant community that exists today. In addition, not only has the fish community composition changed substantially, but sampling data suggests that overall fish abundance has dropped significantly, as well. Such a shift in community and in overall abundance indicates a degraded habitat no longer able to support the fish community that existed in the 1960s, or early 1970s. Changes in the fish community exceed those expected from natural variation alone. Introductions of fish species since the 1970s, whether intentional or accidental, have no doubt affected the resident, indigenous fish community. However, since virtually all are warmwater species, their ability to compete successfully with temperature-sensitive indigenous species may also be a consequence of Merrimack Station's thermal discharge.[24]

EPA also summarized some of the more notable evidence of Merrimack Station's thermal effects on the balanced, indigenous community, including:

1. "During summer low-flow conditions, Merrimack Station's thermal plume can extend from the end of the Discharge Canal . . . approximately 2.9 miles to . . . just above Hooksett Dam. This represents approximately 50 percent of the surface area of Hooksett Pool. Elevated temperatures attributable to Merrimack Station's thermal discharge are also recorded . . . immediately downstream of Hooksett Dam."

2. "Given the relatively shallow depths of Hooksett Pool (generally 10 feet or less), the thermal plume can affect one- to two-thirds of the water column in the deepest areas during summer conditions. Most, if not all, of the shallower areas along the shorelines can be affected by the thermal plume downstream from the discharge. These shallow shoreline areas are important habitat for juvenile fish."

3. "Based on a 21-year data set . . . water temperature[s] reached or exceeded 100ºF (37.8ºC) . . . in July and August, with the highest temperature reaching 104ºF (40.0ºC)."

4. "The thermal plume extends across the entire width of Hooksett Pool during typical summer conditions. As a result, surface- oriented organisms, including larval yellow perch, white sucker, and American shad, which have limited or no ability to avoid stressful thermal conditions, are exposed to plume temperatures while drifting past the discharge canal that have been demonstrated in controlled studies to cause acute lethality to these species."

5. "Under extreme low-flow conditions, Merrimack Station presently redirects up to 83 percent of the Merrimack River flow through the plant . . . Under these conditions, the discharged water can be up to 23.8°F (13.1°C) warmer than ambient temperatures in the river."

6. "Following the start-up of Unit 2 in 1968, the plant's design withdrawal rate was 286 [million gallons per day] of river water. . . At that rate, and using the same [lowest average discharge], the plant would have been withdrawing 75 percent of the total river flow under low-flow conditions. Shorter periods of extreme low flows have resulted in the withdrawal of even a greater percentage of the river's available flow for cooling [which] has caused the heated water from the discharge canal to flow upstream in Hooksett Pool . . ."

7. "Dissolved oxygen ('DO') studies revealed low-DO conditions immediately above Hooksett Dam. The study, conducted by PSNH, stated that the thermal plume from Merrimack Station caused stratification that contributed to low-DO conditions."

8. "Once-abundant populations of coolwater species, such as yellow perch and white sucker, have significantly declined since the 1960s and 1970s. Heat-tolerant species such as bluegill, largemouth bass and smallmouth bass, now

dominate."

9. "Yellow perch and white sucker largely avoided areas of the Hooksett Pool experiencing elevated temperatures associated with Merrimack Station's thermal discharge during August and September."

10. "Thermal conditions created by Merrimack Station's plume are not protective of juvenile alewife during August and early September."

11. "A comparison between the fish communities in Hooksett Pool and Vernon Pool (Connecticut River) demonstrates that temperature-sensitive species such as yellow perch have been competing successfully with introduced heat-tolerant species such as bluegill in the Vernon Pool, but not in the Hooksett Pool. Similarly, data collected by [New Hampshire Fish and Game Department] in 2007 suggests that the yellow perch population just upstream of Hooksett Pool is robust relative to otherspecies, including bluegill."

12. "The attraction of yellow perch to the thermal plume during colder months has been documented, which has potential implications for the species' ability to successfully reproduce following prolonged exposure to the warmer water."

13. "In addition to affecting fish directly, the rise in temperature of the cooling water has a significant effect on the plankton suspended in it downstream from the discharge, according to studies conducted in the 1960s for Merrimack Station. Zooplankton . . . which are important forage for larval and juvenile fish, were among the most susceptible. A significant fraction of the zooplankton forage base is likely exposed to high temperatures (often exceeding 100 degrees during the summer) and physical stressors, particularly under low-flow conditions when up to 83 percent of the river water is drawn into the plant, heated, and discharged back into the river."[25]

After rejecting PSNH's request for a CWA section 316(a) variance, based on that "compelling evidence," EPA determined that "converting the current open-cycle cooling system to a closed-cycle cooling system using 'wet' cooling towers" is the Best Available Technology (BAT) for thermal discharges at Merrimack Station.[26] EPA noted that closed-cycle cooling technology "could reduce the thermal discharge from Merrimack Station into Hooksett Pool by approximately 99.5%."[27] Based on this determination, EPA developed a set of thermal discharge limits consistent with the use of closed-cycle cooling technology. In particular, EPA established heat limits, expressed as the maximum amount of BTUs (British Thermal Units) the Station may add to the river in each month of the year, as well as an annual limit. Those limits were included in the draft NPDES permit that EPA issued for public comment on September 30, 2011 (hereinafter, the "2011 Draft Permit").

In addition, Part I.A.23 of the 2011 Draft Permit includes the effluent limitations on the thermal plume that are in the 1992 Permit with one additional restriction in subsection (d):

> Any thermal plume from Outfall 004D (intake de-icing water) or 003 (Discharge Canal) at Merrimack Station shall (a) not block the zone of fish passage, (b) not change the balanced indigenous population of organisms utilizing the receiving water, (c) have minimal contact with the surrounding shorelines, and (d) *not cause acute lethality to swimming or drifting organisms, including those entering the discharge canal at Outfall 003*.[28]

Likewise, Part I.A.14 of the 2011 Draft Permit includes the effluent limitation prohibiting violations of state water quality standards, almost verbatim from the 1992 Permit, with the addition that neither discharges, *nor water withdrawals*, from the Station may impair designated uses or violate state standards:

> Discharges and water withdrawals from Merrimack Station shall not jeopardize or impair any Class B use of the Merrimack River and shall not cause a violation of the water quality standards of the receiving water. Pollutants which are not limited by this permit, but which have been specifically disclosed in the permit application, may be discharged at the frequency and level disclosed in the application, provided that such discharge does not violate Clean Water Act Sections 307 or 311, or applicable water quality standards.[29]

[19] 2011 Thermal Determinations at viii.

[20] 2011 Thermal Determinations at 28-29

[21] 2011 Thermal Determinations at viii.

[22] 2011 Thermal Determinations at ix (emphasis added).

[23] 2011 Thermal Determinations at 118 (emphasis added).

[24] 2011 Thermal Determinations at 118.

[25] 2011 Thermal Determinations at 118-120.

[26] 2011 Thermal Determinations at 122.

[27] 2011 Thermal Determinations at 122.

[28] 2011 Draft Permit (NPDES Permit No. NH0001465) at Part I.A.23, Page 25 of 29 (emphasis added)

[29] 2011 Draft Permit (NPDES Permit No. NH0001465) at Part I.A.14, Page 23 of 29.

EPA Response:

This comment points to specific concerns EPA outlined in its draft permit determination related to Merrimack Station's thermal discharge and related impacts to the Hooksett Pool BIP. EPA stands by its initial conclusions that, based on all the information provided to the agency in support of the plant's §316(a) variance request prior to the release the Draft Permit in September 2011, the company, then PSNH, had failed to demonstrate that its past thermal discharges under the 1992 Permit had not caused appreciable harm to the BIP. The examples identified in the comment above represented some of the more conspicuous evidence in support of that conclusion. The Final Permit does not change this because, although EPA is basing the Final Permit's limits on a CWA § 316(a) variance, this variance is based on the limited thermal discharges associated with the Facility's much reduced operations, rather than on the baseload operations that prevailed in the past.

Since issuance of the 2011 Draft Permit, EPA has considered a large volume of public comments and additional information and analysis on the thermal discharge issues. Moreover, the additional public comment period for the 2017 Statement also addresses these, as well as other, issues. The comments and new information prompted EPA to re-evaluate its initial analysis and the data upon which it was based. As mentioned above, since the 2011 Draft Permit was issued, Merrimack Station's frequency of operation has dropped steadily and dramatically, especially during the summer months when its capacity to affect the Hooksett Pool aquatic community is the greatest. This reduction in operations was one of the topics that EPA discussed and sought public comment on in the 2017 Statement.

EPA attempts to fully explain in this document how the comments and new information received, in combination with the reduction in plant operations, has informed its decision to modify the Final Permit's thermal discharge limits from those proposed in the Draft Permit. While the 2011 Draft Permit's limits were based on technology and water quality standards, and the rejection of the Facility's request for renewal of the existing CWA § 316(a) variance that, in effect, allowed baseload, open-cycle operations, the Final Permit's limits are based on a CWA § 316(a) variance to authorize the thermal discharges associated with the Facility's current, much reduced operations. The details of how the Final Permit's limits will protect the BIP are described elsewhere in this document. See Responses to Comments II.3.1.3, II.3.4, III.4.5, III.4.6, and III.4.7 (and associated sub-comments.

6.2.4 In 2014, EPA Re-Issued the Draft NPDES Permit with No Changes to any of the Thermal Discharge Requirements

Three years later, in 2014, EPA issued a second version of the Merrimack Station's draft permit for public comment (hereinafter, the "2014 Draft Permit"). In the 2014 Draft Permit, EPA revised its determination of Best Available Technology for discharges of a wastewater stream *other* than thermal discharges from the Station's cooling system. Specifically, EPA determined that, based on public comments received during the comment period on 2011 Draft Permit and additional information the agency had gathered since then, vapor compression evaporation (VCE) technology is BAT for the Station's discharges of wastewater from its wet flue-gas desulfurization (FGD) scrubber. EPA thus gave public notice that it was reconsidering and revising particular provisions of the 2011 Draft Permit, specifically the effluent limits and reporting requirements for Outfall 003C at Part I.A.4 and for Outfall 003A at Part I.A.2 of the draft permit.

Significantly, despite having also received substantial comments from PSNH in objection to the thermal discharge determinations EPA made in 2011, EPA did *not* state in its 2014 public notice, or in the 2014 Draft Permit, or in its fact sheet, that EPA was reconsidering, revising, or reopening any of its thermal discharges determinations or permit provisions.

Indeed, the 2014 Draft Permit issued for public comment retains all of the thermal discharge effluent limitations – those based on closed-cycle cooling, as well as the effluent limitations that restrict the thermal plume and the prohibition against violating state water quality standards – verbatim from the 2011 Draft Permit.

EPA Response:

The comment is correct that EPA's 2014 Revised Draft Permit only reopened, discussed, provided information about, and sought comment on, the permit's effluent limits for discharges of Flue Gas Desulfurization (FGD) wastewater. AR 1135, p. 3 of 57. As EPA explained, it prepared the 2014 Revised Draft Permit because, after issuing the 2011 Draft Permit, it learned that Merrimack Station installed a new vapor compression evaporation treatment system in 2012. *Id.* at pp. 5-6 of 57. This action was irrelevant to ongoing efforts to determine the permit's thermal discharge limits.

6.2.5 In 2017, EPA Sought Public Comment on "New Questions" Related to Temperature Data and an Invasive Species in the Merrimack River, But Did Not Change Its Thermal Discharge Determinations, Did Not Issue a New Draft NPDES Permit, and Limited the Public's Opportunity to Comment to Only Certain Issues.

In 2015, PSNH told EPA that it believed that the agency had misunderstood some of the company's temperature data and acknowledged that "[a]dmittedly, any misinterpretation of the data by the agency is due to a lack of clarity in [PSNH's] Report itself."[30] Specifically, PSNH stated that certain temperature data that the company presented as though they were averages of daily maximum temperatures for each day of the calendar year, actually represented the highest daily maximum temperatures for each of those days over a 21-year period.[31]

After requesting more information from PSNH, EPA issued a 2017 public notice in which it stated that "it did, indeed, appear that the agency had misunderstood the earlier temperature data because of confusing aspects of how it was presented."[32] As a result, in 2017, EPA stated that it was "now re-evaluating its conclusions presented in the 2011 Draft Permit Determinations (AR-618) that were based on the agency's original interpretation of the temperature data."[33] Further, EPA explained:

> PSNH's clarifications about the data have also led EPA to reconsider the ways in which the effects of elevated temperatures can be usefully evaluated to support the development of thermal discharge limits that are adequately protective of the biological community in the affected receiving water. Thus, EPA has reevaluated the use of these data in its assessment of PSNH's thermal variance request and presently concludes that the single-day data submitted by [PSNH's consultant] can, in fact, provide one useful metric for assessing the effects of Merrimack Station's thermal discharge. While considering long-term averages has utility for evaluating thermal discharge impacts, looking *only* at long-term averages would obscure more extreme conditions that fish and other aquatic life might be exposed to over shorter, but still biologically significant periods of time.

> For example, such shorter, but impactful periods could occur during the summer when the plant is in full operation during low river flow and high ambient temperature conditions. Such temperature and flow extremes would be masked by only considering the data averaged over the full 21-year period. Consequently, in response to PSNH's clarification of the data it had submitted, *EPA is now also reevaluating the effects of shorter-term thermal conditions, particularly on species that may be especially sensitive to such temperature excursions in relation to their ability to survive and compete with more thermally-tolerant species*.[34]

Thus, EPA "invite[d] additional public comment addressing the above- discussed issues and materials relevant both to EPA's decision on PSNH's CWA § 316(a) variance application and to EPA's application of New Hampshire water quality standards with regard to thermal effects."[35] In particular, EPA invited public comment on:

- the import of PSNH's new data submissions for EPA's application of CWA § 316(a) and New Hampshire's water quality standards in developing thermal discharge standards for the Merrimack Station permit;

- the question of how shorter-term and longer-term thermal data should be factored into the evaluation under CWA § 316(a) and New Hampshire's water quality standards of the effects of Merrimack Station's thermal discharges on the Hooksett Pool and the development of thermal discharge limits for the Merrimack Station permit; and

- Specific thermal data and related material submitted by PSNH and its consultants, *i.e.*, AR-1352 (Attachments 2 and 3), AR-1367, AR-1298, and AR- 1299 through AR-1307.[36]

In addition, in its 2017 public notice EPA stated that the agency had become "aware of the presence of non-native organisms in Hooksett Pool; in particular, the Asian clam (*Corbicula fluminea*) . . . notably concentrated in areas of Hooksett Pool with water temperatures directly affected by the plant's thermal discharge."[37] EPA stated that it "found this discovery worthy of further research because of the possibility that Merrimack Station's thermal discharge was contributing to the presence and/or prevalence of the Asian clam in the Hooksett Pool and the potential relevance of such a finding to regulating the Facility's thermal discharges" under the Clean Water Act and the requirements in New Hampshire water quality standards for the protection of local aquatic life.[38]

EPA also noted that when the Station is operating, one of its most visible thermal effects can occur during periods in the winter when the river just upstream of the discharge canal is completely ice-covered, but the river is ice-free for miles downstream of the discharge canal, including in the waters of Amoskeag Pool below Hooksett Dam.[39] EPA reviewed scientific publications on the relationship between Asian clams and thermal discharges from power plants, which found that higher winter survival rates of Asian clams occurred within the influence of the power plants' thermal discharge than in ambient areas, and that the elevated temperatures appeared to affect the clam's reproductive success, growth, and abundance.[40]

EPA thus invited public comments addressing the presence of the Asian clam in the Hooksett Pool and the import of this information for setting thermal discharge limits for the Merrimack Station permit under the CWA and/or New Hampshire water quality standards.[41]

Significantly, nothing in the 2017 Statement of New Questions alerted the public that EPA had undertaken or might consider undertaking a complete reexamination of the "compelling evidence of appreciable harm to the balanced, indigenous fish community of Hooksett Pool" that the agency had independently evaluated in developing the 2011 Draft Permit and had not revisited in the 2014 Draft Permit. Indeed, the overall thrust of the thermal discharge questions in EPA's 2017 Statement of New Questions suggested that the agency was considering *strengthening* the thermal discharge requirements in order to ensure compliance with New Hampshire water quality standards or that EPA might be developing additional reasons why a CWA section 316(a) variance was inappropriate for the Station. In particular, EPA's questions expressed concern that (i) looking only at long-term averages and ignoring single-day data would obscure more extreme conditions that especially sensitive fish and other aquatic life might be exposed to over shorter, but still biologically significant periods of time; and (ii) the Station's thermal plume was harboring the invasive Asian claim and thereby further altering the Hooksett Pool's indigenous aquatic communities.

While any draft determination remains open to change until finalized, EPA's 2017 Statement of New Questions raised only questions and did not provide any basis for or explanation of a change to EPA's 2011 and 2014 determinations to reject PSNH's variance application, did not propose any new approach to the thermal discharge permit provisions for the Station (other than potentially adding shorter- term limits), did not issue a new draft permit for public comment, and did not seek comment on the general content of or specific language for any new thermal discharge permit provisions. In contrast, the public notice expressly limited the scope of public comment. EPA's notice stated: "In accordance with 40 C.F.R. § 124.14(c), the comment period for the Draft Permit is *not* being reopened 'across the board.' It is, instead, only being reopened with respect to certain issues."[42]

Accordingly, EPA has built an extensive record in support of the 2011 Draft Permit and the 2014 Draft Permit, has made rational decisions, and supplied explanations that connect its decisions to the facts found. EPA should proceed to issue a final NPDES permit for the Station containing thermal discharge requirements matching those in the 2011 Draft Permit and the 2014 Draft Permit.

[30] AR-1367.

[31] AR-1367.

[32] EPA Region 1 – New England, Statement of Substantial New Questions for Public Comment, Merrimack Station (NPDES Permit No. NH0001465) (hereinafter "2017 Statement of New Questions") at 39.

[33] 2017 Statement of New Questions at 39.

[34] 2017 Statement of New Questions at 39-40 (emphasis added).

[35] 2017 Statement of New Questions at 40.

[36] 2017 Statement of New Questions at 40-41.

[37] 2017 Statement of New Questions at 41.

[38] 2017 Statement of New Questions at 41.

[39] 2017 Statement of New Questions at 41.

[40] 2017 Statement of New Questions at 42.

[41] 2017 Statement of New Questions at 43.

[42] Joint Public Notice of The Reopening of the Public Comment Period for the Draft National Pollutant Discharge Elimination System (NPDES) Permit for Merrimack Station in Bow, New Hampshire (Aug. 7, 2017) (emphasis added).

EPA Response:

The above comment recounts some of the history surrounding EPA's reopening of the public comment period on the draft permit in 2017 and its issuance of the 2017 Statement for public review and comment. EPA takes issue with certain of the comment's characterizations of the facts around these actions and their implications.

First, while the comment emphasizes that EPA only reopened the comment period for certain issues related to the development of thermal discharge limits, the reopening was quite broad as it pertained to thermal discharge issues. AR 1534, pp. 4-5, 37-44. In addition, EPA asked for comment regarding the extent, if any, to which Merrimack Station's reduced operations should affect its permit's limits. *Id.* at 5, 8, 68-69. EPA's public notice well-identified the issues that were in play and EPA received many comments on them, including from the present commenter. While the commenter is correct that EPA did not present new permit conditions for review at that time – it had not developed new permit conditions at that time – it described the range of issues in question and broadly invited comment about them. In addition, the commenter appears to complain that "nothing in the 2017 Statement of New Questions alerted the public that EPA had undertaken or might consider undertaking a complete reexamination of the 'compelling evidence of appreciable harm to the balanced, indigenous fish community of Hooksett Pool,'" but this misses the point. EPA had not undertaken, and did not undertake, a "complete reexamination" of the evidence of harm to the Hooksett Pool from the past baseload operation. Rather, EPA explained that it was reconsidering the data based on a corrected understanding of that data. In EPA's view, it would have been irrational not to do so. Furthermore, EPA made clear that it was considering whether, and in what way, the Facility's reduced operations should affect the permit limits. Finally, while the commenter states that "the overall thrust of the thermal discharge questions in EPA's 2017 Statement of New Questions suggested that the agency was considering *strengthening* the thermal discharge requirements," EPA did not limit how it would consider public comments and what adjustments might be appropriate for the final permit. Moreover, EPA submits that the Final Permit's limits are not weaker than the 2011 Draft Permit. The Final Permit's limits are different from the limits in the 2011 Draft Permit, but the Final Permit limits are stringent and appropriate based on the changed, reduced operations at the Facility.

For comments above related to the presence of Asian clams in Hooksett Pool, these have been included and addressed in Section 5.0 of this document.

6.3 If EPA Proposes Granting a Variance and/or Making Significant Changes to the Permit's Thermal Discharge Provisions, the Agency Must Comply with Mandatory Legal Requirements under the APA and CWA

As discussed above, EPA should proceed to issue a final NPDES permit for the Station, containing the thermal discharge provisions that are in the 2011 Draft Permit and the 2014 Draft Permit. However, if EPA proposes to take the permit in a different direction, the agency must: (i) subject the new permit provisions to public notice and public comment; (ii) comply with the CWA's anti-backsliding rule by not removing or weakening the thermal plume effluent limitations contained in the 1992 Permit; and (iii) avoid making any arbitrary and capricious decisions.

EPA Response:

EPA has responded to these comments farther above in its responses to the comments presented in the Executive Summary of this comment letter and will briefly reiterate here.

First, EPA disagrees that the Final Permit should include the same thermal limits as the 2011 Draft Permit. The facts have materially changed since the 2011 Draft Permit was published and EPA has appropriately revised its analysis and the limits for the Final Permit. Moreover, the 2014 Revised Draft Permit is not relevant here as it only addressed the modified proposed limits for FGD wastewater discharges.

Second, EPA does not agree that another – what would be the fourth – notice-and-comment period is necessary at this point because the Final Permit is a logical outgrowth of the 2011 Draft Permit and EPA appropriately exercised its discretion, as explained in more detail above in response to the Executive Summary of the comment letter, not to reopen the comment period under 40 CFR § 124.14.

Third, in the same response above, EPA also explained that it does not agree that the CWA's anti-backsliding requirements apply to the Final Permit. This is because the Final Permit's thermal discharge limits are not less stringent than those in the 1992 Permit. Furthermore, even if the anti-backsliding provisions did apply here, those provisions include several exceptions to the prohibition against making a new permit's conditions less stringent than the corresponding provisions in the prior permit and one of the exceptions applies here. Specifically, the anti-backsliding rule does not apply to new permit limits issued pursuant to a CWA § 316(a) variance, such as the thermal discharge limits in the Final Permit here. *See* 33 U.S.C. § 1342(o)(2)(D).

Finally, the Final Permit is consistent with applicable law and EPA has provided a rational basis for its decision. That decision is neither arbitrary nor capricious.

6.3.1 Since it Bought the Station in 2018, GSP and EPA Have Met Frequently, and Have Recently Exchanged Radically New "Discussion Draft" Provisions for Thermal Discharges.

Documents provided by EPA under the Freedom of Information Act ("FOIA") indicate that, since GSP acquired the Station in 2018, GSP and EPA have met frequently – at least five times in person over the past fifteen months, as well as in numerous phone calls – to discuss the thermal discharge requirements (and other issues) in the Merrimack NPDES permit. After that series of meetings, it appears that EPA may propose a radical departure from the 2011 Draft Permit, the 2014 Draft Permit, and all the attendant public comment solicitations from the past decade. In particular, materials obtained through FOIA suggest that EPA is contemplating reversing its findings concerning the Section 316(a) variance and the permit's thermal discharge requirements (among other issues not addressed here). In fact, EPA appears to have shared with GSP some "discussion drafts" embodying these departures from the 2011 and 2014 Draft Permits. The "discussion drafts" exchanged between EPA and GSP differ dramatically from the thermal discharge provisions in the draft permits EPA noticed for public comment in 2011 and 2014.[43] However, such approach to permitting thermal discharges would be unique and none of these discussion drafts have been subjected to public notice and comment.

These new developments implicate several mandatory requirements under the APA and CWA.

[43] For example, the "discussion drafts" suggest that EPA may propose granting a CWA section 316(a) variance, reversing its 2011 and 2014 determinations to require closed-cycle cooling as BAT for thermal discharges, and base entirely new permit requirements on the Station's "capacity factor" (CF) (*i.e.*, the Station's ratio of an actual electrical energy output over a given period of time to the maximum possible electrical energy output over that period).

EPA Response:

The comment above correctly states that, prior to issuance of the Final Permit, EPA had a number of meetings and phone calls with GSP regarding the permit since the company purchased the Facility in January 2018. There is nothing inappropriate or unlawful about that. The commenter states that it learned about these EPA communications with GSP through records obtained in response to FOIA requests. This is only partly correct and is potentially misleading. EPA voluntarily provided the commenter with most records documenting EPA's communications with GSP, rather than provided them only in response to FOIA requests as the comment might suggest. *See, e.g.,* AR-1814; AR-1816; AR-1820. EPA regards these documents recounting its communications with GSP to be part of the public permit record and readily provided them to the commenter upon its request. Regardless of whether the commenter had requested them directly, EPA was still going to include those records in the Administrative Record for the Merrimack Station permit. It also should be mentioned that EPA not only spoke with GSP about the Merrimack Station permit, but it also discussed the permit over the telephone on multiple occasions with the commenter who called EPA with issues or questions that it wanted to discuss. *See, e.g.,* AR-1635; AR-1637; AR-1773; AR-1818.

The commenter states that the materials it has obtained from EPA "suggest that EPA is contemplating reversing its findings concerning the Section 316(a) variance and the permit's thermal discharge requirements." EPA disagrees about what those materials "suggest" but, in any event, confirms that it has not "reversed" its conclusions about the CWA § 316(a) variance that were associated with the 2011 Draft Permit. At that time, EPA proposed rejecting the Facility's request for renewal of the 1992 Permit's thermal discharge conditions based on a CWA § 316(a) variance that essentially allowed thermal discharges associated with baseload operations using open-cycle cooling. The Final Permit does not reverse that proposed decision. Instead, for the Final Permit, EPA has confirmed its earlier proposal not to renew Merrimack Station's 1992 CWA § 316(a) variance, *see* Responses to Comments II.3.1.3, 3.3.1, and 4.4, but also has decided to set stringent thermal discharge limits under CWA § 316(a) that will maintain river temperatures to protect the BIP and set operational requirements that reflect the Facility's current reduced operations.

EPA agrees with the commenter that the thermal limits considered in the "discussion drafts" are different from those proposed in the 2011 Draft Permit but does not agree that "dramatic" changes or "unique" permit provisions have resulted. For the 2011 Draft Permit, EPA considered the Facility's request for renewal of the thermal limits from the 1992 Permit under a CWA § 316(a) variance, as well as limits that would be set under the federal BAT technology standard and state water quality standards. Ultimately, EPA rejected the Facility's variance request and set limits based on technology and water quality requirements. These proposed limits restricted thermal discharges to a far greater extent than the 1992 Permit based on the expectation that the Facility would continue its longstanding baseload operations but could reduce thermal discharges by adding closed-cycle cooling. At the same time, EPA specifically indicated that it was also considering, and requested comment on, whether it should set water quality-based limits that would maintain certain instream temperatures that would protect the BIP in light of critical temperatures for resident fish species. *See* AR 618, pp. 214-17. These limits also would have restricted the Facility's thermal discharges far more than the 1992 Permit. EPA also considered the option of controlling thermal discharges based on operational restrictions but rejected it because the Facility could maintain its baseload operations to serve the electrical grid and control thermal discharges with closed-cycle cooling technology.

EPA's 2011 Draft Permit Determinations Document, as well as the 2017 Statement, provided extensive discussion of a range of options, the different potential bases of legal authority (namely, CWA § 316(a), technology-based and/or water quality-based requirements), and provided relevant information and data for review and comment. Indeed, the 2017 Statement expressly discussed and asked for comment on the extent to which the Facility's reduced operations should affect the final permit limits. AR 1534, pp. 5, 8, 34-36, 39-41, and 68-70. EPA indicated that it was not expecting to set thermal discharge limits based on reduced operations because PSNH was still requesting limits based on baseload operations, which it suggested might resume in the future. AR 1534, pp. 68-69. Later, the Facility's new owners, GSP, indicated that it expected to continue operating in the current, reduced mode and did not object to the concept of permit limits reflecting such operations.

Ultimately, EPA set the Final Permit's thermal discharge limits based on a CWA § 316(a) variance, taking account of the Facility's reduced operations, and using the same critical temperature approach identified in the 2011 Determinations Documentation with respect to possible water quality standards-based limits. As with the limits in the 2011 Draft Permit, the Final Permit's limits are much more stringent than those in the 1992 Permit.

The record shows that through multiple comment periods, EPA well informed the public of the range of issues and options under consideration for permitting Merrimack Station's thermal discharges. The Final Permit's thermal discharge limits are not dramatically different from the limits that were in the 2011 Draft Permit or were otherwise under public review during this permit proceeding.

Finally, contrary to the comment, the Final Permit's thermal discharge limits are not "unique." EPA has written other NPDES permits that regulate thermal discharges based on maintaining particular instream temperature levels to protect resident fish, such as the NPDES permit for the GenOn Kendall Station power plant in Massachusetts. *See, e.g.,* Statement of Basis for Kendall Station permit, pp. 8, 45. EPA has also set many permits with flow limits that, in effect, limit generation. *See, e.g.,* Permit for Taunton Municipal Light, https://www3.epa.gov/region1/npdes/permits/2006/finalma0002241permit.pdf. In addition, not only did EPA consider setting thermal discharge limits based on operational restrictions for the 2011 Draft Permit, *see* AR 618, pp. 144-45, but EPA has considered the same approach for other permits. *See* AR 664, pp. 4-38 to 4-39. And, of course, EPA's regulations authorize setting effluent limits in many ways, including water quality-based limits and production-based limits. *See* 40 CFR §§ 122.44(d) and 124.45(b)(2). In addition, EPA's 2014 CWA § 316(b) regulations authorize less stringent requirements for facilities that have a low capacity factor. 40 CFR § 125.94(c)(12). In the case of the Final Permit for Merrimack Station, EPA has taken many of these considerations into effect to craft stringent thermal discharge limits that will assure the protection and propagation of the Hooksett Pool BIP while corresponding to the Facility's current and planned future reduced mode of operation.

6.3.2 A Final Permit Containing the "Discussion Draft" Provisions Exchanged Between EPA and GSP Would Not Be a Logical Outgrowth of the 2011 Draft Permit or the 2014 Draft Permit.

As EPA is well aware, the APA, EPA's regulations, the federal courts, and EPA's Environmental Appeals Board (EAB) all require that a final permit issued by EPA must be a "logical outgrowth" of the draft permit; otherwise, EPA would have failed to give proper notice and allow the public the legally required opportunity for public comment.[44]

Although EPA has issued two draft permits for public comment (in 2011 and 2014), and has sought comment on "significant new questions" (in 2017), the thermal discharge provisions in the "discussion drafts" represent a dramatic departure from the 2011 and 2014 drafts.[45] EPA did not describe such new approach in the 2017 notice, nor could it have been predicted from the limited set of questions on which EPA sought comment in 2017.

As discussed above, the 2011 and 2014 draft permits were based on EPA's decision to reject PSNH's request for a CWA section 316(a) thermal variance. EPA's decision to reject the variance was based on a detailed analysis of the "compelling evidence of appreciable harm to the balanced, indigenous fish community of Hooksett Pool" that the agency had independently evaluated and explained in more than 200 pages in the 2011 Thermal Determinations.

If EPA proposes to view this evidence differently or to arrive at a different conclusion from all of this evidence, it must subject its new interpretation to public notice and comment. Or, if EPA proposes to find, on the basis of new information, that reduced operations at the Station will assure that the Hooksett Pool's BIP has been, or will be, restored to complete health, the agency must give the public notice of any such opinion and an opportunity to comment. Indeed, while noting in 2017 that EPA was "considering whether [the] changed operating profile should trigger changes to the permit limits being developed for the Facility's NPDES permit," EPA also stated that "[a]t present, EPA has determined that the changing operating scenario does *not* provide a basis for altering what would otherwise be the permit limits [and] . . . given that the Facility still operates at high rates in hot summer and cold winter conditions, its extensive operations during those periods can still potentially have serious environmental effects."[46] Equally important, if EPA wants to propose a very different set of thermal discharge requirements in the Station's NPDES permit, based on the Station's operational profile or anything else, then those new proposed requirements must also be subjected to public comment.

If the public is given an opportunity to comment on a new draft permit, Sierra Club and Conservation Law Foundation intend to engage technical experts to review the permit provisions and EPA's supporting rationale for proposing them, and to submit comments based on their evaluation. If the new proposed permit were to include requirements similar to those in the EPA-GSP "discussion drafts," then the issues warranting public comment might include issues such as the following, among others:

- Whether the permit should be based on a Capacity Factor limit and, if so:
    - what the CF% should be,
    - over what time period should it be measured,
    - when should it apply, and
    - should compliance with that limit exempt the Station from any other limits?;
- Whether a Capacity Factor limit would allow the Station to run at high capacity for significant periods of time and discharge a similar amount of waste heat during those times as a baseload facility;
- Whether the periods of time in the summer when the Station is most likely to run at high capacity (despite a Capacity Factor limit) correspond with when ambient temperatures are at their highest;
- How the periods of time in the summer when the Station is most likely to run at high capacity despite a Capacity Factor correspond with times when fish or other aquatic organisms sensitive to high temperatures will be present in or near the Station's thermal discharges;

- Whether exempting the Station from "chronic" temperature limits when Capacity Factor limits are met in the summer would allow river temperatures to exceed fish threshold tolerances;

- Whether there should be downriver temperature limits, and, if so:

    - where should they be measured,
    - what times of year should they be applied, and
    - how should they be expressed and calculated)?

- Whether the Station's thermal discharges should be monitored at monitoring station S-0 (at the end of the Station's discharge canal), or monitoring station S-4 (approximately half a mile downstream), or both;

- Whether EPA has a sufficient basis to correlate temperatures at S-4 with temperatures at S-0 and other locations in Hooksett Pool;

- If there is a temperature limit imposed at the discharge point:

    - what should this temperature limit be,
    - how should be expressed and calculated,
    - and how often should the company monitor the temperature?;

- Whether ascertaining permit compliance based only on S-4 temperatures will prevent acute lethality/mortality to larvae or other drifting or swimming organisms, including the zooplankton forage base, that may come in contact with hot water leaving the discharge canal;

- Whether ascertaining permit compliance based only on S-4 temperatures will protect shallower areas along the shorelines that provide important habitat for juvenile fish;

- Whether ascertaining permit compliance based only on S-4 temperatures will protect other locations in the river where "suitable habitat is needed for various lifestage requirements, including gonadal development, spawning, egg and larva development, and foraging and refugia for juveniles and adults," as is necessary to protect the BIP;

- How compliance with the S4 temperature limits can be measured if the Station is allowed to remove the temperature monitoring probe from S-4 during winter months;

- Whether there should be a Delta-T limit, and, if so:

    - what the limit should be,

- when it would be effective,
- and what two points in the river would be compared?

- Whether "acute" temperature limits that apply only in certain months of the year would be sufficient to protect aquatic organisms from excessive heat;

- Whether the permit requirements would sufficiently address the problem of "cold shock" for fish that find refuge in the heated discharge during winter and are then harmed or killed when warm water suddenly disappears because the Station powers down;

- Whether the permit requirements would sufficiently prevent other impacts of elevated temperatures on indigenous fish populations and lifestages that are accustomed to cold water in winter;

- Whether the permit requirements would sufficiently address the problem of higher winter survival rates of Asian clams within the influence of the power plants' thermal discharge than in ambient areas, caused by elevated temperatures that affect the clam's reproductive success, growth, and abundance;

- Which temperature limits would apply in the winter months, when the Station has been operating at its highest capacity recently;

- Whether GSP has submitted, and EPA has analyzed, *all* of the 15-minute- interval temperature data that the company has for the years 2013-2017, or only such data for the warmer months of the year.

In 2016, when PSNH wanted EPA to change the thermal provisions in the draft NPDES permit, the company told the agency:

> Region 1 needs to revisit and substantially revise its analysis of the aquatic organisms in the Hooksett Pool and its evaluations of what impact, if any, thermal discharges from Merrimack Station have on the BIP. The revisions required for Region 1's thermal analyses and permit determinations to comply with the law cannot reasonably be considered a "logical outgrowth" of the 316(a) conclusions set out in the 2011 Draft Permit. [¶] For all of these reasons, PSNH requests that Region 1 issue a new draft permit for Merrimack Station for public notice and comment. A new draft is compelled by . . . the corrected temperature data analysis affecting Region 1's 316(a) determinations [and] the extensive new information considered by the agency specific to this permit. Allowing PSNH and the public the opportunity to comment on a revised draft that reflects and is fully responsive to these significant developments is not only legally required, it is especially appropriate here given the significant public interest in the Merrimack Station NPDES permit and the likelihood of litigation.[47]

EPA has two choices under the law – it can proceed to finalize a NPDES permit that is similar enough to the 2011 and 2014 draft permits that it is a "logical outgrowth," or, if EPA proposes to make dramatic changes like those being discussed with GSP, then the agency must subject that new permit to public notice and public comment as the company itself requested.

[44] 5 U.S.C. § 553(b), (c); 40 C.F.R. §§ 124.6(d), 124.10(a)(1)(ii). The first judicial decision using the "logical outgrowth" language was a First Circuit case involving an EPA air quality transportation control plan for the Boston area. *South Terminal Corp. v. EPA*, 504 F.2d 646, 659 (1st Cir. 1974). *See also, e.g.,* NRDC v. EPA, 279 F .3d 1180, 1186 (9th Cir.2002); *In re D. C. Water and Sewer Auth.*, NPDES Appeal Nos. 05-02, 07-10, 07-11, 07-12, 2008 EPA App. LEXIS 15, *112 (EAB March 19, 2008) (holding that "new language in the Final [NPDES] Permit was not a logical outgrowth of the language in the previous draft and, accordingly, [Friends of the Earth and Sierra Club] were denied the opportunity to provide meaningful comments," and remanding the permit to EPA Region 3).

[45] For example, the "discussion drafts" exchanged between EPA and GSP suggest that EPA may propose wholly new permit requirements such as: Capacity Factor (CF) limits averaged over a 45- day (or other) period; "chronic" in-river temperature limits measured downstream from the discharge point; "acute" in-river temperature limits; and/or a "Rise in Temperature" limit from ambient upstream temperature. Those potential requirements differ dramatically from the proposed thermal requirements that EPA noticed publicly and are obviously not a "logical outgrowth" of the prior draft permits.

[46] 2017 Statement of New Questions at 68-69 (emphasis added).

[47] Letter from Eversource Energy to U.S. Environmental Protection Agency – Region 1 (Dec. 22, 2016) (AR-1352) at 7-8.

EPA Response:

As EPA has already discussed above in response to the Executive Summary section of this comment letter, the Final Permit's thermal discharge limits are a logical outgrowth of the 2011 Draft Permit and the 2017 Statement. All the relevant issues and information were made available to the public for review and comment and another comment period is not needed because of the Final Permit's thermal discharge conditions. Beyond that, EPA also notes that it has shared records of EPA's more recent discussions with GSP as well as drafts of the permit conditions as they were under development. The commenter reviewed those drafts and now has submitted these comments and EPA has considered them and responds to them herein. To be clear, as stated above, the Final Permit is a logical outgrowth of the 2011 Draft Permit and the 2017 Statement (and the analysis and record material associated with those documents) – this would be the case even if EPA had not shared the "Discussion Draft" permit conditions with the commenter – and EPA is not legally required to consider and respond to these late submitted comments. EPA has decided, however, as a discretionary matter, to do so (*i.e.*, consider and respond to the comments).

The commenter complains that it could not have predicted the Final Permit conditions. EPA disagrees. Of course, a commenter can always say it could not have predicted the Final Permit conditions when those conditions are different from earlier proposed conditions. Based on the facts here, however, EPA thinks that conditions like those in the Final Permit could have been predicted based on the information EPA presented previously to the public. Again, as described above, in the 2011 Determinations Document issued with the 2011 Draft Permit, EPA specified that it was still considering the alternative of setting water quality-based thermal discharge limits designed to maintain various instream temperatures based on critical temperatures for various life stages of resident fish species. Different temperatures would apply during different times of year based on what the most sensitive organisms and life stages are at different times, and water temperatures would be measured either at the end of the discharge canal (Monitoring Station S0) or at a downstream monitoring location (Station S4). *See* AR 618, pp. 214-17. EPA expressly requested comment on whether it should set permit limits based on this approach. *Id.* at 217.

EPA also identified, in the 2017 Statement, that it was considering the import of Merrimack Station's much reduced capacity factor in setting the final permit limits and requested comment on the subject. AR 1534, pp. 5, 8, 34-36, 39-41, and 68-70. Indeed, the present commenter submitted comments on this subject, which EPA has responded to above. S*ee* Response to Comment II.3.2.3. Ultimately, for the Final Permit, EPA decided it *should* take account of this reduced capacity factor while setting limits based on the water quality approach detailed in the 2011 Determinations Document. Indeed, some of the Final Permit's parameters and monitoring locations are exactly the same as those specified in the discussion in EPA's 2011 Determinations Document. *Compare* Final Permit, Part I.A.11 *with* AR 618, p. 215.

The commenter urges that if EPA changes its decision on PSNH's initial variance application from that set forth in the 2011 Draft Permit, then the Agency must have an additional comment period. In response, EPA notes, first, that it has *not* changed its decision on PSNH's earlier application seeking renewal of the CWA § 316(a) variance underlying the 1992 Permit. EPA rejected that request before and has not changed its decision on that. At the same time, even if EPA had changed that earlier decision in response to public comment, it is not necessarily the case that an additional comment period would be needed. Additional comment would not be needed if the final decision is a logical outgrowth of the proposed decision. The administrative process does not require that proposed agency decisions be "carved in stone" so that reasonable changes cannot be made in response to comments and information in the record.

The commenter also states that "… if EPA proposes to find, on the basis of new information, that reduced operations at the Station will assure that the Hooksett Pool's BIP has been, or will be, restored to complete health, the agency must give the public notice of any such opinion and an opportunity to comment." EPA has not, however, concluded that reduced operations alone will assure the protection and propagation of the BIP. Instead, EPA has taken into account the Facility's reduced operations but has set specific instream temperature limits and associated conditions that will control water temperatures in a manner that will assure the protection and propagation of the Hooksett Pool's BIP. EPA has explained its analysis herein and, as discussed above, this analysis and the Final Permit conditions are a logical outgrowth of the 2011 Draft Permit and the 2017 Statement, and EPA has reasonably exercised its discretion not to reopen the comment period again under 40 CFR § 124.14.

The commenter notes that in the 2017 Statement, EPA indicated both that it was considering whether Merrimack Station's reduced capacity factor should affect the final permit limits, and that it had decided against it because the Facility could increase operations again in the future. (EPA also noted that, at the time, the Facility was still seeking limits allowing baseload operations despite its consistent, reduced capacity factor. AR 1534, pp. 68-69.) EPA expressly invited comment on this issue, *id.* at 69, and ultimately decided to make permit changes reflecting the Facility's reduced capacity factor in part because GSP agreed that it could potentially accept CWA § 316(a) variance-based limits reflecting the reality of its reduced capacity factor. *See* AR-1802. EPA's Final Permit includes limits that, unless modified in the future, are not compatible with a return to baseload operations. EPA has determined that the combination of reduced operations and protective instream temperature limits will assure the protection and propagation of the BIP. The issues related to these Final Permit limits and the Agency's assessment have been subject to public review and comment.

The commenter goes on to provide a long list of questions and possible concerns that it might address if another comment period was provided. In EPA's view, the commenter could have addressed all of these issues before in response to, and prompted by, the analysis and material that EPA previously made available to the public with the 2011 Draft Permit and/or the 2017 Statement. In addition, EPA has addressed many of these issues in Responses to Comments in Section II.3.1.3 and II.3.4 (and associated sub-comments).
Finally, the commenter quotes an argument by PSNH from 2016 that EPA should renotice a new draft permit after making all the changes to the 2011 Draft Permit that it deemed necessary and to allow public review of all the new information that had been brought to bear on the thermal issues. EPA did, of course, reopen the comment period in 2017 to allow public review and comment on all the new information, which included a variety of additional matters not mentioned in the paragraph quoted by the commenter. As explained above, reopening the comment period again is not necessary at this point.

6.3.3 The Clean Water Act's Anti-Backsliding Rule Prohibits Removal of The Thermal Plume Effluent Limitations That Have Been in the Station's Permit Since at Least 1992.

The Clean Water Act was enacted to reduce and eventually eliminate the discharge of pollutants.[48] Accordingly, the Act prohibits permit writers from relaxing effluent limitations in subsequent permits. Specifically, the CWA's anti- backsliding provisions, in section 402(o) of the Act and EPA's regulations, forbid NPDES permits from being "renewed, reissued, or modified to contain effluent limitations which are less stringent than the comparable effluent limitations in the previous permit."[49]

The 1992 Permit contains several effluent limitations[50] that restrict the thermal plume. As noted above, the three limitations that provide restrictions on the Station's thermal plumes are set forth in Part I.A.1.g. of the existing permit, which provides:

> The combined thermal plumes for the station shall … not block the zone of fish passage;
>
> The combined thermal plumes for the station shall … not change the balanced indigenous population of the receiving water; and
>
> The combined thermal plumes for the station shall … have minimal contact with the surrounding shorelines.

These thermal plume limitations serve important functions. For example, as EPA explained at length in the 2011 Thermal Determinations, diadromous fish that pass into and through the Hooksett Pool are an important component of the Hooksett Pool's BIP.[51] In addition, shallower areas along the shorelines that can be affected by the thermal plume are important habitat for juvenile fish.[52]

And these limitations are far from unique. Indeed, virtually all NPDES permits issued by EPA Region 1 for power plants located on rivers in New England contain thermal plume limitations that are identical or nearly identical to those contained in the Merrimack Station's 1992 Permit. For example, in the 1990 NPDES permit for the Schiller Station on the Piscataqua River in Portsmouth, New Hampshire (which is also now owned by a GSP affiliate), EPA included exactly the same three thermal plume effluent limitations, verbatim, that are in the 1992 Merrimack Permit.[53] When EPA renewed the Schiller Station's NPDES permit on April 6, 2018, it retained all three thermal plume limitations and added a fourth – that the "thermal plumes from the station shall . . . not interfere with spawning of indigenous populations.[54] Likewise, the NPDES permit for the Newington plant (also on the Piscataqua River and owned by a GSP affiliate) has the same three thermal plume effluent limitations as Merrimack, plus the fourth one that EPA added at Schiller.[55] Similarly, in Massachusetts, EPA included those four thermal effluent plume limitations in the NPDES permits for the Mirant Canal Station[56] (on Cape Cod Canal), the Mystic Station[57] (on the Mystic River), and the Pepperrell Power Plant[58] (on the Nashua River).

These standard permit conditions were included in the EPA-issued NPDES permits for those five other New England power plants (and possibly others) regardless of whether the permits include numeric maximum temperature limits. For example, the current Schiller permit requires that "The 95° F temperature limit shall not be exceeded at any time (instantaneous maximum)."[59] Likewise, the Mirant Canal Station's permit imposes a maximum instantaneous temperature limit on the non-contact condenser cooling water discharge.[60] Thus, the permits include effluent limitations on the thermal plume even if there are maximum temperature limitations at the discharge point or another specific location.

In 2011 and 2014, EPA proposed adding a fourth effluent limitation to the Merrimack Station's NPDES permit: "Any thermal plume from Outfall 004D (intake de-icing water) or 003 (Discharge Canal) at Merrimack Station shall . . . (d) not cause acute lethality to swimming or drifting organisms, including those entering the discharge canal at Outfall 003."[61] This is an important requirement given EPA's very valid concern that "[s]ince the highest water temperatures from the plant exist closest to the discharge point, the potential for the thermal plume to cause acute lethality or impairment to drifting organisms, such as fish larvae, is most likely to occur in the waters near the discharge."[62] In addition, the thermal plume effluent limitation that was added to the Schiller permit in 2018, and is in the other power plant permits discussed above, but is not in the Merrimack permit – "The thermal plumes from the station shall . . . not interfere with spawning of indigenous populations" – should also be added to the Station's permit given that EPA's recognition that suitable habitat for spawning is critical to protecting balanced, indigenous community of Merrimack River.[63]

Accordingly, the CWA's anti-backsliding rule forecloses EPA from removing the thermal plume effluent limitations from the Station's NPDES permit, and the additional thermal plume effluent limitation proposed for the Station in 2011 and 2014, as well as the one included in the permits for the Schiller, Newington, Cape Cod Canal, Mystic, and Pepperell plants should be added to the Station's permit.

The Station's 1992 Permit also includes standard language prohibiting violation of state water quality standards:

> The discharges shall not jeopardize any Class B use of the Merrimack River and shall not violate applicable water quality standards….[64]

A provision of this type is commonplace in EPA-issued NPDES permits for power plants (and other types of facilities). For example, the current Schiller permit states: "Discharges and water withdrawals shall not cause a violation of the water quality standards or jeopardize any Class B use of the Piscataqua River."[65] The Newington permit provides: "Discharges and water withdrawals shall not either cause a violation of the water quality standards or jeopardize any Class B use of the Piscataqua River."[66] And the NPDES permit for the Kendall Station states: "The discharges shall not cause a violation of any applicable water quality standards (WQS) or degrade the aquatic habitat quality."[67]

Accordingly, the water quality standards effluent limitation must be retained in the Station's NPDES permit to comply with the anti-backsliding rule and EPA's longstanding practice.

As noted above, EPA and GSP have exchanged "discussion drafts" of the thermal discharge provisions for possible inclusion in a renewed NPDES permit for the Merrimack Station. It is not clear from the public record whether EPA currently intends to keep, eliminate, or modify the effluent limitations restricting the thermal plume and prohibiting violations of water quality standards because the "discussion drafts" exchanged between EPA and GSP did not include the pages of the permit that would presumably contain those limitations. What is clear is that the law forbids EPA from eliminating or including any effluent limitations less stringent than those in the 1992 Permit.

[48] 33 U.S.C. §1251.

[49] 33 U.S.C. § 1342(o)(1); 40 C.F.R. § 122.44(l)(1); *see, e.g., Citizens for a Better Env't-California v. Union Oil Co. of California*, 861 F. Supp. 889, 900 & n.4 (N.D. Cal. 1994) *aff'd*, 83 F.3d 1111 (9th Cir. 1996); *New Jersey Public Interest Research Group v. New Jersey Expressway Auth.*, 822 F. Supp. 174, 185 (D.N.J. 1992). There are certain exceptions to the anti-backsliding rule, which are not applicable here. Nevertheless, even where an exception does apply, CWA section 402(o)(3) includes a safety clause that "acts as a floor" and provides an absolute limitation on backsliding, by "prohibit[ing] the relaxation of effluent limitations in all cases if the revised effluent limitation would result in a violation of applicable effluent guidelines or water quality standards, including antidegradation requirements." U.S. Envtl. Prot. Agency, NPDES Permit Writers' Manual, at 7-4 (Sept. 2010), https://www3.epa.gov/npdes/pubs/pwm_chapt_07.pdf.

[50] CWA section 502(11) defines "effluent limitation" to mean "any restriction established by . . . the Administrator on quantities, rates, and concentrations of chemical, physical, biological, and other constituents which are discharged from point sources into navigable waters . . . including schedules of compliance. Both that definition and EPA's regulatory definition of "effluent limitation" at 40 C.F.R. § 122.2, are broad and include

narrative limitations; neither requires an effluent limitation to be expressed as a numeric limit. *NRDC v. EPA*, 673 F.2d 400, 403 (DC Cir. 1982), *cert. denied sub nom. Chemical Mfrs. Ass'n v. EPA*, 459 U.S. 879 (1982) ("Section 502(11) defines 'effluent limitation' as '*any* restriction' on the amounts of pollutants, not just a numerical restriction.").

[51] *See, e.g.,* 2011 Thermal Determinations at 33 ("In addition to resident species, diadromous species that once migrated freely through this reach of the Merrimack River are also considered part of the [BIP]. Diadromy is the collective term used for fish species that spend part of their life cycle in fresh water and part in salt water. There are three forms of diadromy, two of which – anadromy and catadromy – are represented by fish species found in the Merrimack River. Anadromous species are born in fresh water, mature in salt water, and return to fresh water to spawn. Conversely, fish born in salt water, mature in fresh water, and return to salt water to spawn are called catadromous species. Anadromous species that commonly inhabit Hooksett Pool during part of their life cycle are Atlantic salmon, American shad, and alewife. Blueback herring and sea lamprey may occasionally be present, as well. Only one catadromous species, American eel, is at times present in the pool.")

[52] 2011 Thermal Determinations at 119; *see also id*. at 39 ("Near-shore shallows are widely recognized as important habitat for juvenile fish."

[53] See Schiller Station, NPDES Permit No. NH0001473 (issued Sept. 11, 1990) at I.A.h:

"The combined thermal plumes for the station shall: (a) not block zone of fish passage, (b) not change the balanced indigenous population of the receiving water, and (c) have minimal contact with the surrounding shorelines."

[54] Schiller Station, NPDES Permit No. NH0001473 (issued April 6, 2018) at I.A.10.b:

"The thermal plumes from the station shall: (a) not block zones of fish passage, (b) not interfere with spawning of indigenous populations, (c) not change the balanced indigenous population of the receiving water, and (d) have minimal contact with surrounding shorelines."

[55] Newington Generating Station, NPDES Permit No. NH0023361 (issued Oct. 25, 2012) at I.A.5.b:

"The thermal plumes from the station shall: (a) not block zones of fish passage, (b) not interfere with spawning of indigenous populations, (c) not change the balanced indigenous population of the receiving water, and (d) have minimal contact with surrounding shorelines."

[56] Mirant Canal Station, NPDES Permit No. MA0004928 (issued August 1, 2008) at I.A.15.b:

"The thermal plumes from the station shall: (a) not block zones of fish passage, (b) not interfere with spawning of indigenous populations, (c) not change the balanced indigenous population of the receiving water, and (d) have minimal contact with surrounding shorelines."

[57] Mystic Station, NPDES Permit No. MA0004740 (issued Aug. 17, 2001) at I.A.15.b:

"The thermal plumes from the station shall: (a) not block zones of fish passage, (b) not interfere with spawning of indigenous populations, (c) not change the balanced indigenous population of the receiving water, and (d) have minimum contact with surrounding shorelines."

[58] Pepperell Power Plant, NPDES Permit No. MA0032034 (issued Sept. 8, 2006) at I.A.13:

"The thermal plumes from the station shall: (a) not block zones of fish passage, (b) not interfere with spawning of indigenous populations, (c) not change the balanced indigenous population of the receiving water, and (d) have minimum contact with surrounding shorelines."

[59] Schiller Station, NPDES Permit No. NH0001473 (issued April 6, 2018) at I.A.1, Note 3.

[60] Mirant Canal Station, NPDES Permit No. MA0004928 (issued August 1, 2008) atI.A.2.

[61] 2011 Draft Permit at Part I.A.23; 2014 Draft Permit at Part I.A.23.

[62] 2011 Thermal Determinations at 83.

[63] 2011 Thermal Determinations at 37 ("EPA believes that all resident fish species identified as being part of the balanced, indigenous community historically had sufficient suitable habitat in Hooksett Pool to support them throughout every life stage. Suitable habitat is needed for various lifestage requirements, including gonadal development, spawning, egg and larva development, and foraging and refugia for juveniles and adults.)

[64] 1992 Permit, Part I.A ("Effluent limitations and Monitoring Requirements") at I.A.1.b.

[65] Schiller Station, NPDES Permit No. NH0001473 (issued April 6, 2018) at I.A.10.a.

[66] Newington Generating Station, NPDES Permit No. NH0023361 (issued Oct. 25, 2012) at I.A.5.a.

[67] GenOn Kendall, LLC (formerly Mirant Kendall, LLC), NPDES Permit No. MA0004898 (issued Dec. 17, 2010) at I.A.5.

"The thermal plumes from the station shall: (a) not block zones of fish passage, (b) not interfere with spawning of indigenous populations, (c) not change the balanced indigenous population of the receiving water, and (d) have minimal contact with surrounding shorelines."

EPA Response:

This comment again urges that the Final Permit must retain provisions like the narrative water quality-oriented provisions of the 1992 Permit and the 2011 Draft Permit. One of the provisions in each focused on satisfying water quality standards generally (Part 1.A.1.b of the 1992 Permit and Part I.A.14 of the 2011 Draft Permit) and the other provision had multiple sub-parts pertaining specifically to thermal discharges (Part I.A.1.g of the 1992 Permit and Part I.A.23 of the 2011 Draft Permit). EPA has discussed these issues in responding to comments 6.1 and 6.2.2, above. The Agency incorporates those responses here by reference and will discuss these issues again further here.

First, with respect to the general water quality-related provision in the Draft Permit (Part I.A.14), EPA has retained that provision in the Final Permit. This provision speaks broadly to maintaining compliance with New Hampshire's water quality standards, including the protection of designated uses, and, in the context of this permit, these standards address many issues other than thermal conditions. The commenter is correct that this type of provision is common in EPA's permits and it is retained in the Final Permit but not to address thermal standards or issues.

Second, with respect to the narrative water quality-related provisions specific to thermal discharge (Part 1.A.23 of the 2011 Draft Permit), EPA has not retained those provisions for the Final Permit. As explained previously, the reason is that EPA believes the Final Permit's stringent CWA § 316(a) variance-based thermal limits will assure the protection and propagation of the BIP and the narrative water quality-related provisions specific to thermal discharge are no longer needed. Moreover, in this case, the Final Permit's thermal discharge limits are based on a *CWA § 316(a) variance from both technology-based and water quality-based standards*. Thus, the narrative provisions in question are not legally required to satisfy water quality standards and, although EPA could include them if needed within the context of setting limits that would satisfy CWA § 316(a), EPA has reached a contrary conclusion in this case. EPA has determined that the permit's stringent thermal discharge conditions will assure the protection propagation of the BIP. This includes providing adequate protection of habitat, zone of passage, and drifting organisms to satisfy CWA § 316(a).

The commenter also argues that EPA *must* retain the narrative water quality-oriented provisions in order to comply with the CWA's anti-backsliding requirements, which prevent new permit conditions from being made less stringent than the corresponding provisions in a facility's existing permit. *See* 33 U.S.C. § 1342(o). EPA has already responded to this anti-backsliding argument in its responses to comments 6.1 and 6.3, above, and incorporates those responses here by reference. EPA also provides additional response below.

As EPA has explained above, it does not agree that the Final Permit's thermal discharge limits are less stringent than the limits in the 1992 Permit, taking the latter permit's narrative provisions into account. In EPA's view, the Final Permit's thermal limits assure the protection and propagation of the Hooksett Pool's BIP and are *more* stringent than the requirements of the 1992 Permit. As a result, the CWA's anti-backsliding restrictions are not violated.

To be clear, EPA agrees with the commenter than the narrative provisions are not barred simply because the Final Permit has numeric thermal discharge limits. In a particular case, EPA could conclude that both numeric and narrative thermal discharge conditions are needed. In this case, however, EPA concludes, based on its detailed assessment under CWA § 316(a), that the thermal discharge limits in the Final Permit are sufficient without the addition of the narrative conditions. EPA disagrees with the commenter's statement that these sorts of narrative provisions related to thermal plumes and water quality standards are included in "virtually all NPDES permits issued by EPA Region 1 for power plants located on rivers in New England." While they have been included in some such permits, they have not been included in other permits on the basis of detailed CWA § 316(a) variance determinations. For example, such narrative provisions were not included in the permits for Brayton Point Station, Kendall Station or General Electric Aviation. *See* https://www3.epa.gov/region1/npdes/braytonpoint/pdfs/finalpermit/BraytonPointFinalPermit.pdf; https://www3.epa.gov/region1/npdes/permits/2010/finalmodma0004898permit.pdf; and https://www3.epa.gov/region1/npdes/permits/2015/finalma0003905permitmod.pdf.

Finally, as also explained farther above, even if one regarded the Final Permit as being less stringent than the 1992 Permit to the extent that the narrative water quality limits are not retained, this would not be barred by the statute's anti-backsliding requirements because one of the statutory exceptions to those requirements apply. Specifically, CWA § 402(o)(2)(D), 33 U.S.C. § 1342(o)(2)(D), provides that a subsequent permit may be issued with less stringent conditions if "the permittee has received a permit modification under section … 316(a)." That is what has happened here. The Final Permit changes the thermal discharge limits from those included in the 1992 Permit and the new limits are based on a variance under CWA § 316(a). EPA has determined that the Final Permit's stringent numeric thermal discharge limits will assure the protection and propagation of the BIP and that the narrative thermal plume provisions are not needed.

6.3.4 Any New Thermal Discharge Decisions to Be Made by EPA Must Be Supported by Record Evidence, a Rational Basis, and an Explanation that Logically Connects the New Decisions Made to the Facts Found.

The Clean Water Act prohibits the discharge of heat or any other pollutant from a point source to a water of the United States unless authorized by an NPDES permit.[68] The permit limits EPA establishes for thermal discharges must satisfy federal technology-based requirements and any more stringent requirements based on applicable state water quality standards.[69] CWA section 316(a) allows EPA to grant a variance and impose less stringent thermal discharge limits *only* if the permittee demonstrates that "any effluent limitation proposed for the control of the thermal component of any discharges . . . will require effluent limitations more stringent than necessary to assure the protection and propagation of a balanced, indigenous population ['BIP'] of shellfish, fish, and wildlife."[70] Nevertheless, permit conditions based on a section 316(a) variance must "assure the protection and propagation of a balanced, indigenous population of shellfish, fish, and wildlife in and on the body of water."[71]

The permittee has the burden of proof in persuading the permitting authority both that the non-variance limits are more stringent than is needed and that an alternative set of limitations will be sufficient to protect the BIP.[72] "[T]he burden of proof in a 316(a) case is a stringent one."[73] Alternative thermal discharge limitations must "assure" the protection and propagation of the BIP.[74] As EPA has acknowledged, when considering a section 316(a) variance application, the Agency "may not speculate as to matters for which evidence is lacking,"[75] and that if "deficiencies in information are so critical as to preclude reasonable assurance, then alternative effluent limitations should be denied."[76]

An existing discharger may base its thermal demonstration on a showing that there has been no "appreciable harm" to the BIP from "the thermal component of the discharge taking into account the interaction of such thermal component [of the discharge] with other pollutants and the additive effect of other thermal sources."[77] Alternatively, an existing discharger can attempt to show that "despite the occurrence of such previous harm, the desired alternative effluent limitations (or appropriate modifications thereof) will nevertheless assure the protection and propagation of . . . [the BIP]."[78] Here, GSP has taken the former approach, arguing that there has been no appreciable harm to the Hooksett Pool, an argument that EPA soundly rejected in an extensive, independent analysis documented in more than 200 pages in the 2011 Thermal Determinations.

As with any administrative decisionmaking by a federal agency, EPA's section 316(a) and thermal permitting determinations must conform to the APA and be based on "reasoned decisionmaking."[79] "Not only must an agency's decreed result be within the scope of its lawful authority, but the process by which it reaches that result must be logical and rational."[80] A court must reject an agency decision that, inter alia, is based on explanation "that runs counter to the evidence before the agency" or lacks "a satisfactory explanation . . . including a rational connection between the facts found and the choice made."[81]

When EPA preliminarily determined, in 2011, that PSNH failed to demonstrate that the Station's thermal discharge has not caused appreciable harm to the BIP, that the "evidence as a whole indicates that [the] Station's thermal discharge has caused, or contributed to, appreciable harm to [the] BIP," and that PSNH did not demonstrate that thermal discharge limits based on technology-based and water quality-based requirements would be more stringent than necessary to assure the protection and propagation of the BIP, the agency did so based on an extensive record, its own independent analysis of data supplied by the applicant, and coordination with state and federal scientists and regulators. EPA supplied a detailed explanation of its process and its reasoning, including a rational connection between the facts found and the choice made. And the agency described in detail the extensive "compelling evidence of appreciable harm to the balanced, indigenous fish community of Hooksett Pool."

In 2014 and in 2017, EPA issued new public notices relating to aspects of the Station's NPDES permit, but did not change its conclusions that the Station's thermal discharges have harmed the BIP and that the technology-based and water quality-based requirements set forth in the 2011 and 2014 draft permits are necessary to assure protection of the BIP compliance with New Hampshire water quality standards.

If EPA plans to reconsider its 2011 decision to deny a section 316(a) variance, or if EPA is considering new thermal discharge requirements for the Station, the APA requires the agency to explain how the extensive record that supported its 2011 conclusions will support any new conclusions. In the absence of supporting record evidence, a rational basis, and an explanation logically connecting the decisions to the facts, agency action will be held unlawful and set aside as arbitrary and capricious under the APA.[82]

[68] 33 U.S.C. § 1311(a), 1362(6).

[69] *See* 33 U.S.C. § 1311(b)(1)(C), (b)(2)(A).

[70] 33 U.S.C. § 1326(a).

[71] 33 U.S.C. § 1326(a); 40 C.F.R. § 125.70.

[72] 33 U.S.C. § 1326(a); 40 C.F.R. § 125.73(a).

[73] *In the Matter of Public Serv. Co.* ("*Seabrook")*, 1 E.A.D. 332, 346 (E.P.A. June 10, 1977), 1977 EPA App. LEXIS 16, at *31.

[74] 2011 Permitting Determinations at 24.

[75] *Seabrook,* 1977 EPA App. LEXIS 16, at *31.

[76] *Seabrook,* 1977 EPA App. LEXIS 16, at *33 (quoting 1974 Draft EPA § 316(a) Guidance). *See also In the Matter of: Public Service Company of Indiana, Inc., Wabash River Generating Station, Cayuga Generating Station*, 1 E.A.D. 590 E.P.A. Nov. 19 10, 1979), 1979 EPA App. LEXIS 4, *34-40 (permit remanded to where variance-based thermal discharge limitations were issued despite lack of data regarding thermal effects under worst case, low-flow conditions).

[77] 40 C.F.R. § 125.73(c)(1)(i).

[78] 40 C.F.R. § 125.73(c)(1)(ii).

[79] *See Allentown Mack Sales & Serv. v. NLRB*, 522 U.S. 359, 374 (1998) (quoting *Motor Vehicle Mfrs. Ass'n of the United States, Inc. v. State Farm Mut. Auto. Ins. Co.*, 463 U.S. 29, 52 (1983)).

[80] *Id.*

[81] *Grosso v. Surface Transp. Bd.*, 804 F.3d 110, 116 (1st Cir. 2015) (quoting *State Farm*, 463 U.S. at 43); *see also Southcoast Hosps. Grp., Inc. v. NLRB*, 846 F.3d 448, 453 (1st Cir. 2017).

[82] 5 U.S.C. § 706(2)(a).

EPA Response:

EPA largely agrees with the commenter's background discussion about various requirements under CWA § 316(a). EPA provided its own discussion of these matters in the 2011 Draft Permit Determinations Document. *See* AR 618, pp. 17-26. EPA does not agree with the comment, however, when it states that the Facility attempted only to make a retrospective demonstration that it qualifies for alternative thermal discharge limits under a CWA § 316(a) variance. Merrimack Station, rather, attempted to make both retrospective and prospective demonstrations. *See, e.g.,* AR 618, p. 78. *See also id.* at 27; 40 CFR § 125.73(c)(1)(ii). EPA's review and analysis of the Facility's demonstration and the available data and scientific information led to the Agency's conclusion that the Facility did not demonstrate either that its past thermal discharges had not appreciably harmed the BIP of the Hooksett Pool or that its requested thermal limits (based on discharges from baseload operations with open-cycle cooling technology) would assure the protection and propagation of the BIP in the future. *See* AR 618, pp. 120-21. Thus, EPA developed thermal discharge limits for the 2011 Draft Permit based on technology standards and water quality standards.

At the same time, EPA indicated that it was considering whether it could and should set limits based on seasonal critical temperatures for resident fish species. Such limits would have been based on water quality standards and a CWA § 316(a) variance from technology standards during some parts of the year. *See id.* at 212-17. EPA expressly invited public comment on this approach. This approach obviously involved a forward-looking assessment based on whether future limits would protect the BIP and was not based on a retrospective analysis, since EPA had found that the retrospective analysis did not establish that past discharges had not caused appreciable harm to the BIP.

Moving forward, and after considering public comment, EPA has not changed its view of PSNH's retrospective demonstration. If the Agency *had* changed its view, it could simply have renewed the existing variance-based limits secure in the knowledge that the Facility discharged far less waste heat now than it did before. Since the Agency maintained its conclusions about the retrospective demonstration, however, it has focused instead on the questions raised by the alternative approach identified in the 2011 Draft Permit determination document, as well as the questions discussed in the 2017 Statement: namely, whether in light of the Facility's much-reduced operations, new thermal discharge limits could be set that would assure the protection and propagation of the BIP going forward based on a prospective or predictive analysis considering critical temperatures for resident fish species. *See id*. at 212-17; AR 1534, pp. 39-41, 68. This is rational and reasonable given that the Facility's operational profile and the scope of its thermal discharges has changed so significantly since issuance of the 2011 Draft Permit for public review. Indeed, EPA finds that it would have been irrational and unreasonable to ignore the facts regarding the Facility's altered operations and thermal discharges.

In addition, the following discussion further responds to the comment's allusions to EPA's proposed determination for the 2011 Draft Permit based on appreciable harm to the Hooksett

Pool's BIP and the Agency's rationale for that determination. EPA received substantial comments and information after the 2011 Draft Permit was released questioning whether designating a fish community from the 1960s as the BIP was appropriate given that it likely reflected the poor water quality of that time. EPA had based its §316(a) variance request determination on analysis of fish community information originally provided largely by the plant. Prior to release of the 2011 Draft Permit, no reports or written concerns were received that questioned using fish data from the 1960s. EPA used this information because it reflected the earliest data that existed prior to the start-up of the plant's Unit II and, therefore, EPA considered it the best information to reflect the fish community prior to the Facility's full thermal discharge. In EPA's view at the time, this provided the closest approximation possible of the *indigenous* community of organisms in the Hooksett Pool and the best point of comparison for evaluating the Facility's thermal effects. While EPA questions or refutes some of PSNH's arguments made concerning the extent to which Hooksett Pool's water quality was impaired in the 1960s (*See* Section 4.2.1), it agrees that some of the fish species common in the 1960s in the Hooksett Pool are more tolerant of depressed dissolved oxygen levels, which is an important metric for characterizing water quality, and that some of the common species are identified as "pollution tolerant." However, since most of the Facility's initial analyses, prior to the release of the 2011 Draft Permit, focused on comparisons between the fish community of the 1970s with that of the 2000s (2004, 2005), much of EPA's original analyses did not change appreciably by shifting focus more to the 1970s fish community and less to the 1960s community.

EPA also received from PSNH's consultant Normandeau two reports describing results of fisheries studies conducted in 2010 and 2011 (AR-871,) and additional studies conducted in 2012 and 2013 (AR-1551). These reports included updated trends analyses for representative important species of the Hooksett Pool fish community. They also included comparisons of the Hooksett fish community with the Garvins Pool community, immediately upstream. While there are aspects to these studies that EPA has concerns about, which are discussed in this document (*See* II.4.3.3(ii)), they nevertheless represent the first comprehensive comparisons of these two adjacent fish communities. As such, EPA has considered the Garvins Pool fish community comparison information to provide additional useful information for assessing the current status of Hooksett Pool's BIP. Therefore, in response to comments, EPA has looked at both changes in historical trends and comparisons with an adjacent fish community not influenced by a thermal discharge because, in the Agency's view, it provides a more comprehensive approach to EPA's evaluation of the BIP. This approach is similar to a "Before-After-Control-Impact" study design often used in assessing impacts to biological communities. *See* Larson et al. 2018 (AR-1774).

Taking into consideration all the information received to date,[32] EPA concludes that the evidence still indicates that appreciable harm to the Hooksett Pool fish community occurred in the past, based on comparisons of the fish community from the 1970s with that of the early 2000s (2004, 2005). Declines in abundance in Hooksett Pool's most temperature sensitive resident species, yellow perch, were still evident through 2011, according to catch data and trends analyses presented in Normandeau's 2011 fisheries report (*See* AR-871 at 79, 220). That said, EPA also

[32] EPA received this additional information during the comment period on the 2011 Draft Permit, additional information submissions prior to the 2017 reopened comment period, in response to EPA information requests, and, finally, in comments submitted during the 2017 public comment period.

has found that additional fish data collected in 2012 and 2013, and related analyses, provide some evidence that the negative trend in yellow perch abundance had improved to the extent that a negative trend was no longer detectable (*See* AR-1551 at 27). In addition, increases in fallfish abundance – another coolwater species – in the thermally-influenced section of Hooksett Pool during 2012 and 2013 also suggest that temperature-sensitive fish species are inhabiting the lower section of Hooksett Pool more during the months of August and September (*See* AR-1551 at 16 and 19). These increases in habitat use correspond with substantial decreases in Merrimack Station's operation (and thermal discharge) during warmer months, which could be an influencing factor (*See* II.3.5.1, above).

In addition to these encouraging changes to trends within the Hooksett Pool fish community that could be indicative of a recovering BIP, comparisons of the present Hooksett Pool community to that of Garvins Pool suggests notable similarities in the mix of coolwater and warmwater species in these adjacent communities. *See* AR-871 at 217-219. These similarities would also be consistent with an improving balance to the resident community of fish. The introduction of new fish species over time is inevitable in a waterbody like the Merrimack River, and the Hooksett Pool community reflects such changes. These introductions can add to existing stress on indigenous species, especially if elevated temperatures provide the new arrivals with a competitive advantage. However, one notable introduction that did not appear in fish sampling catch results until 2004 was black crappie (*Pomoxis nigromaculatus*). This coolwater member of the sunfish family was newly present in Hooksett Pool in low abundance during the last four years of sampling (2010-2013). *See* AR-1551 at 34. While this species would not be considered part of the BIP for historical comparisons, its presence nevertheless demonstrates that other coolwater species are able to exist in Hooksett Pool under current thermal conditions.

Merrimack Station's "capacity" to adversely impact the Hooksett Pool's fish community remains relatively unchanged since EPA released its 2011 draft permit, but the plant's precipitous and steady reduction in operation over the past 10 years, particularly during the critical summer months, has allowed Hooksett Pool to return to a more natural habitat, far less influenced by the plant's thermal effects. While there is no indication that market forces will reverse the plant's decreased operations, the temperature and operational limits established in this final permit are designed to ensure that plant's future operation does not cause excessive and prolonged thermal conditions in the pool that would cause appreciable harm to the BIP. Therefore, EPA expects Hooksett Pool's BIP to be protected going forward, but the Final Permit requires fish studies to be continued to ensure the BIP remains protected.

Regarding the comment's reference to the 2011 Draft Permit and the 2017 public comment period, EPA reiterates two points already made in these Responses to Comments. First, the 2014 Revised Draft Permit addressed new limits for proposed FGD wastewater discharges and was not relevant to the thermal discharge issues. Second, the 2017 Statement identified a number of issues and a variety of new information that EPA was considering and inviting comment on that pertained to setting thermal discharge limits. AR 1534, pp. 4-5, 7-8, 36-44, 68-69.

EPA agrees with the comment that the Agency must articulate a rational basis for the Final Permit's thermal discharge limits. EPA has done so.

6.4 Conclusion

EPA should proceed, without further delay, to: (i) finalize its proposed denial of the Station's request for a CWA section 316(a) variance; (ii) issue a final NPDES permit containing thermal discharge requirements based on closed-cycle cooling, as it proposed in 2011; and (iii) retain the 1992 Permit's effluent limitations restricting the thermal plume and prohibiting violations of water quality standards.

If, however, EPA proposes to grant a variance and/or include substantially different requirements in the permit, then EPA must: (i) subject those new decisions to public notice and public comment; (ii) retain the 1992 Permit's effluent limitations restricting the thermal plume and prohibiting violations of water quality standards; and (iii) support any new conclusions with an evidentiary basis in the record, reasoned decision making, and a rational explanation connecting the decisions made to the facts found.

The permitting process for Merrimack Station has taken far too long already. EPA should not, at the behest of a new owner of the Station, further delay issuance of the permit and disregard years of work and analysis by the agency. Changing course now, as the "discussion drafts" suggest, would amount to an unwarranted windfall to the company, which acquired the Station knowing full well that EPA had made a proposed determination that BAT and state water quality standards required converting the Station's cooling system to closed-cycle cooling (and whose bid and purchase price for the Station must have factored in that risk). EPA should not delay any further and should not allow Station's "appreciable harm" to the Merrimack River to continue any longer.

EPA Response:

The commenter reiterates its view that EPA must reaffirm its denial of Merrimack Station's CWA § 316(a) variance request, set thermal discharge limits based on closed-cycle cooling technology, and retain the narrative water quality-oriented conditions in the 2011 Draft Permit. EPA has already responded to each of these points in responses to other comments above. EPA has not changed its decision not to grant a CWA § 316(a) variance that would authorize discharges consistent with baseload operations using open-cycle cooling. At the same time, EPA has not decided to set the Final Permit's limits based on closed-cycle cooling technology – though the Facility is free to meet the limits using that technology if it so chooses – and has instead decided to set the limits based on CWA § 316(a) and state water quality standards taking into account the Facility's reduced discharges and critical temperatures for resident and anadromous fish species. For the Final Permit, EPA has retained one of the narrative provisions mentioned in the comment, Part I.A.14 from the 2011 Draft Permit, but dropped the other, Part I.A.23 of the 2011 Draft Permit, because it is no longer needed and would be a potential source of confusion.

EPA has also already responded to comments insisting that if EPA changes the limits from the 2011 Draft Permit, the Agency must reopen the comment period again, and stating that the Agency must articulate a rational basis for the Final Permit's limits. With respect to the former point, EPA has explained its disagreement pointing out that the Final Permit is a logical outgrowth of the 2011 Draft Permit and the 2017 Statement, and that it has reasonably exercised its discretion under 40 CFR § 124.14 not to reopen the comment period again in this case. With respect to the latter comment, EPA agrees that it must provide a rational basis for the Final Permit and it has done so.

The commenter urges that "[t]he permitting process for Merrimack Station has taken far too long already" and EPA has properly taken this concern into account in its decision not to reopen the comment period again under 40 CFR § 124.14. Contrary to the comment's suggestion, EPA is not, "at the behest of a new owner of the Station," further delaying issuance of the permit or disregarding years of work and analysis by EPA. Instead, the Agency is moving forward to issue the Final Permit building on its past work and taking account of the facts and science. EPA's Final Permit will not, the Agency has concluded, allow continued "appreciable harm" to the Hooksett Pool's BIP, but it also requires continued monitoring so that conditions can continue to be assessed going forward. With regard to the commenter's suggestion that changing the Final Permit will provide "an unwarranted windfall to the company," economic considerations are not a valid factor to consider under CWA § 316(a), which focuses on the protection and propagation of the BIP, or under state water quality standards.

Table of Contents – Chapter III

1.0 The 2014 Final § 316(b) Rule Requires EPA To Revisit Its BTA Determination In The Draft Permit

Comment III.1(i)	AR-1548, PSNH, pp. 110-111
See also AR-1215, PSNH, p. 169	

In 2011, EPA utilized its BPJ authority to render a determination that a limitation of the intake flow volume of both CWISs at Merrimack Station to a level consistent with operating in CCC mode annually from April 1 through August 31, is BTA pursuant to § 316(b). PSNH and other interested stakeholders disputed this determination as arbitrary and capricious in their February 2012 comments to the Draft Permit. These comments were validated by EPA's promulgation of the 2014 final § 316(b) rule, in which the agency specifically rejected CCC as BTA for the industry.[483]

EPA correctly acknowledges in its Statement that its BPJ-based BTA determination in the Draft Permit is now null and void due to the new final § 316(b) rule. The agency is required to generate a new BTA determination in accordance with the requirements of this new rulemaking. A reasonable application of this rule would lead to a conclusion that the operation and technologies of the existing CWISs constitute BTA because the rates of impingement and entrainment at the facility are *de minimis* and because EPA implicitly acknowledged in its final § 316(b) rule that facilities with a three-year average AIF below 125 MGD are not required to address entrainment, absent extenuating circumstances (which do not exist at Merrimack Station).

Set out below is a detailed discussion of the final § 316(b) rule, including a well-reasoned application of its requirements to Merrimack Station—dictating that existing CWISs constitute BTA. PSNH also sets out a discussion of the 2017 evaluation of wedgewire screen technologies by Enercon and Normandeau, as well as an analysis of whether this CWIS technology is feasible and cost-effective for the facility. PSNH concludes its § 316(b) discussions by revisiting and updating it 2012 comments to the Draft Permit regarding why CCC is not and cannot be BTA for the CWISs at Merrimack Station.

483 *See, e.g.,* 79 Fed. Reg. at 48,340.

EPA Response

PSNH first comments that EPA's nationally applicable 2014 Final Regulations for Existing Cooling Water Intake Structures (Final Rule) validate PSNH's earlier comments opposing EPA's site-specific determination in the 2011 Draft Permit that closed-cycle cooling is the BTA for Merrimack Station. According to PSNH, the Final Rule "specifically rejected CCC as BTA for the industry."

To the extent the comment suggests that the Final Rule prohibits the selection of closed-cycle cooling as the BTA at a particular facility, EPA disagrees. To be clear, EPA found in the Final Rule that closed-cycle cooling reduces entrainment and impingement mortality to the greatest extent and is the most effective performing technology. 79 Fed. Reg. 48,300 at 48,340 (Aug. 15, 2014); *see also id.* at 48,342 ("Closed-cycle cooling is indisputably the most effective technology at reducing entrainment."). In the Final Rule, EPA specifically adopted closed-cycle cooling as the BTA for entrainment (and impingement) for new units at existing facilities. *Id.* at 48,337; 40 CFR § 125.94(e)(1). Furthermore, EPA established closed-cycle cooling as an alternative for satisfying the BTA standard for impingement mortality at existing facilities. *See* 40 CFR § 125.94(c)(1). For entrainment at existing facilities, EPA adopted a regulatory framework under which the permitting authority establishes BTA entrainment requirements "on a site-specific basis following prescribed procedures and applying specified factors for decisionmaking . . ." 79 Fed. Reg. at 48,342.[1] And, the Final Rule explicitly recognizes that EPA may determine that closed-cycle cooling is the site-specific BTA standard for entrainment at a particular facility. *See* 40 CFR § 125.94(d). Thus, EPA clarifies that the Final Rule does not prohibit EPA from selecting closed-cycle cooling as an entrainment BTA at a particular facility, but rather requires that its selection as the best technology available be determined via a site-specific inquiry. *See* 40 CFR § 125.98(f); *Cooling Water Intake Structure Coal. v. EPA*, 905 F.3d 49, 66 (2d. Cir. 2018) (noting that, under the Final Rule, a permitting authority may determine that closed-cycle cooling is the BTA at a particular facility).

PSNH also comments that the Final Rule, promulgated after EPA issued the Draft Permit, nullifies EPA's BPJ-based permit determination and that, consequently, EPA must "generate a new BTA determination" in accordance with the requirements of the Final Rule. In particular, EPA disagrees that its 2017 Statement of Substantial New Questions for Public Comment ("the 2017 Statement") "acknowledges…that its BPJ-based BTA determination in the Draft Permit is now null and void." The 2017 Statement specifically requested comment regarding "the import of the 2014 CWA § 316(b) Regulations" and "what cooling water intake structure requirements should be included in the Final Permit in light of the 2014 CWA § 316(b) Regulations" but did not "acknowledge" that the BPJ-based BTA determination in the Draft Permit was "null and void." Rather, EPA recognized that the Final Rule grants a permitting agency the discretion to decide whether to consider each of the factors specified in 40 CFR § 125.98(f)(2) and (3), when rendering a BTA determination in an ongoing permit proceeding such as this one. 2017 Statement at 16-17. As EPA noted, the regulation provides that "[t]he Director's BTA determination may be based on some or all of the factors in paragraphs (f)(2) and (3) of this section and the BTA standards for impingement mortality at § 125.95(c)." *Id.* EPA further noted that it had "effectively considered all of the § 125.98(f)(2) and (3) factors, as well as the technologies specified in 40 CFR § 125.94(c)" in its proposed BTA determination in the 2011 Draft Permit. *Id.* Having said that, EPA agrees that the Final Rule is effective and that the final BTA determination for Merrimack Station should be consistent with the new regulations. *See id*. To this end, EPA has considered the factors at 40 CFR § 125.98(f)(2) and (3) in rendering its determination for the Final Permit and has determined that the site-specific determination complies with the Final Rule. *See* Response to Comment 5.3.

Finally, PSNH comments that EPA should determine that the current operation and technologies of the existing CWISs constitute BTA because "the rates of impingement and entrainment at the

[1] The Final Rule makes no specific mention of Merrimack Station and, therefore, does not specifically identify any particular technology as the BTA for the facility.

facility are *de minimis* and because EPA implicitly acknowledged in its final § 316(b) rule that facilities with a three-year average actual intake flow (AIF) below 125 MGD are not required to address entrainment, absent extenuating circumstances (which do not exist at Merrimack Station)." In the Responses to Comments below, EPA evaluates the existing technologies at Merrimack Station's CWISs pursuant to the framework established in the Final Rule and whether the rates of entrainment and impingement at Merrimack Station are *de minimis*. *See* Response to Comments III.3, III.3.4, III.3.6. EPA also disagrees with PSNH's statement that the Final Rule implicitly acknowledges that a facility with an AIF less than 125 million gallons per day (MGD) is not required to address entrainment. As discussed in detail in Response to Comment III.3.5, the BTA standard for entrainment applies to all facilities subject to the Final Rule (i.e., with design flows greater than 2 MGD and which use at least 25% of water withdrawn from its CWISs exclusively for cooling).

1.1 Legal Background

Comment III.1.1	**AR-1548, PSNH, pp. 111-118**
See also AR-1231, PSNH, pp. 29-34	

PSNH set out the complete CWA § 316(b) legal history in its February 28, 2012 comments to EPA's original Draft Permit.[484] Included here is the only relevant legal background: an explanation of EPA's 2014 § 316(b) final rule, which governs the regulation of all CWISs within the industry—including the CWISs at Merrimack Station. EPA published its CWA final § 316(b) rule for CWISs on August 15, 2014.[485] The final rule became effective October 14, 2014.[486] It applies to existing industrial facilities with the capability to withdraw greater than 2 MGD and utilize 25 percent or more of that water exclusively for cooling purposes.[487] The new regulations are codified under 40 C.F.R. Part 125, Subpart J, and 40 C.F.R. § 122.21, and establish categorical standards for determining and implementing BTA to minimize impingement and entrainment impacts of CWISs. The final § 316(b) rule modified and combined into a single rulemaking portions of its previous phased CWA § 316(b) rulemakings that had been litigated and remanded following judicial review.[488]

The primary requirements applicable to existing facilities in the final § 316(b) rule include the requirement that any facility with a DIF greater than 2 MGD install one of several approved technologies to reduce fish impingement mortality at its CWIS and the requirement that any existing facility with an AIF over 125 MGD conduct certain studies regarding entrainment of aquatic organisms in the facility's CWIS that will allow the permitting authority to establish BTA standards for entrainment on a site-specific basis.[489] As an existing facility withdrawing less than 125 MGD AIF, Merrimack Station is subject only to the first of these two primary requirements.

EPA advanced seven "pre-approved" control technologies from which a facility may choose to satisfy the impingement mortality BTA standard.[490] The new regulations also allow facilities to select other technologies upon a demonstration to the permitting authority that the selected technology will perform adequately.[491] The seven delineated control technologies for impingement mortality include:

(1) operate a closed-cycle recirculating system;

(2) operate a CWIS with a designed maximum through-screen design intake velocity of 0.5 fps;

(3) operate a CWIS with actual maximum through-screen design intake velocity of 0.5 fps;

(4) operate an offshore velocity cap if installed before October 14, 2014;

(5) operate a modified traveling screen that incorporates certain protective measures as defined by 40 C.F.R. § 125.92(s);

(6) operate any other combination of technologies, management practices, and operational measures that the permit writer determines is BTA for impingement reduction; and

(7) achieve the specified impingement mortality performance standard.[492]

Options 1, 2, and 4 are essentially "pre-approved" technologies the implementation of which would not generally require a demonstration to or approval by the permitting authority. Option 3 requires at least daily monitoring of the actual velocity at the screen in perpetuity, and Option 7 requires biological monitoring in perpetuity at a minimum frequency of monthly to demonstrate compliance with the impingement mortality performance standard.[493] If a facility chooses Options 5 or 6 to comply with the rule, it must undertake an "impingement technology performance optimization study."[494] That study takes place after the installation of the chosen impingement technology and following the issuance of a new final NPDES permit (*i.e.*, "post-permit"). The study must include two years of at least monthly impingement mortality monitoring and set forth biological data measuring the reduction in impingement mortality achieved by operation of the chosen compliance option, including a demonstration that operation of the compliance option has been optimized to minimize impingement mortality.[495]

EPA has acknowledged there may be circumstances in which flexibility in the application of the final § 316(b) rule may be necessary.[496] For this reason, EPA has the discretion to determine that no additional controls are needed to meet the BTA impingement mortality standard if the rate of impingement at the facility is *de minimis*.[497] There is not an explicit standard or threshold for when the agency will deem a facility a candidate under the *de minimis* provision.[498] By way of illustration, the final rule provides that a facility might be a candidate for consideration "if [the] facility withdraws less than 50 [MGD] AIF, withdraws less than 5 percent of mean annual flow of the river on which it is located (if on a river or stream), and is not co-located with other facilities with CWISs such that it contributes to a larger share of mean annual flow[.]"[499] EPA explicitly clarifies that "the authority of the Director [to utilize the *de minimis* provision] is not limited to low flow facilities," despite the examples provided.[500] The agency acknowledges the definition of *de minimis* can and should vary on a site-specific basis.[501] Therefore, in order for a facility to avail itself of the *de minimis* provision, it must submit data to EPA indicating its *de minimis* impingement rate.[502]

For entrainment reduction, the final § 316(b) rule establishes regulations requiring the permitting authority to make a site-specific BTA determination—including a possible determination that no entrainment controls at a facility are necessary—after consideration of certain specified factors and based on all available entrainment data for a facility.[503] Specifically, 40 C.F.R. § 125.98(f) states that a permitting authority must consider the following factors in making such a site-specific determination:

> (i) Numbers and types of organisms entrained, including, specifically, the numbers and species (or lowest taxonomic classification possible) of Federally-listed, threatened and endangered species, and designated critical habitat (e.g., prey base);
>
> (ii) Impact of changes in particulate emissions or other pollutants associated with entrainment technologies;
>
> (iii) Land availability inasmuch as it relates to the feasibility of entrainment technology;
>
> (iv) Remaining useful plant life; and
>
> (v) Quantified and qualitative social benefits and costs of available entrainment technologies when such information on both benefits and costs is of sufficient rigor to make a decision.[504]

In terms of social costs and relative benefits, the "significantly greater than" and "wholly disproportionate" cost-benefit standards at issue in the U.S. Supreme Court's *Entergy Corp. v. Riverkeeper Inc.*[505] opinion remain in effect following promulgation of the final § 316(b) rule. These standards provide a basis for EPA to "reject an otherwise available technology as a BTA standard for entrainment if the social costs are not justified by the social benefits."[506] A more complete discussion of the implication of the costs of a § 316(b) technology compared to its relative benefits is set out in Part III.D.3. below.

In addition to the five aforementioned mandatory factors, the permitting authority may also consider several other factors in reaching a site-specific BTA determination for entrainment, which include:

> (i) Entrainment impacts on the waterbody;
>
> (ii) Thermal discharge impacts;
>
> (iii) Credit for reductions in flow associated with the retirement of units occurring within the ten years preceding October 14, 2014;
>
> (iv) Impacts on the reliability of energy delivery within the immediate area;
>
> (v) Impacts on water consumption; and

> (vi) Availability of process water, gray water, waste water, reclaimed water, or other waters of appropriate quantity and quality for reuse as cooling water.[507]

The weight given to the mandatory factors may vary depending upon the circumstances of an individual facility.[508]

The permitting authority's consideration of the aforementioned factors in making a BTA determination is to be "based on a [facility's] submission of certain . . . required information" relating to entrainment impacts at a facility.[509] Specifically, to ensure that the permitting authority has access to the information necessary to make an informed BTA determination about a facility's site-specific entrainment controls, the final § 316(b) rule requires any existing facility with "major cooling water withdrawals"—greater than 125 MGD AIF—to collect the following types of entrainment-related information:[510]

> Entrainment Characterization Study: A study of at least two years of entrainment data, identifying and documenting "organisms collected to the lowest taxon possible of all life stages of fish and shellfish that are in the vicinity of the cooling water intake structure(s) and are susceptible to entrainment, including any organisms identified by [EPA], and any species protected under Federal, State, or Tribal law, including threatened and endangered [("T&E")] species with a habitat range that includes waters in the vicinity of the cooling water intake structure";
>
> Comprehensive Technical Feasibility and Cost Evaluation Study: A description of the technical feasibility and incremental costs of candidate entrainment control technologies. The study must include an evaluation of the technical feasibility of closed-cycle cooling ("CCC"), fine-mesh screens with a mesh size of 2 mm or smaller, reuse of water or alternate sources of cooling water, and any other entrainment reduction technologies identified by the applicant or requested by the permitting authority;
>
> Benefits Valuation Study: A detailed discussion of the magnitude of water quality benefits, both monetized and non-monetized, of the entrainment mortality reduction technologies evaluated in the Comprehensive Technical Feasibility and Cost Study, including discussion of recent mitigation efforts already completed and how these have affected fish abundance and ecosystem viability in the intake structure's area of influence as well as other benefits to the environment and the community; and
>
> Non-water Quality and Other Environmental Impacts Study: A detailed discussion of the changes in non-water quality factors attributed to technologies and/or operational measures

> considered.[511]

As EPA explained in the final § 316(b) rule, these entrainment study requirements are limited to facilities with actual water withdrawals exceeding 125 MGD because:

> [T]his threshold will capture 90 percent of the actual flows but will apply only to 30 percent of existing facilities. EPA concluded that this threshold struck the appropriate balance between the goal of capturing the greatest portion of intake flow while minimizing the study requirements for smaller facilities . . . . The selected threshold would significantly limit facility burden at more than two-thirds of the potentially in-scope facilities while focusing the Director on major cooling water withdrawals.[512]

Stated differently, facilities above the 125 AIF threshold comprise approximately 200 billion of the national total of 222 billion combined AIF gallons, which is why EPA determined in the final § 316(b) rule that it is these larger facilities (*i.e.*, > 125 MGD AIF) that have "the highest likelihood of causing adverse impacts" from entrainment.[513]

Facilities falling below this 125 AIF threshold supposedly are not universally exempt from the entrainment requirements of the final § 316(b) rule, according to EPA. Yet, the agency recognized in its proposed rule that a BTA determination for entrainment at facilities within the 2 MGD DIF to 125 MGD AIF range could very well be "no other technologies beyond impingement control . . . because no other technologies are feasible and/or their benefits do not justify their costs."[514] Nevertheless, EPA provided permitting authorities the right to "require reasonable information to make informed decisions at the smaller facilities" regarding what entrainment controls, if any, may be necessary to satisfy the BTA standard.[515]

Regarding implementation, 40 C.F.R. § 125.98(g) provides:

> In the case of permit proceedings begun prior to October 14, 2014 whenever the Director has determined that the information already submitted by the owner or operator of the facility is sufficient, the Director may proceed with a determination of BTA standards for impingement mortality and entrainment without requiring the owner or operator of the facility to submit the information required in 40 C.F.R. 122.21(r) . . . . In making the decision on whether to require additional information from the applicant, and what BTA requirements to include in the applicant's permit for impingement mortality and site-specific entrainment, the Director should consider whether any of the information at 40 C.F.R. 122.21(r) is necessary.[516]

EPA has determined it "has sufficient information in the record to determine the BTA requirements for the Merrimack Station permit" and does not need any of the additional permit application information described in 40 C.F.R. § 122.21(r) to support its permit decision.[517]

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484 *See* AR-846 at 61-66.
485 *See* 79 Fed. Reg. at 48,300.
486 *Id.* at 48,358.
487 *See* 40 C.F.R. § 125.91(a).
488 *See, e.g.,* 79 Fed. Reg. at 48,328.
489 *See* 40 C.F.R. § 125.94(a), (c); *id*. at § 122.21(r)(9)-(12).
490 *See id*. at § 125.94(c).
491 *See id*. at § 125.94(c)(6), (7).
492 *See id.* at § 125.94(c)(1)-(7).
493 *See id*. at § 125.94(c)(3), (7).
494 *See id*. at § 122.21(r)(6)(i), (ii).
495 *See id.*
496 79 Fed. Reg. at 48,309.
497 40 C.F.R. § 125.94(c)(11).
498 *See* 79 Fed. Reg. at 48,309, 48,371.
499 79 Fed. Reg. at 48,309.
500 *Id.* at 48,371.
501 *See id.* at 48,371-72.
502 *See id.*
503 40 C.F.R. § 125.94(d).
504 *Id*. at § 125.98(f)(2)(i)-(v).
505 556 U.S. 208, 225 (2009).
506 40 C.F.R. § 125.98(f)(4).
507 *Id*. § 125.98(f)(3)(i)-(vi).
508 *Id*. § 125.98(f)(2).
509 *See* 76 Fed. Reg. 22,174, 22,204 (Apr. 20, 2011) (codified at 40 C.F.R. pts. 122 and 125).
510 *See* 79 Fed. Reg. at 48,309; 40 C.F.R. § 122.21(r)(9); *see also* EPA, Technical Development Document for the Proposed Section 316(b) Phase II Existing Facilities Rule, Dock. ID EPA-HQ-OW-2008-0667-1282, at 7-7 (Mar. 28, 2011) (noting that "the permit writer would have access to all the information necessary for an informed decision about [a site-specific BTA determination] . . . to reduce entrainment mortality at facilities above 125 MGD AIF" because "the facility's permit application must include information to support such an evaluation"). Hereinafter, references to this document will be cited as "Proposed Rule TDD."
511 *See* 40 C.F.R. § 122.21(r)(9)-(13). Discussion of the changes in non-water quality factors attributed to technologies and/or operational measures include but are not expressly limited to evaluating increases and decreases in energy consumption, thermal discharges, air pollutant emissions, water consumption, noise, safety, grid reliability, and facility reliability. *See id.* at § 122.21(r)(12).
512 EPA Technical Development Document for the Final Section 316(b) Phase II Existing Facilities Rule, Dock. ID EPA-HQ-OW-2008-0667-4138, at 3-8 (May 19, 2014). Hereinafter, references to this document will be cited as "Final Rule TDD."
513 79 Fed. Reg. at 48,309.
514 76 Fed. Reg. at 22,005.
515 79 Fed. Reg. at 48,309.
516 40 C.F.R. § 125.98(g).
517 *See* AR-1534 at 16.

EPA Response

In its comment, PSNH states that its 2012 comments "set out the complete CWA § 316(b) legal history," but notes that "the only relevant legal background" is that pertaining to EPA's 2014

Final Rule.[2] The comment then presents PSNH's interpretation of the Final CWA § 316(b) regulations promulgated in 2014. For the most part, PSNH's comments here neither present an interpretation of how the regulations should be applied specifically to the Merrimack Station permit, nor request that EPA change the Draft Permit in any way. To the extent that PSNH's comments elsewhere echo one or more of the comments above and, based on the legal interpretations PSNH propounded here, suggest that certain permit conditions are inappropriate or request changes to permit conditions, EPA will respond to those later comments in appropriate detail.

Having said that, PSNH's comments make a number of statements regarding the Supreme Court's *Entergy* decision and the requirements of the Final Rule with which EPA does not agree and which warrant response. First, according to the comment, the "primary requirements" of the Final Rule are (1) compliance with one of the standards for the best technology available to minimize impingement mortality at 40 CFR § 125.94(c); and (2) that any existing facility with an AIF over 125 MGD must conduct and submit the results of certain studies regarding entrainment at 40 CFR § 122.21(r)(9) through (13) to help support the permitting agency's effort to develop BTA requirements for permit. Yet, the commenter's list is far from complete.

In EPA's view, the "primary requirements" for existing facilities in the Final Rule are set out in 40 CFR § 125.94(a), which states:

> On or after October 14, 2014, the owner or operator of an existing facility with a cumulative design intake flow (DIF) greater than 2 mgd is subject to the BTA (best technology available) standards for impingement mortality under paragraph (c) of this section, and entrainment under paragraph (d) of this section including any measures to protect Federally-listed threatened and endangered species and designated critical habitat established under paragraph (g) of this section.

The primary requirements established by the Final Rule are the BTA standards for impingement mortality *and* entrainment. The permit application requirements simply help provide permitting agencies with information to support the determination of requirements meeting the BTA standards set out in 40 CFR §§ 125.94(c) and (d). The application requirements for all facilities are set forth at 40 CFR § 122.21(r)(3) through (8), while additional requirements for facilities with actual intake flows (AIF) greater than 125 MGD are detailed at 40 CFR §§ 122.21(r)(9) through (13). According to PSNH, the additional information required from "any existing facility with 'major cooling water withdrawals'—greater than 125 MGD AIF" is mandated to ensure that the permitting authority "has access to the information necessary to make an informed BTA determination about a facility's site-specific entrainment controls." PSNH further suggests that the implication of EPA's not requiring this information for facilities with intake flows less than

[2] To the extent that PSNH's 2012 comments address past legal requirements that are no longer in effect, do not apply to the Final Permit, and, according to PSNH, are no longer relevant, EPA does not need to reply to such comments here because they are immaterial for the current permit proceeding. If EPA does not respond to some or all of such comments, it should not be read to indicate EPA's agreement with PSNH's characterization of those past requirements.

125 MGD is that such facilities need not install any entrainment controls. In its comment above, as well as in Comment III.3.5, PSNH suggests that EPA did not intend under the Final Rule for entrainment requirements to be established for facilities with an AIF less than 125 MGD. For example, PSNH states that "[f]acilities falling below this 125 AIF threshold *supposedly* are not universally exempt from the entrainment requirements" (emphasis added), and further states that "the agency recognized in its proposed rule that a BTA determination for entrainment at facilities within the 2 MGD DIF to 125 MGD AIF range could very well be 'no other technologies beyond impingement control…'" (citations and footnotes omitted).[3]

Yet, PSNH's comments appear to misunderstand or misconstrue the Rule. While only facilities with an AIF greater than 125 MGD must submit the additional entrainment related studies, a site-specific determination of the BTA for entrainment must be made for *all* facilities subject to the Final Rule. *See* 40 CFR §§ 125.91(a)(2), 125.94(d), 125.98(f). The text quoted above from 40 CFR § 125.95(a) expressly states that facilities withdrawing 2 MGD or more must satisfy the Rule's BTA standards for entrainment control. Nothing in the Final Rule exempts facilities with an AIF above 2 MGD but below 125 MGD from needing entrainment controls, and there is no regulatory presumption in the Final Rule that facilities withdrawing less than 125 MGD are not causing adverse impacts. *See, e.g.*, 79 Fed. Reg. at 48,355 ("since any facility *at any flow* may have an adverse environmental impact" (emphasis added)). In support of its argument that adverse impacts from entrainment are limited to facilities greater than 125 MGD AIF, PSNH cites to a passage from EPA's Technical Development Document (TDD) for the Final Rule which states that "this threshold [of 125 MGD] will capture 90 percent of the actual flows but will apply only to 30 percent of existing facilities." Yet, this passage goes on to explain that:

> [c]ontrary to a number of public comments, however, EPA is not implying or concluding that the 125 mgd threshold is an indicator that facilities withdrawing less than 125 mgd are (1) not causing any adverse impacts or (2) automatically qualify as meeting BTA. In other words, the threshold, while justified on a technical basis, does not result in exemptions from the rule. Instead, EPA is making a policy decision as to which facilities must provide a certain level and type of information.

TDD at 3-8. *See also* 79 Fed. Reg. at 48,309 (including the same statement). Thus, EPA made it abundantly clear in the preamble to the Final Rule, in the TDD, and in the regulations themselves, that 125 MGD AIF is a threshold for determining which facilities must provide certain types of additional studies. It does not determine whether site-specific entrainment controls are needed at a particular facility and it does not limit the permitting agency's ability to establish such entrainment controls in a NPDES permit. Indeed, contrary to other of its comments, PSNH recognizes this when it quotes from the preamble to the Final Rule in its comment, stating that "EPA provided permitting authorities the right to 'require reasonable information to make informed decisions at the smaller facilities' regarding what entrainment controls, if any, may be

[3] EPA notes that the preamble does not use the phrase "very well" while noting that facilities may not be required to install additional technology for entrainment control in all cases. EPA also notes that even facilities withdrawing more than 125 MGD might not, in a particular case, be required to install additional technology for entrainment control. *See* 40 C.F.R. § 125.98(f)(4).

necessary to satisfy the BTA standard" (footnote omitted). Thus, the regulations authorize EPA to require additional information, beyond the otherwise specified types of information, to support BTA findings for facilities withdrawing more than 2 MGD of water. *See* 40 CFR §§ 122.21(r)(1)(ii)(C), 125.98(i). EPA responds in more detail to PSNH's interpretation of the site-specific entrainment requirements and the administrative threshold of 125 MGD in Response to Comment III.3.5.

PSNH characterizes the BTA standards for impingement in the Final Rule as "seven 'pre-approved' control technologies from which a facility may choose to satisfy the BTA standard." As PSNH recognizes in its description of the alternative technologies, EPA only characterizes as "pre-approved" the three technologies that require no further demonstration or monitoring: closed cycle cooling, a *design* through-screen velocity no greater than 0.5 fps, and an existing offshore velocity cap. 40 CFR § 125.94(c)(1), (2), (4). Complying with the BTA for impingement mortality either through an *actual* through-screen velocity of 0.5 fps or by meeting the impingement mortality performance standard require ongoing monitoring. *Id.* § 125.94(c)(3), (7). In other words, while a permittee may elect to comply with the BTA for impingement mortality using either of these alternatives, the permittee must perform ongoing monitoring to demonstrate compliance with the standard. In addition, both the modified traveling screens and system of technologies options require submission of an impingement technology performance optimization study for the permitting authority to review before either technology may be determined to be the best technology available for impingement mortality. *Id.* § 125.94(c)(5), (6); *see also, e.g.*, 79 Fed. Reg. 48,321. In other words, the permittee may choose the alternatives at § 125.94(c)(5) or (6) to comply with the impingement mortality BTA standard, but the permitting authority must approve the technology and include permit conditions that ensure it is operated consistent with the optimization study.

In the above comment, PSNH neither argues that EPA's consideration of costs and benefits for the site-specific determination at Merrimack Station was incorrect nor explains how its comments on costs and benefits would impact the decision at issue in this permit proceeding. In any event, EPA agrees with PSNH that in *Entergy Corp. v. Riverkeeper, Inc*. 556 U.S. 208 (2009), the Supreme Court held that the CWA gives EPA the discretion to rely on cost-benefit analysis in establishing § 316(b) permitting requirements. The majority opinion allowed that in considering costs and benefits, the "wholly disproportionate" standard and the "significantly greater than" standard, or some other test, would all be within EPA's discretion under the statute. The Court did not conclude that EPA's consideration of costs and benefits under §316(b) *must* use a particular standard. EPA responds in more detail to PSNH's comments on consideration of the costs and benefits of available technologies in Response to Comments III.5.2.1, III.5.2.2, and III.5.2.3, below.

PSNH's comment also cites to, and quotes from, the regulations that detail the various factors, some mandatory and others discretionary, that permitting authorities are to consider when rendering site-specific BTA determinations for controlling entrainment. *See* 40 CFR § 125.98(f)(2) and (3). As the comment also notes, permitting agencies have discretion to determine the weight to assign to the various factors in their BTA determinations. In addition, PSNH's comment notes the terms of 40 CFR § 125.98(g), which authorizes permitting agencies to forego requiring additional information submissions for "ongoing permit proceedings."

Lastly, EPA notes that the Final Rule was recently upheld by the U.S. Court of Appeals for the Second Circuit as a reasonable interpretation of the Clean Water Act. *See Cooling Water Intake Structure Coal. v. EPA*, 905 F.3d 49 (2d. Cir. 2018).

2.0 EPA Is Obligated To Apply The Requirements of the 2014 Final CWA § 316(b) Rule

Comment III.2(i)	**AR-1548, PSNH, pp. 118-119**
See also AR-1215, PSNH, p. 169; AR-1231, PSNH, pp. 25-29, AR-841, UWAG, p. 61; AR-1222, UWAG, pp. 33-34	

In its Statement, EPA requests comments on a series of questions regarding whether, and to what extent, the agency should apply the standards of the 2014 final § 316(b) rule. PSNH responds in detail to each such question below. However, the Company's positions on these issues are simple: EPA should apply each and every standard of the 2014 final § 316(b) rule to the CWISs at Merrimack Station. The final rule was promulgated by the agency to establish a single, uniform set of standards to regulate every CWIS within the industry. It would therefore be patently unfair to not apply the rule and incongruent with the rule to cherry-pick limited provisions from it, causing Merrimack Station to be regulated differently than every other facility.

EPA Response

In response to the request for comment on whether and how to apply the Final Rule to the ongoing permit proceeding for Merrimack Station, PSNH comments that EPA should apply all of the standards of the Final Rule. EPA agrees that the determination for the BTA at Merrimack Station should consider the factors for site-specific entrainment controls as well as the BTA standards for impingement mortality established in the Final Rule. EPA also believes it effectively considered many of the factors specified in 40 CFR § 125.98(f)(2) and (3), as well as the impingement technologies specified in 40 CFR § 125.94(c) in rendering its proposed BTA determination in 2011. *See* AR-1534 at 16-17. *See also* Fact Sheet, Att. D "Clean Water Act NPDES Permitting Determinations for the Thermal Discharge and Cooling Water Intake Structures at Merrimack Station in Bow, New Hampshire" Chapters 10-12 (hereinafter, "2011 Draft Determinations Document") (AR-618). EPA also clearly stated that it expects to consider the § 125.98(2) and (3) factors, as well as the BTA standards for controlling impingement mortality specified in § 125.94(c) in rendering its BTA determination for the Final Permit. *See* AR-1534 at 17. PSNH provides additional details in later comments on how the Final Rule should be considered in the BTA determination for Merrimack Station. EPA responds to the detailed comments below. *See* Response to Comment III.5.3.

2.1 EPA No Longer Possesses the Authority to Determine BTA Utilizing BPJ Authority

Comment III.2.1	**AR-1548, PSNH, pp. 119-120**
See also AR-841, UWAG, pp. 61; AR-846, PSNH, pp. 118-119; AR-1131, Ohio Power, p. 2; AR-1215, PSNH, pp. 25-29, 169; AR-1222, UWAG, pp. 33-34; AR-1231, PSNH, pp. 25-29	

The regulations set out in the agency's 2014 final § 316(b) rule must govern the Final Permit for Merrimack Station. EPA does not enjoy any level of discretion on this issue. PSNH previously articulated this fact[518] and EPA correctly notes in its Statement that "these [2014 § 316(b)] regulations are now in effect and govern the Final Permit for Merrimack Station."[519] BPJ-based case-by-case § 316(b) determinations like those included in EPA's 2011 draft of the NPDES permit for Merrimack Station are only proper when national regulations have not been set. Courts, the EAB, and EPA have all established that the CWA does not allow for permit limits based on the agency's BPJ once uniform, technology-based standards for a source category are established.[520]

EPA's final § 316(b) rule was promulgated on August 15, 2014. Over three years have since elapsed and the NPDES permit for Merrimack Station has not yet been finalized. Attempting to single out Merrimack Station and apply a divergent set of standards to this singular facility would be arbitrary, capricious, and patently unfair. EPA appropriately acknowledges in its Statement that the agency has no choice but to apply these industry-uniform regulations to the Final Permit. PSNH agrees.

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518 *See, e.g.,* AR-1231 at 25-34.

519 AR-1534 at 14.

520 *See e.g.*, *Natural Res. Def. Council, Inc. v. EPA,* 859 F.2d 156, 200 (D.C. Cir. 1988) (providing that CWA § 402(a)(1) "preclude[s] the establishment of BPJ permit limits once applicable effluent guidelines are in place"); *Natural Res. Def. Council, Inc. v. EPA*, 822 F.2d 104, 111 (D.C. Cir. 1987) (noting that a state or permit writer may set limitations utilizing its BPJ authority only when there is no national standard that has been promulgated for a point-source category); *Riverkeeper, Inc. v. EPA*, 358 F.3d 174, 203 (2d Cir. 2004) ("It is, of course, true that once the EPA promulgates applicable standards, regulation of those facilities subject to those standards on a [BPJ] basis must cease . . ."); *Citizens Coal Council v. EPA*, 447 F.3d 879, 891 n.11 (6th Cir. 2006) (noting that BPJ applies only when "EPA has not promulgated an applicable guideline"); *see also* Letter from Jim Hanlon, Director, Office of Wastewater Management, to Water Division Directors Regions 1-10, Attachment A, at 1 (June 7, 2010) (acknowledging that BPJ-based limits are only to be included in permits "until such time [as the ELGs are] promulgated") (attached hereto as Exhibit 16); *In re: Certainteed Corporation*, NPDES Appeal No. 15-01, 2015 WL 10091224, at *1 (EAB May 7, 2015) ("If EPA has developed industrial category-wide (or subcategory-wide) effluent limitations — referred to as 'effluent limitation guidelines' [] — such limits must be included in that facility's permit.") (citing 40 C.F.R. § 125.3(c)(1) & *E.I. du Pont de Nemours & Co. v. Train*, 430 U.S. 112 (1977)); H.R. Rep. No. 92-911, at 126 (1972), *reprinted in* A Legislative History of the Water Pollution Control Act Amendments of 1972 at 813 (1973) (providing that permits with BPJ limits may be issued only "prior to" the promulgation of nationally applicable effluent guidelines).

EPA Response

As stated in response to the previous comment, EPA agrees that the Final Rule establishes national standards for determining the BTA for impingement mortality and entrainment mortality at existing CWISs and that these standards apply to the BTA determination for Merrimack Station's Final Permit. As such, EPA has made its determination consistent with the standards established in the Final Rule. *See* Responses to Comments III.3.1, III.5.2, III.5.3. In the 2017 Statement, EPA expressed its view that the Final Rule would govern the BTA determination for Merrimack Station, while also noting the several pending challenges to the Final Rule in Federal court by a number of industry and environmental petitioners. 2017 Statement at 14-15. We note here that the Second Circuit has since denied those challenges and upheld the Final Rule. *See Cooling Water Intake Structure Coal. v. EPA*, 905 F.3d 49 (2d. Cir. 2018).

2.2 EPA Should Consider All of the Regulatory Factors Set Out in the 2014 Final CWA § 316(b) Rule

Comment III.2.2	**AR-1548, PSNH, pp. 119-121**

The 2014 final § 316(b) rule purports to give permit writers discretion in "ongoing permitting proceedings" to apply less than all of the entrainment factors and BTA standards for impingement mortality.[521] Specifically, the regulation provides that "[t]he Director's BTA determination may be based on some or all of the factors in [40 C.F.R. § 125.98](f)(2) and (3) . . . and the BTA standards for impingement mortality at § 125.95(c)."[522] EPA acknowledges this regulation in its Statement but essentially disclaims that it has or will render its BTA determination for Merrimack Station based on less than all the factors and standards set out in the final § 316(b) rule:

> EPA's 2011 Draft Permit . . . analysis effectively considered all of the § 125.98(f)(2) and (3) factors, as well as the technologies specified in 40 C.F.R. § 125.94(c), in rendering its proposed BTA determination . . . EPA also expects to consider the § 125.98(f)(2) and (3) factors, as well as the BTA standards for controlling impingement mortality specified in § 125.94(c), in rendering its BTA determination for Merrimack Station's Final Permit.[523]

PSNH supports EPA's decision on this issue. Rules such as the final § 316(b) rule are promulgated to establish a uniform set of standards and equal playing-field for all facilities within an industry. It would therefore be counterproductive and prejudicial to regulate Merrimack Station by an incomplete set of factors or an altogether different set of criteria. The fact that more than three years (or more than half a standard permit cycle) have now passed since EPA promulgated the final § 316(b) rule further bolsters this conclusion, as the intent of 40 C.F.R. § 125.98(g) must be construed to apply to only those permit proceedings wherein the permit writer had almost concluded responding to comments and the final permit was days away from being finalized when the final § 316(b) rule became effective.

Application of all the final § 316(b) rule factors and standards in this permit renewal proceeding is also prudent because, in a practical sense, the BTA analysis was started anew by EPA's Statement. EPA has essentially reversed course on its BTA determination by renewing its consideration of wedgewire screen technologies as a feasible and effective option for Merrimack Station. In its 2011 Draft Permit, EPA utilized its BPJ authority to determine that PSNH must limit the intake flow volume of both CWISs at Merrimack Station to a level consistent with operating in a CCC mode from, at a minimum, April 1 through August 31 of each year. Despite PSNH identifying cylindrical wedgewire screens as a feasible technology in its submissions to EPA prior to the issuance of the 2011 Draft Permit, the agency rejected the technology and insisted on a CCC system as the BTA to control for entrainment and impingement mortality. EPA is now reconsidering its determination and examining wedgewire screens as the possible BTA for Merrimack Station. Such a shift—from rejecting a technology altogether to then considering its use—demonstrates the permitting agency is essentially starting over in its decision-making, and therefore, should apply all the regulatory factors set out in the 2014 final § 316(b) rule.

521 *See* 40 C.F.R. § 125.98(g).
522 *Id.*
523 AR-1534 at 16-17.

EPA Response:

As stated in response to the previous comment, EPA agrees that the Final Rule establishes national standards for determining the BTA for impingement mortality and entrainment mortality at existing CWISs and that these standards apply to the BTA determination for Merrimack Station's Final Permit. EPA does not agree with PSNH's narrow, unsupported interpretation that § 125.98(g) "must be construed to apply to only those permit proceedings" where, on October 14, 2014, the final permit was only "days away." While section 125.98(g) provides that it applies to "permit proceedings begun prior to October 14, 2014," it does not specify an outside time limit.

In any event, as the comment points out, EPA made clear in the 2017 Statement that it expected to consider the factors and standards of the Final Rule in rendering its BTA determination for the Final Permit. *See* AR-1534 at 17.[4] The 2017 Statement also clarifies that, in this case, the determination is consistent with the ongoing permitting provision of the Final Rule at 40 CFR § 125.98(g) in that EPA has determined that the record contains sufficient information to

[4] The comment also states that, by issuing the 2017 Statement, EPA "essentially reversed course" and is "starting over" in its BTA determination. To the extent the commenter is asserting that the 2017 Statement is an announcement of a wholesale reconsideration of the entirety of EPA's analysis in the 2011 proposed BTA determination, EPA disagrees. The 2017 Statement notes that new information related to the space requirements for, and effectiveness of, cylindrical wedgewire screens suggests that they may be available at Merrimack Station. *Id.* at 17-21. Furthermore, the 2017 Statement invites public comment on these issues, as well as on "how the costs of using wedgewire screens . . . compare to the costs and benefits of using closed-cycle cooling as part of the BTA" and on the effect of the Final Rule. *Id.* at 21. While the 2017 Statement notes that EPA is reconsidering wedgewire screens as the possible BTA for Merrimack Station, it does not announce an intention by EPA to abandon the entirety of the BTA analysis. Indeed, it would make little sense to do so where the new information and comments EPA has received to-date do not address or affect that analysis or the Final Rule does not alter the analysis.

determine the BTA requirements without further delaying permit issuance by waiting for the specific, additional information submissions established in the Final Rule at 40 CFR § 122.21(r). EPA maintains, as it set out in the 2017 Statement, that the appropriate factors under the Final Rule can be addressed without the additional § 122.21(r) submissions established under the Final Rule. *See* AR-1534 at 16. Moreover, EPA agrees that additional information that PSNH submitted with its comments on the 2017 Statement, including an additional entrainment technology evaluation (AR-1550), biological benefits evaluation (AR-1567), and economic analysis (AR-1565), is substantially similar to information required under 40 CFR § 122.21(r). *See* Comment 5.2. EPA has considered these additional submissions in its determination for the Merrimack Station Final Permit. *See* Responses to Comments III.4.2 and III.5.2.

2.3 EPA Must Consider Additional 40 CFR § 122.21(r) Studies Submitted Along with These Comments Before Rendering Its BTA Determination

Comment III.2.3	**AR-1548, PSNH, pp. 122-127**
See also AR-1231, PSNH, pp. 29-36	

Since the AIF of the CWISs at Merrimack Station is below the 125 MGD AIF compliance threshold established in the final § 316(b) rule and because entrainment at Merrimack Station is *de minimis*, technological installations to address entrainment at Merrimack Station are unwarranted.[524] Should EPA improperly reject this conclusion, the agency must consider the analyses submitted by PSNH contemporaneously with these comments to provide EPA at least the minimum amount of information the agency would need to make a reasoned and legally defensible BTA entrainment determination in accordance with the final § 316(b) rule.

The final § 316(b) rule requires that "BTA standards for entrainment . . . reflect the [permitting authority's] determination of the maximum reduction in entrainment warranted after consideration of the relevant factors as specified in § 125.98."[525] PSNH has not previously submitted to EPA a number of fundamental analyses the agency would need to adequately assess the factors set out in § 125.98 and make a rational BTA determination for entrainment at Merrimack Station. These analyses have not previously been completed because EPA has not requested them and because they are not mandated by the final § 316(b) rule for facilities with AIFs equivalent to those at Merrimack Station.[526] However, without these essential analyses, EPA cannot possibly render a reasonable and rational BTA determination for entrainment.

The final § 316(b) rule requires operators with CWISs to submit an array of information with their NPDES permit application.[527] Some application requirements apply to "all existing facilities" while others apply only to existing facilities that withdraw greater than 125 MGD AIF of water for cooling purposes.[528] To ensure a permitting authority has access to the information necessary to make an informed BTA determination about a facility's site-specific entrainment controls, the final § 316(b) rule requires any existing facility with "major cooling water withdrawals"—greater than 125 MGD AIF—to collect entrainment-related information, including an Entrainment Characterization Study, Comprehensive Technical Feasibility and Cost Evaluation Study, Benefits Valuation Study, and Non-water Quality and Other Environmental Impacts Study.[529]

As mentioned above, EPA has not asked PSNH to submit any of the aforementioned entrainment studies required by the final § 316(b) rule. Instead, it states it "has sufficient information in the record to determine the BTA requirements for the Merrimack Station permit."[530] This decision is arbitrary and capricious and not supported by the facts. While PSNH has over the years provided to EPA a number of comprehensive biological studies that likely satisfy the Entrainment Characterization Study requirement of the final § 316(b) rule,[531] as well as a host of reports and responses to CWA § 308 information requests that could constitute a satisfactory Comprehensive Technical Feasibility and Cost Evaluation Study,[532] a Benefits Study and Non-water Quality and Other Environmental Impacts Study addressing the specific requirements of the final § 316(b) rule have not previously been submitted by the Company.[533] EPA must consider these two additional types of reports given the agency explicitly stated it intends to apply each and every standard of the 2014 final § 316(b) rule to the CWISs at Merrimack Station.

A report prepared by NERA Economic Consulting ("NERA") has been submitted along with these comments that addresses many of the requirements of the Benefits Valuation Study.[534] A Benefits Valuation Study evaluates the magnitude of water quality benefits, both monetized and non-monetized, of the entrainment mortality reduction technologies evaluated in the Comprehensive Technical Feasibility and Cost Study. It includes discussion of recent mitigation efforts already completed and how these have affected fish abundance and ecosystem viability in the intake structure's area of influence as well as other benefits to the environment and the community. Benefits are quantified in physical or biological units and monetized using appropriate economic valuation methods. The study also identifies other benefits to the environment and nearby community, including improvements for mammals, birds, and other organisms and aquatic habitats.[535] NERA's robust study uses data from Normandeau's previous biological studies, benefits information Normandeau provided directly to NERA to support its analyses, and technological cost information provided by Enercon.[536]

Several aspects of a Non-water Quality and Other Environmental Impacts Study required by the final § 316(b) rule are addressed in the Enercon 2017 Comments, which have been submitted along with these comments.[537] The final § 316(b) rule specifies that a Non-water Quality Environmental and Other Impacts Study must discuss changes in environmental and other factors not water quality-related that are attributed to the candidate technologies or operational measures. Potential impacts that are to be evaluated include, but are not limited to, energy consumption, air pollution, noise, safety concerns, grid reliability, plant reliability, consumptive water use, impacts of construction, aesthetic impacts, environmental justice, archaeological and historical resources, and other permitting impacts. Evaluation of these concerns puts CWIS technological options being considered into proper perspective by quantifying the totality of environmental impacts expected if a technology is implemented at a facility. This ensures that a technology that is better from a CWA perspective is not worse overall for the environment.

As stated at the outset and discussed in detail below, PSNH maintains that additional technological controls at Merrimack Station to address entrainment are unwarranted.

Nevertheless, if EPA intends to require PSNH to incorporate entrainment controls at the facility, the agency's previous assertion that BTA for entrainment has been fully evaluated is arbitrary and capricious. Only after EPA considers the reports prepared by NERA and Enercon will the agency have some information that at least addresses the 40 C.F.R. 122.21(r)(9) through (r)(12) requirements so it can attempt to evaluate all of the mandatory BTA factors set out in 40 C.F.R. § 125.98(f).[538] Without them, EPA cannot and has not rendered a BTA determination that can withstand judicial scrutiny.

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524 The significance of the 125 MGD AIF threshold, as well as the facts supporting a determination that entrainment at Merrimack Station is *de minimis* are discussed in Sections III.C.2. & 3., respectively, below.

525 40 C.F.R. § 125.94(d); *see also* 79 Fed. Reg. at 48,330 ("While site-specific permit requirements are not new, what is different about this approach from the current requirement for permits to include 316(b) conditions is that for the first time, EPA is establishing a detailed specific framework for determining BTA entrainment control requirements. Thus, the rule identifies what information must be submitted in the permit application, prescribes procedures that the Director must follow in decision making and factors that must be considered in determining what entrainment controls and associated requirements are BTA on a site-specific basis.").

526 40 C.F.R. §§ 122.21(r)(1)(ii)(C) and 125.98(i) provide EPA discretionary authority to compel PSNH to submit any additional information the agency determines is necessary for determining permit conditions and requirements. EPA has made no such requests of PSNH for this permit renewal proceeding.

527 *See generally id*. at § 122.21(r).

528 *See, e.g.*, *id*. § 122.21(r)(1)(ii)(A), (B).

529 *See* 79 Fed. Reg. at 48,309; *id.* § 122.21(r)(9)-(12).

530 AR-1534 at 16.

531 *See, e.g.,* AR-1154.

532 *See, e.g.,* AR-6. Notably, the discussions in many if not all such reports and responses previously submitted by PSNH and/or its consultants may be outdated and may not include all the cost-related details required by 40 C.F.R. § 122.21(r)(10)(iii).

533 The Company has previously submitted analyses, reports, and/or comments that address these topics. These materials predate the 2014 final § 316(b) rule, however, and therefore were not prepared to satisfy all of the requirements of the new regulations.

534 *See generally* NERA Economic Consulting, Economic Evaluation of Two Entrainment Reduction Technologies at Merrimack Station (Dec. 2017). This report is attached hereto as Exhibit 17. Hereinafter, references to this document will be cited as "NERA 2017 Report." This report also addresses the cost-related requirements of 40 C.F.R. § 122.21(r)(10)(iii). *See id.* Attached hereto as Exhibits 18 and 19, respectively, are a memorandum from Enercon Services, Inc. to NERA entitled Technical Memorandum to Document Technology Cost Inputs for Merrimack Station (Dec. 13, 2017) ("Enercon Technology Cost Inputs Memo") and Normandeau Associates, Inc., Biological Benefit Evaluation of Entrainment Reducing Technologies at Merrimack Station (Dec. 11, 2017). These two documents provide factual information utilized in NERA's analyses.

535 *See* 40 C.F.R. § 122.21(r)(11).

536 *See generally* NERA 2017 Report.

537 *See generally* Enercon 2017 Comments.

538 In fact, one could argue EPA needs more specific and/or detailed information regarding entrainment at Merrimack Station because the agency's maximum potential reduction in entrainment impacts is diminutive compared to the maximum potential at facilities with an average AIF of 125 MGD or more—where impacts due to entrainment may more rationally be assumed and corresponding, meaningful reductions in entrainment can therefore be expected. At facilities with an AIF below 125 MGD, like Merrimack Station, EPA is forced to make an arguably more difficult and precise determination regarding entrainment compliance when compared to larger-flow facilities already presumed to have a significant impact due to entrainment, meaning the agency has a very small margin for error in reaching a reasonable entrainment BTA determination.

EPA Response:

PSNH begins its comment asserting that technological installations to address entrainment are unwarranted for Merrimack Station because the AIF at Merrimack Station is below 125 MGD and because entrainment is, according to PSNH, *de minimis*. EPA disagrees on both counts and responds in more detail to PSNH's comments on these issues below. *See* Response to Comment III.3.5 and 3.6. As explained in these responses, the Final Rule neither exempts facilities with an AIF less than 125 MGD from the BTA standards for entrainment, nor does it establish an express exception for *de minimis* entrainment impacts (as it does for impingement). *See* Response to Comment III.3.6; *see also* 40 CFR §§ 125.91(a)(2), 125.94(d). In addition, EPA has explained that it does not regard Merrimack Station's entrainment of millions of fish eggs and larvae each year from the Merrimack River to be *de minimis*. *See* AR-618 at 252-254. *See also* Response to Comment 4.F. Instead, in EPA's view, this entrainment represents adverse environmental impact that needs to be addressed under CWA § 316(b). On the facts of this case, EPA has determined that technological upgrades are warranted at Merrimack Station to minimize the adverse environmental impacts from entrainment. *See* AR-618 at 314-315.

Next, PSNH comments that EPA must consider the analyses submitted by PSNH with its comments on the 2017 Statement. EPA agrees that, as the analyses at issue were submitted during the comment period for the 2017 Statement in support of comments provided by PSNH, it is appropriate for EPA to consider them in development of the Final Permit. To this end, EPA has considered them and responds to the additional information, including the economic analysis prepared by NERA and Enercon's assessment of non-water quality and other environmental impacts, in responses to PSNH's more detailed comments below. See Response to Comment 6 and associated sub-comments.

Although EPA agrees that consideration of the analyses submitted in support of PSNH's comments on the 2017 Statement (as well as the 2011 Draft Permit, to the extent they are still relevant) is appropriate, EPA does not agree that it could not render a reasonable and rational BTA determination for entrainment in accordance with the Final Rule without the reports required for larger facilities.

As PSNH points out, the actual intake flow (AIF) at Merrimack Station is below 125 MGD. For this facility, the Final Rule therefore would require only the information specified in 40 CFR § 122.21(r)(4) through (8): Source Water Physical Data, Source Water Biological Characterization Data, Cooling Water Intake System Data, as well as facility-specific information about the selected impingement compliance option and operational status of each CWIS. Under the Final Rule, an Entrainment Characterization Study, Comprehensive Technical and Feasibility and Cost Evaluation Study, Benefits Valuation Study, and Non-water Quality and Other Environmental Impact Study are not required for facilities, like Merrimack Station, with AIF less than 125 MGD, 40 CFR § 122.21(r)(9)-(12). Thus, the comment is controverted by the plain language and structure of the regulations. Indeed, PSNH acknowledges in the comment that the specified studies "are not mandated by the final § 316(b) rule for facilities with AIFs equivalent to those at Merrimack Station." As explained more below, *see* Response to Comment 3.5, EPA's policy decision to require the specified studies only from facilities with AIFs greater than 125 MGD was made in part to reduce the potential burden of the permit application process on smaller facilities. PSNH points to nothing in the Rule to indicate that EPA intended that a permitting authority could not make a BTA determination in accordance with 40 CFR § 125.98(f)(2) and (3) without those studies. To the contrary, the fact that the Final Rule requires only larger facilities to submit these studies, *see* 40 CFR § 122.21(r)(1)(ii)(B), while still requiring a permitting authority to make an entrainment BTA determination under the framework of the Final Rule for any facility larger than 2 MGD, *see id.* §§ 125.91(a)(2), 125.94(d), 125.98(f), indicates that the Final Rule contemplates that a permitting authority may make BTA determinations for facilities with AIFs below 125 MGD without the specified studies.[5] Under the commenter's approach, facilities with AIFs above 125 MGD would have to submit the studies required by 40 CFR §§ 122.21(r)(9) – (12), but so would facilities with AIFs *below* 125 MGD. In EPA's view that would make no sense, because it contradicts the plain language of the regulations and would eviscerate the potential relief that EPA intended to provide to facilities with relatively lower AIFs. EPA declines the comment's suggestion to interpret the additional application requirements in the Final Rule for facilities with AIFs *greater than* 125 MGD as a requirement that facilities with AIFs *less than* 125 MGD must also submit these studies before a permitting authority may make an entrainment BTA determination.[6] And while the comment states that EPA "cannot possibly render a reasonable and rational BTA determination for entrainment" for this facility without information that the Final Rule does not otherwise require, it provides no explanation why, despite the rule, the reports are nonetheless necessary for a BTA determination for Merrimack Station in particular (*i.e.*, based on specific circumstances at this facility).

Irrespective of which permit application materials are required for this facility under the Final Rule, the final entrainment BTA for Merrimack Station is informed in part by the reports and analyses that PSNH provided, which are substantially similar to the full suite of information required by facilities with AIF greater than 125 MGD. In other words, EPA has considered the additional analyses referenced in the comment. In addition, PSNH recognizes that information it submitted prior to and since issuance of the 2011 Draft Permit is substantially similar to the information required for facilities with AIF greater than 125 MGD, including the comprehensive biological studies and evaluations of technical feasibility and cost.

3.0 Existing Technologies and Operations at Merrimack Station Constitute BTA

Comment III.3(i)	AR-1548, PSNH, p. 126

[5] Furthermore, the preamble to the Final Rule states: "To facilitate the determination of entrainment requirements for facilities below 125 mgd AIF, a [permitting authority] *may* require the owner or operator to submit some or all of the study requirements at § 122.21(r)(9) through (13) *or variations thereof*." 79 Fed. Reg. at 48,378 (emphasis added). Consistent with the intent expressed in the preamble, for the Merrimack permit, EPA has considered in its BTA determination information substantially similar to that required from facilities with larger AIFs.

[6] To the extent the comment asserts that the Final Rule should have required all facilities with an AIF lower than 125 MGD to submit the studies at § 122.21(r)(9) through (12), the time for challenging the Final Rule on this basis is long expired. CWA § 509(b)(1), 33 U.S.C. § 1369(b)(1). Moreover, the Final Rule was recently upheld by the U.S. Court of Appeals for the Second Circuit as a reasonable interpretation of the Act. *See Cooling Water Intake Structure Coal. v. EPA*, 905 F.3d 49 (2d. Cir. 2018).

PSNH established in its February 2012 comments to EPA's 2011 Draft Permit that the existing technologies at Merrimack Station constitute BTA under a complete and reasoned BPJ analysis. Specifically, PSNH provided that "[a] proper BTA analysis demonstrates that 1) rescheduling maintenance outages for Units 1 and 2 at Merrimack Station; 2) installation of a new fish return system; and 3) continuous operation of existing traveling screens from April through December, collectively, constitute BTA for § 316(b)."[539] The requirements of the 2014 final § 316(b) rule do not negate this conclusion. In fact, the 2014 final § 316(b) rule dictates that continued use and operation of existing CWIS technologies (*i.e.*, use of existing traveling screens and the current fish return system) is all that is required to satisfy the BTA standard.[540] This is so because: (1) the rate of impingement at Merrimack Station is *de minimis*, meaning no additional controls are needed to satisfy the BTA impingement mortality standard;[541] (2) the 3-year average AIF at Merrimack Station is below the 125 MGD compliance threshold EPA set out in the final § 316(b) rule for addressing entrainment mortality; and (3) entrainment is *de minimis* at Merrimack Station, even if EPA does not summarily conclude no entrainment controls are needed at Merrimack Station based on the 125 MGD AIF compliance threshold established in the final § 316(b) rule.

539 AR-846 at 113.
540 Although, PSNH may still consider upgrading its fish return system to address identified issues with the current system.
541 *See* 40 C.F.R. § 125.94(c)(11).

EPA Response

The comment above echos comments that PSNH made on the 2011 Draft Permit regarding requirements to install technology to minimize impingement at Merrimack Station. PSNH indicates what it believes is the BTA for impingement mortality under the 2014 Final Rule. In this case, EPA developed one response to this comment as well as comments submitted on impingement BTA from 2012 (summarized below). Following that response, EPA addresses PSNH's detailed comments on whether impingement is *de minimis*, the comment related to the actual intake flow at Merrimack Station, and whether entrainment is *de minimis*.

3.1 Proposed Operational Changes and Installation of a New Fish Return System at Merrimack Station Constitute BTA and Satisfy the Requirements of § 316(b)

Comment III.3.1	**AR-846, PSNH, pp. 113-118**
See also AR-872, Normandeau, pp. 133-4AR-1207, EPRI, pp. 5-6, AR-1128, NERA, pp. E-3, 11-18	

Although, PSNH does not concede that the current intermittent operation of the existing traveling screens and fish return system at Merrimack Station fail to reflect BTA pursuant to § 316(b), it recognizes that certain improvements and/or operational changes are available to make the system more effective and further reduce impingement mortality. A proper BTA analysis demonstrates that 1) installation of a new fish return system; 2) continuous operation of existing traveling screens from April through December; and 3) rescheduling maintenance outages for Units 1 and 2 at Merrimack Station, collectively, constitute BTA for § 316(b).[60]

To upgrade its current fish return system, PSNH proposed installing a low-pressure spray wash[61] and a trough, with removable cover, designed to maintain a water velocity of 3 to 5 feet per-second, with a minimum water depth of 4 to 6 feet. The trough would limit sharp turns and discharge slightly below the low water level.[62] In 2007, PSNH estimated the total capital cost of upgrading the fish return system to be approximately $300,000. *Id*. at 66. PSNH acknowledged that impingement survival with Merrimack Station's current system is minimal. Thus, assuming 100 percent mortality with the existing system, an improved fish return system—coupled with the changes in operations to the plant's current traveling screens—is estimated to reduce mortality rates of impingement at Merrimack Station by 46 percent at Unit 1 and 54 percent at Unit 2. *See id*. at 66-67. In terms of adult equivalent losses, the mortality rates would be reduced by 46 percent at Unit 1 and 50 percent at Unit 2.[63] *Id*.

Continuous operation of the existing traveling screens, except during periods of low impingement, would reduce impingement and improve the mortality of any fish that are impinged by returning them to the river more quickly. Normandeau's data indicates that impingement levels are typically low in January through March, when the Merrimack River is usually frozen. *See* 2007 § 308 Response at 88. Running the traveling screens continuously from April through December was estimated in 2007 to increase annual maintenance costs by approximately $60,000 and would require an initial capital cost of approximately $15,000 to $20,000 to install an additional screen wash spray pump at each unit so that both traveling screens at each unit may be run continuously. *See* 2007 § 308 Response at 65.

Finally, rescheduling the annual planned maintenance outage of Unit 2 to occur from mid-May to mid-June would reduce annual impingement by approximately 41 percent and entrainment by approximately 40 percent. *Id*. at 91-93. Rescheduling of Unit 1's biennial planned maintenance outage to October can reduce annual impingement by approximately five percent. *Id*. at 93. Collectively, rescheduling of these outages would reduce annual impingement by approximately 46 percent[64] and entrainment by approximately 40 percent. *Id*.

EPA erroneously rejected this proposed rescheduling of outages as BTA in the 2011 Draft Permit.[65] In doing so, EPA did not contend that this operational change was unavailable or that its costs were wholly disproportionate or significantly greater than its expected benefits. Indeed, EPA plainly stated that flow reductions are one of the most effective strategies for yielding the greatest annual reduction in impingement and entrainment. *See* Determination at 297. As support for its dismissal of this § 316(b) compliance option, EPA stated only that it is not BTA for Merrimack Station because the outage periods do not encompass the entire period during which fish eggs and larvae are present in the Hooksett Pool, nor does the option adequately address impingement that occurs year-round at the facility. *Id*.

EPA's rejection of rescheduled maintenance outages for Units 1 and 2 at Merrimack Station is arbitrary and capricious inasmuch as it ignores the fact that the purpose of § 316(b) is to only minimize—not eliminate completely—impingement and entrainment due to operation of CWISs.

Merrimack Station currently impinges and entrains a de minimis number of fish and ichthyoplankton, as confirmed by Normandeau's reports and data. In Normandeau's expert scientific opinion, the average annual losses currently experienced at Merrimack Station due to impingement and entrainment are undeniably de minimis and result in little to no AEI to the Hooksett Pool. *See, e.g.*, Normandeau Comments at 143. EPRI agrees, and its data confirms that Merrimack Station's annual rates of impingement and entrainment comprise less than one-tenth of one percent of the combined total losses experienced at the numerous facilities from whom EPRI has received data. 2012 EPRI Comments at 7. This shows the minuscule impact, if any, Merrimack Station's CWISs currently cause to the environment.

EPA's rejection of the rescheduling of annual planned maintenance outages because they do not address year-round impingement and do not encompass the entire period during which fish eggs and larvae are present in the Hooksett Pool is equally unavailing. The Unit 2 outage would occur from mid-May to mid-June, when average impingement and entrainment levels are at their respective peaks. See 2007 § 308 Response at 92. Moreover, EPA cannot consider each technological option in a vacuum. PSNH's proposed upgrades to Merrimack Station's fish return system and continuous operation of the plant's existing traveling screens from April through December will fill the impingement gap EPA has noted.[66] The combination of these technological improvements provides sufficient additional reductions to Merrimack Station's already *de minimis* levels of impingement and entrainment and is all that is necessary for PSNH to satisfy its regulatory burden. *See* 33 U.S.C. 1326(b). Indeed, these proposed changes are the only options that satisfy every aspect of the BTA standard for minimizing AEI to the Hooksett Pool: 1) each of the proposed changes is clearly available; 2) each—individually and in combination—is effective enough in reducing AEI, especially in light of the de minimis levels of impingement and entrainment currently experienced at the plant; and 3) the costs to install or implement each change is reasonably proportionate to the relative benefits the change would provide in further minimizing AEI. *Entergy*, 129 S. Ct. at 1506. EPA's BTA conclusions to the contrary are baseless and must be revisited prior to issuance of the final permit.

60 Current operational measures and existing circumstances at Merrimack Station already cause significant flow reductions through the CWISs that result in a substantial decrease in overall impingement and entrainment. Specifically, as explained in the 2007 § 308 Response: Existing operational flow reductions at Merrimack Station occurring due to maintenance outages, Unit 2 single pump operation, and de-icing recirculation flow result in a combined annual flow reduction from a full flow baseline of 6.3 percent at Unit 1 and 9.0% at Unit 2. However, by far the greatest overall existing flow reductions for the Unit 1 and Unit 2 CWIS comes from the loss of intake pumping efficiency due to head loss from design full pond elevation as Hooksett Pool water levels change daily due to hydropower operation of the Garvins Falls (upstream) and Hooksett (downstream) hydroelectric stations. Head loss alone accounts for a 22.9% intake flow reduction for Unit 1 and a 14.5% intake flow reduction for Unit 2. When the actual operational flow reductions during the June 2005 through June 2007 entrainment and impingement studies are weighted by the monthly abundance of impingement and entrainment and compared to the design flows, an overall annual reduction of adult equivalent losses of 17% for entrainment and 22% for impingement is attributable to the Station's existing operational flow reductions. 2007 § 308 Response at 96 (internal references omitted)

61 Relatedly, EPA points out that currently one traveling screen and one pump at Unit 2 are shut down for approximately 8.4 days each year due to frazil ice, which results in 100 percent of the traveling screen spray wash flow being directed at the traveling screens in operation and increases the pressure of that spray wash flow. Determination at 269-70. This is an incorrect statement. The screen spraywash pressure remains constant regardless of how many pumps are in operation. Additionally it should be noted that operating only one intake pump during

these 8.4 days not only reduces the overall intake flow, it also results in a roughly proportional reduction in the maximum through screen design velocity—providing a decrease in risk of impingement mortality.

[62] Although PSNH would limit sharp turns in the trough, studies indicate that sharp turns do not impact mortality rates. 2012 EPRI Comments at 5.

[63] PSNH has also considered replacing its existing traveling screens with coarse mesh Ristroph screens or Geiger MultiDisc screens ("MD screens"), although PSNH believes installation of said screens is unnecessary due to the current *de minimis* levels of impingement and entrainment. *See* 2007 § 308 Response at 68-74. Use of Ristroph screens, in combination with the upgraded fish return system, would reduce impingement mortality from baseline by approximately 50 percent at Unit 1 and 53 percent at Unit 2, with adult equivalency loss reductions of 60 percent and 50 percent at each unit, respectively. *Id*. at 68-69. The present value of the estimated cost of installing the Ristroph screens and the upgraded fish return system is approximately $1,576,000, although these costs could be higher due to "various uncertainties associated with the costs of installation and operations of the" screens. *See* 2012 NERA Report at E-3, 18. These percentage reductions in impingement appear substantial. However, because impingement mortality at PSNH is already trifling, the cost-benefit ratio of installing this technology at Merrimack Station is 138 to 1, meaning that for every $1 of social benefit PSNH's customers would pay $138. *Id*. at 36. This too fails EPA's "wholly disproportionate" and "significantly greater" standard, as well as the requirements of Exec. Order 13563. Installation of MD screens at Merrimack Station, along with upgrades to the fish return system, would reduce impingement mortality by approximately 69 percent at Unit 1 and 80 percent at Unit 2, with adult equivalency loss percentages of 67 percent and 60 percent, respectively. *See* 2007 § 308 Response at 71-74. Installation of this technology is estimated to cost approximately $2,624,000 in present value, although these costs could actually be higher than estimated, as well, due to various uncertainties. *See* 2012 NERA Report at E-3, 18. The estimated costs and relative benefits result in a ratio of 186 to 1, meaning installation of MD screens at Merrimack Station is also not justified in light of EPA's "wholly disproportionate" and "significantly greater" standard, as well as the requirements of Exec. Order 13563. *Id.* at 36.

[64] The reduction in impingement expected from moving the scheduled outage of Unit 1 to October is five percent. Because this outage is biennial, impingement reduction at Merrimack would alternate each year between 41 and 46 percent.

[65] EPA actually provided that "scheduling the annual Unit 2 maintenance outage from mid-May to mid-June could be a component of the BTA under CWA § 316(b)." *See* Determination at 297. However, the rescheduling option was ultimately rejected in lieu of requiring installation of CCC at the facility.

[66] Moreover, in its 2007 Responses to EPA's § 308 Request, PSNH included other proposed operational changes, including installation of variable speed pumps, that could be used in conjunction with the technologies listed in this subpart. See 2007 § 308 Response at 87-93. EPA summarily dismissed each of these options— individually—without looking at their potential, collective effectiveness if used in combination. EPA's failure to consider a combination of upgrades and operational changes to achieve substantially equivalent minimization of AEI compared to CCC is arbitrary and capricious. Such an analysis is warranted, indeed required, prior to final issuance of the permit.

EPA Response:

In this 2012 comment, made prior to EPA's promulgation of the 2014 Final Rule, PSNH stated somewhat confusingly and contradictorily that, while it did "not concede that current <u>intermittent</u> operation of the <u>existing</u> traveling screens and fish return system at Merrimack Station fail to reflect BTA pursuant to § 316(b)" (emphases added) a "proper BTA analysis" demonstrates that the BTA is <u>continuous</u> rotation of the existing traveling screens, installing a <u>new</u> fish return system, and rescheduling maintenance outages. At the time of the 2011 Draft Permit (i.e., before EPA issued the Final Rule in 2014), in the absence of national, categorical technology guidelines for CWISs at existing facilities, EPA determined BTA on a best professional judgment (BPJ) basis. *See* AR-618 at 221, 225. In 2017, PSNH commented that promulgation of the Final Rule in

2014 did not "negate [PSNH's 2012] conclusion"[7] and, in PSNH's view, "dictates that continued use and operation of existing CWIS technologies (*i.e.*, use of existing traveling screens and the current fish return system) is all that is required to satisfy the BTA standard." Comment III.3 (emphases added). PSNH asserts this is so because, according to PSNH, the rate of impingement at Merrimack Station is so low as to be *de minimis*, the 3-year average AIF at Merrimack Station is below a supposed 125 MGD "compliance threshold" that PSNH reads into the Final Rule, and, even if the Final Rule contains no such "compliance threshold,"[8] entrainment at Merrimack Station is likewise *de minimis.* Thus, PSNH's 2017 comment appears to be that, even if EPA does not agree with PSNH's *de minimis* and 125 MGD "compliance threshold" arguments, then one of PSNH's 2012 BTA conclusions should be applicable. It is not clear, however, which of those 2012 conclusions should, in PSNH's view, be applicable, because they are inconsistent with one another. Specifically, on the one hand, PSNH appears to comment in 2012 that 1) BTA is intermittent operation of the existing traveling screens and use of the current fish return system (i.e., no change), while also commenting that 2) BTA is continuous screen rotation, a new fish return, and maintenance outages. EPA begins the response to these comments by briefly addressing the 2017 comments that impingement and entrainment are *de minimis* and that the Final Rule purportedly contains a 125 MGD "compliance threshold." We then turn to PSNH's 2012 BTA conclusions.

First, the rates of impingement and/or entrainment at Merrimack Station are not *de minimis*. Merrimack Station's CWISs impinge thousands of fish on its intake screens each year, *see* Demonstration Document at 259-60, and the existing traveling screen system does not adequately transport fish back to the source waterbody.[9] Similarly, Merrimack Station's CWISs entrain millions of fish eggs and larvae annually. *See* AR-618 at 245-46. These levels of impingement and entrainment represent adverse environmental impacts that must be minimized with the best technology available to satisfy § 316(b). EPA addresses PSNH's more detailed comments that impingement and entrainment are *de minimis* in Response to Comments III.3.4, 3.5, and 3.6, below. In addition, contrary to the comment, there is absolutely no 125 MGD "compliance threshold" for entrainment in the Final Rule. All facilities subject to the Final Rule, regardless of whether their actual intake flows (AIFs) are above or below 125 MGD, are required to meet the BTA standards for entrainment. *See* 40 CFR § 125.94(d). The 125 MGD threshold in the Final Rule on which PSNH erroneously bases its argument is actually a threshold for additional application requirements for larger facilities; it has no bearing on whether a facility is subject to the entrainment control requirements of the Final Rule. *See* 40 CFR § 122.21(r)(1)(ii)(B). EPA has addressed this issue in Response to Comment III.2, above (and associated comments) and responds in detail in Response to Comment III.3.5, below. In summary, there is no merit to any of the three reasons that PSNH provides to support its comment that the Final Rule "dictates" that existing CWIS technologies are the BTA.

Having established that Merrimack Station must address impingement mortality and entrainment under the Final Rule, EPA focuses in this response on PSNH's comments that the existing CWISs

[7] Although it is not clear to which 2012 conclusion PSNH is referring. *See infra*.

[8] It does not. *See* Response to Comment III.3.5.

[9] As explained below and elsewhere in this Response to Comments, the existing debris return sluice does not allow the fish to enter the river and results in 100% impingement mortality. *See also* AR-846 at 115; AR-6 at 30.

technologies are the BTA at Merrimack Station as it applies to impingement mortality, including comments from 2012 in support of this determination. EPA addresses the BTA for entrainment mortality in Responses to Comments III.4 and III.5, below.

Section 316(b) of the CWA requires that a facility's cooling water intake structure (CWIS) reflect the best technology available to minimize adverse environmental impact. Although § 316(b) does not require every facility to "eliminate completely" the adverse environmental impact of its CWISs, to "minimize" in the context of § 316(b) likewise does not mean maintain the status quo at a CWIS, especially when that status quo does not meet even the barest minimum of available technologies (i.e., returning impinged fish to the source water). Rather, it means "to reduce to the smallest amount, extent, or degree reasonably possible." 40 CFR § 125.92(r); AR-618 at 232; *see* 40 CFR § 125.83 (defining "minimize" identically); *see also Entergy Corp. v. Riverkeeper, Inc*., 556 U.S. 208, 219 (2009) (recognizing the regulatory definition of "minimize" at 40 CFR § 125.83 and acknowledging EPA's "discretion to determine the extent of reduction that is warranted under the circumstances"). In 2012, and again in 2017, PSNH characterizes the existing technology as "traveling screens and fish return system." To be clear, the "fish return system" currently in use at Merrimack Station is in reality a "debris return sluice, which discharges into a dry sump and does not allow the fish to enter the river except under high pool elevations." AR-6 at 30 (emphasis added). Enercon acknowledges that the debris sluice results in 100% impingement mortality. *Id*. In its 2012 comments, PSNH also acknowledges that "impingement survival with Merrimack Station's current system is minimal." AR-846 at 115. The existing technology, which was not designed as a fish return and indeed does not return fish to the Merrimack River, is plainly not the "best technology available."[10] Moreover, PSNH agrees. In its 2012 comments, PSNH states that "certain improvements and/or operational changes are available to make the system more effective and further reduce impingement mortality" and that a "proper" analysis demonstrates that BTA is continuous rotation of the existing traveling screens,

[10] In 2012, PSNH also commented that existing maintenance outages, de-icing recirculation flows, and loss of intake pump efficiency due to hydropower operations result in "significant flow reductions through the CWISs that result in a substantial decrease in overall impingement and entrainment." AR-846 at 113 n.60. Head loss from daily changes in design full pond elevation related to hydropower operation of the Garvins Falls and Hooksett hydroelectric stations accounts for the majority of the difference between actual flow and design flow. After considering available information about the flows used in the Engineering and Biological Reports, actual flow reductions (and proportional actual entrainment reductions) are likely between 10% and 20% (*see* AR-6 at 17, AR-210 Attachment I), which is not as effective as other available technologies for reducing impingement and entrainment. Normandeau derived estimates of impingement and entrainment at both design flow and actual intake flow (reflecting pump efficiency) which demonstrate that both levels are not *de minimis*. *See* AR-2 at 52, 74, 77. In addition, while one-pump operation at Unit 2 for approximately 9 days in response to frazil ice will reduce the through-screen velocity at the Unit 2, CWIS, it will not reduce the velocity as low as 0.5 fps, given that the design velocity with both pumps is 1.82 fps, AR-6 at 15, 28, and the comment concedes (at fn 61) that one-pump operation "results in a roughly proportional reduction in the maximum through screen design velocity." Moreover, the reduction associated with one-pump operation is extremely limited in duration (i.e., on average, 9 days). EPA maintains that it is unlikely that the existing operational measures result in significant reductions in impingement mortality and entrainment in comparison to the proposed improvements to the traveling screens or wedgewire screens. Moreover, PSNH has not demonstrated that the existing "operational measures" and "circumstances" satisfy any of the impingement mortality compliance alternatives at 40 C.F.R. § 125.94(c).

installing a new fish return system, and rescheduling maintenance outages.[11] AR-846 at 113-114. In other words, even PSNH recognizes that installing a "fish-friendly" return, which is technologically feasible and economically practicable based on the 2012 comments, will reduce impingement mortality.

EPA has since established national requirements that reflect the BTA for minimizing adverse environmental impact at existing facilities. *See* 40 CFR part 125, subpart J; *see also* 79 Fed. Reg. 48,300. Under the Final Rule, the owner or operator of an existing facility like Merrimack Station must comply with one of the alternatives identified in the national BTA standard for impingement mortality at § 125.94(c). In addition, the owner or operator of an existing facility like Merrimack Station must comply with BTA standards for entrainment established by the permitting authority on a site-specific basis that reflect "the maximum reduction in entrainment warranted after consideration" of relevant factors specified in 40 CFR § 125.98(f). 40 CFR § 125.94(d). For the Final Rule, EPA aligned the deadlines for complying with the impingement mortality and entrainment BTA standards. *Id*. § 125.94(b)(1) ("After issuance of a final permit that establishes the entrainment requirements under § 125.94(d), the owner or operator must comply with the impingement mortality standard in § 125.94(c) as soon as practicable"); *see also* 79 Fed. Reg. at 48,327. Thus, the Final Rule sequences the entrainment and impingement mortality controls so that facilities select and implement controls for impingement mortality only after the entrainment controls have been determined. *See* 79 Fed. Reg. at 48,358-60. In the preamble to the Final Rule, EPA states that permitting authorities are "encouraged to consider the extent to which those technologies proposed to be implemented to meet the requirements of § 125.94(d) [the BTA standards for entrainment] will be used, or could otherwise affect a facility's choice of technology, to meet the requirements of § 125.94(c) [the BTA standards for impingement mortality]." *Id*. at 48,369. In this way, the facility can take advantage of the potential impingement benefits provided by the required entrainment controls. In response to comments received in 2012, 2014, and 2017, and after considering the relevant factors at 40 CFR § 125.98(f)(2) and (3), EPA has determined that the BTA for entrainment at Merrimack Station is seasonal operation of wedgewire screens. The Final Permit (Part I.E) establishes requirements for meeting this BTA standard, as well as a compliance schedule to achieve compliance as soon as practicable. *See* Responses to Comments III, Sections 4, 5, and 6 (and associated comments). As the Final Permit establishes BTA standards for entrainment, the Permittee must plan to comply with one of the alternatives identified in the national BTA standard for impingement mortality at § 125.94(c) as soon as practicable.

[11] PSNH also comments, in fn 66, that EPA failed to consider other potential options, such as installation of variable speed pumps, without looking at their potential, collective effectiveness if used in combination with upgrades and operational changes. EPA notes here that PSNH did not provide an assessment of the potential improvements of variable speed pumps in combination with other upgrades proposed in its 2012 and 2017 comments. In 2007, Enercon concluded that the use of variable speed pumps would reduce impingement by about 23% at Unit 1 and 5% at Unit 2 and that there would be no corresponding reduction in entrainment. Limits on the thermal discharge (addressed in Chapter II of this Response to Comments) would limit the use of flow reduction via variable speed pumps as a means of reducing impingement and entrainment during spring and summer when entrainment occurs. *See* AR-6 at 90. PSNH has not updated the analysis of the effectiveness of variable speed pumps and EPA agrees that the temperature limits of the Final Permit will likely limit the use of this technology for entrainment.

In its 2017 comments, PSNH maintains that continued use and operation of existing CWIS technologies (*i.e.*, use of existing traveling screens and the current fish return system) is all that is required to satisfy the BTA standard because the rate of impingement at Merrimack Station is *de minimis*. EPA interprets this comment to mean that PSNH selected 40 CFR § 125.94(11) (*de minimis* rate of impingement) as its method of compliance with the impingement mortality BTA standard. See also, Comment III.4, below ("Merrimack Station also is not required to select one of the seven pre-approved impingement mortality options set out in 40 CFR § 125.94(c), because the rate of impingement at the Station is *de minimis*.") This option allows that, "[i]n limited circumstances" the permitting authority may conclude that the documented rate of impingement is so low that no additional controls are warranted. *Id*. As addressed fully in Response to Comment III.3.4 below, EPA rejects the proposal that the documented rate of impingement at Merrimack Station is *de minimis*. Moreover, PSNH does not assert that the existing traveling screens and debris sluice comply with any of the alternative BTA standards for impingement mortality that now exist in the 2014 Final Rule at 40 CFR § 125.94(c)(1) through (7). Nor could PSNH.[12] Therefore, the existing technology cannot be the BTA for impingement. In addition, the existing screens and fish return cannot be the BTA for entrainment, because the 3/8-inch mesh screens do not "minimize" entrainment in any way. *See* 40 CFR §§ 125.92(r), 125.94(d). *See also* AR-6 at 28 (conceding that the 3/8-inch screens do not minimize entrainment), 95 (recognizing that in the Comparative Matrix Enercon expects that "Fish Return Systems" and "Coarse Mesh Screening Technologies" will result in an entrainment reduction of 0% from baseline). EPA addresses the BTA for entrainment in more detail elsewhere in this Response to Comments.

Furthermore, PSNH has not shown that continuous rotation, a new fish return, and rescheduled outages, collectively, will satisfy the impingement BTA requirements of the Final Rule. First, they do not conform to any of the pre-approved technologies, including § 125.94(c)(5) because

[12] The existing screens and debris sluice do not meet the definition for modified traveling screens, because, among other reasons, the screens rotate only intermittently and the sluice does not return fish to the source water, *see* 40 C.F.R. §§ 125.92(s), 125.94(c)(5), as PSNH concedes in the comment. Normandeau (AR-872 at 134) comments that the pressure of the spray wash is much lower than 85 psi or 80-100 psi, as described in the 2011 Draft Determinations Document (at 269), because the "pressure decreases greatly as the water leaves the header" but does not provide any calculation or measurement of the spraywash pressure to demonstrate that the pressure is consistent with the definition of modified traveling screen in the Final Rule. Nor does the existing technology meet the requirements for through-screen velocity under all conditions. *See id.* § 125.94(c)(2), (3); *see also* AR-6 at 15 ("The design through-screen velocity of the Unit 1 CWIS is 1.5 [fps]; for Unit 2, it is 1.82 fps."), 28. Normandeau (AR-872 at 137-140) comments on prolonged versus burst swim speeds of fish commonly impinged at Merrimack Station related to through-screen velocity; however, the compliance alternatives for the Final Rule are based on through-screen velocities of 0.5 fps or less and the existing screens do not meet this requirement. In addition, the existing technology is obviously not a "[c]losed-cycle recirculating system," *id.* § 125.94(c)(1), or an "[e]xisting offshore velocity cap," *id.* at § 125.94(c)(4). Finally, it does not come even close to the impingement mortality performance standard of no more than 24% mortality, *see id.* § 125.94(c)(6), (7), since, as Enercon acknowledged, "[t]he existing traveling screen and fish return system has 100% impingement mortality," AR-6 at 30; *see also id.* at 66 ("Impingement survival at Merrimack Station with the existing sluice is essentially zero, because the end of the screenwash discharge pipe is not above the river's surface except at extremely high river levels, preventing fish washed from the end of the pipe from returning alive to the River."). Finally, Normandeau also comments (AR-872 at 133-4) that EPA incorrectly described the traveling screens as "laden with fish" when an impingement rate of 6 fish per hour would not be "laden" with fish. This description is not EPA's but was quoted directly from the description of the traveling screens ("fish and/or debris-laden mesh panels and shelves") in Enercon's 2007 Engineering Response (AR-6 at 27).

Merrimack Station's existing traveling screens would need to be upgraded to meet the definition of modified traveling screens. *See* 40 CFR § 125.92(s).[13] Second, while EPA agrees that continuous rotation and a new return would reduce impingement mortality, PSNH has not demonstrated that these changes, even when coupled with the rescheduled outages, will reduce it enough to achieve the 12-month impingement mortality performance standard of "no more than 24% mortality." *Id.* § 125.94(c)(7); *see also id.* § 125.94(c)(6) (noting that compliance with the systems of technologies alternative "will be informed by" comparing performance data to the 24% standard in paragraph (c)(7)). In the comment, PSNH assumes that the current system results in 100% impingement mortality. Meanwhile, Enercon estimated that the combination of continuous rotation, a new fish return, and the rescheduled outages could reduce that mortality by up to 51.1% on an annual basis. AR-6 at 95. In other words, even PSNH's submittals estimate 12-month impingement mortality would still be 48.9%—more than twice the standard of 24%. 40 CFR § 125.94(c)(7). These changes have a greater likelihood of satisfying the alternative impingement BTA compliance method at § 125.94(c)(6), however, when combined with the technology EPA determined meets the requirements of § 125.94(d) for entrainment. As EPA explained in the preamble to the Final Rule, "[o]nce the BTA requirements for entrainment have been established, the facility would finalize its chosen method for compliance with impingement mortality under § 125.94(c)." 79 Fed. Reg. at 48,359. The wedgewire screens that will be operated seasonally as the entrainment BTA will be designed with a through-screen velocity less than 0.5 fps, which will protect the vast majority of impingeable aquatic organisms. *See id.* at 48,345. When the Permittee is operating the wedgewire screens (April through August 15) to reduce entrainment, this through-screen velocity should achieve a greater reduction in impingement mortality than the technology on which the Final Rule's impingement mortality standards are based (i.e., modified traveling screens). *Id*. The Final Permit (Parts I.A.1, IA.2, and I.E.2) establish a maximum daily limit of 0.5 fps for intake velocity from April 1 through August 15. Additionally, as discussed at length in Response to Comments II.3.2 (and associated sub-comments), Merrimack Station's operational profile has changed since the 2011 Draft Permit. Based on generating data for the years 2012 to 2019, Merrimack Station rarely operates during the months of September and October, and DMR data for these months reflect low average monthly flows. *See* AR-1717. When the Station is not operating, there is no flow through the CWISs, and the actual through-screen velocity will be less than 0.5 fps (in fact it would be zero), which should also achieve low impingement mortality. When the Station is generating electricity (and withdrawing water) and the wedgewire screens are not operating, Merrimack Station will have to employ another technology to minimize impingement. In the 2009 Supplemental Engineering Report in which seasonal use of wedgewire screens was first proposed, Enercon stated that when the wedgewire screens would not be operating, Merrimack Station's existing

[13] Even with the installation of a new fish return sluice, the existing traveling screens would not meet the definition of modified traveling screens under the Final Rule, which requires "screens with collection buckets or equivalent mechanisms designed to minimize turbulence to aquatic life; addition of a guard rail or barrier to prevent loss of fish from the collection system; replacement of screen panel materials with smooth woven mesh, drilled mesh, molded mesh, or similar materials that protect fish from descaling and other abrasive injury; continuous or near-continuous rotation of screens and operation of fish collection equipment to ensure any impinged organisms are recovered as soon as practical; a low pressure wash or gentle vacuum to remove fish prior to any high pressure spray to remove debris from the screens…" 40 C.F.R. § 125.92(s); *see also* 79 Fed. Reg. 48,329; *compare* AR-618 at 267-69 (describing the existing traveling screens).

coarse mesh traveling screens would be used in combination with upgraded fish return systems. *See* AR-4 at 4. As noted in the comments, PSNH proposed installing a new fish return system and continuously operating the plant's traveling screens from April through December. *See* AR-846 at 114-115. Because the current debris return sluice results in minimal to no survival, a new fish return will be crucial to reduce impingement mortality when the Station is operating and the wedgewire screens are not in use (i.e., the facility is not otherwise achieving through-screen velocities at or below 0.5 fps). Upgrading the Facility's fish return system to ensure fish are transported back to the river (rather than being deposited in a dry sump) will improve the effectiveness of the existing technology. In addition, continuous rotation of the traveling screens from April through December (when the screens are operating) will reduce the duration of exposure and improve survival for impinged organisms. AR-6 at 65-66. *See also* AR-1670 at 3-20. EPA believes that, through the combination of wedgewire screens, actual through-screen velocity less than 0.5 fps when not operating, and continuously rotating the existing traveling screens and installing a new fish return system, the Permittee may be able to comply with the impingement mortality BTA standard at 40 CFR § 125.94(c)(6) ("Systems of technologies").[14] EPA acknowledges that the permittee must first perform the impingement performance technology optimization study, which cannot be completed until <u>after</u> the new fish return has been designed and constructed. *See* 79 Fed. Reg. 48,359.

A schedule must provide for compliance with requirements for both entrainment and impingement mortality as soon as practicable. 40 CFR § 125.98(c); *see also* 79 Fed. Reg. at 48,359 ("It would then be appropriate for the Director to develop a schedule whereby the facility would proceed to design, construct, and implement its technologies for impingement mortality, for entrainment, or for both together should the same technology address[] both impacts."). The Final Permit establishes permit requirements and a schedule to achieve compliance with a BTA standard as soon as practicable. A schedule is necessary because the Facility will have to install technology to meet the impingement mortality standards. To comply with 40 CFR § 125.94(c)(6), the Permittee must complete an *impingement performance technology optimization study* (described in 40 CFR § 122.21(r)(6)(ii)) to demonstrate the systems of technologies have been optimized to minimize impingement mortality. In this case, a new fish return system and

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[14] In 2012, PSNH also proposed rescheduling the maintenance outage for Unit 2 during late May to early June to reduce flow and, therefore, entrainment and impingement. EPA has determined that the BTA for entrainment is to operate wedgewire screens during this time period, which suggest rescheduling such an outage may be unnecessary. In addition, recent generating data indicate that Merrimack Station typically operates very little in May and early June, which effectively achieves flow reductions somewhat comparable to those PSNH had proposed achieving by rescheduling the Unit 2 maintenance outage (though EPA recognizes that the energy market, rather than a permit condition, results in Merrimack Station curtailing operations during this period). For example, in the combined average monthly flow for May based on DMR data from 2013 through 2019 was, at most, about 6% of the permitted flow. *See* AR-1717. Actual average monthly flows in June were less than 33% of permitted flow over this same period and less than 10% of permitted flow in 4 of 7 years. *See id*. Finally, rescheduling the maintenance outages would only minimize impingement mortality for the short period that each outage lasts. In the case of Unit 1, PSNH notes that the 5% reduction would only occur every other year. In the case of Unit 2, the Permittee should already be able to achieve a design through-screen velocity of 0.5 fps or less. In both cases, the Permittee would still require an alternative technology to meet the impingement mortality standard for the rest of the year. Thus, rescheduling the maintenance outages as PSNH describes may not contribute all that much to meeting the system of technologies alternative, although the permittee would be free to assess these options in its optimization study.

continuous rotation would likely be the focus of the optimization study, which cannot be completed until after the technologies have been designed and constructed. *See* 79 Fed. Reg. 48,359. Following submission of the optimization study, EPA may choose to incorporate additional permit conditions through a permit modification or in the next permit issuance (e.g., permit conditions specifying the optimal rotation frequency from December through March when conditions may not be suitable for continuous rotation). At the same time, while EPA maintains that compliance with the impingement mortality BTA standard at 40 CFR § 125.94(c)(6) is the most direct and likely method of complying with the impingement mortality BTA standards, the Permittee could choose to operate the wedgewire screens year-round, which would comply with 40 CFR § 125.94(c)(2), or it could upgrade the existing traveling screens to meet the definition of modified traveling screens at § 125.94(c)(5).[15] PSNH stated, however, that it would not operate the wedgewire screens during the fall and winter out of a concern that they could be damaged if used during this time. *See* Comments III.4 (and associated sub-comments). And while PSNH suggested it would not upgrade its traveling screens to meet the regulatory definition, *see* Comment III.3.1 n.63, if the new Permittee later decided to choose that compliance alternative, it would still need to build a fish-friendly return.[16] *See* 40 CFR § 125.92(s). Thus, a new fish return is a necessity to satisfy the impingement standard and is, therefore, a requirement in the Final Permit. The Final Permit also requires the Permittee to complete an impingement technology performance optimization study after installation of the new fish return system which will determine the optimal rotation speed and frequency to minimize impingement mortality. Should the Permittee select an alternative method of compliance (e.g., year-round wedgewire screen use or modified traveling screens), EPA would likely modify the permit to incorporate any changes to the CWIS requirements for impingement mortality.

In summary, impingement at Merrimack Station is not *de minimis*. Therefore, the Permittee must select, and comply with, one of the BTA alternatives for impingement mortality in 40 CFR § 125.94(c)(1) through (7) as soon as practicable. The existing technology at Merrimack Station does not satisfy any of these impingement BTA compliance alternatives. Further, PSNH did not show that its asserted BTA of continuous rotation, a new fish return, and rescheduled outages (collectively, but without additional technology) will satisfy any of the seven alternatives—to the contrary, PSNH's data suggest such changes will not be enough. The Final Rule encourages

[15] In footnote 63 to the comment, PSNH states that it "also considered replacing its existing traveling screens with coarse mesh Ristroph screens or Geiger MultiDisc screens ('MD screens')" for use at Merrimack Station, though it ultimately rejects them. If the facility chose to install such screens at Merrimack Station that otherwise met the definition of a "modified traveling screen" at 40 CFR § 125.92(s), they could also be used to satisfy the impingement BTA alternative at § 125.94(c)(5) when the wedgewire screens were not in use. In addition, either type of screen system would also require a new fish return to satisfy the definition of "modified traveling screen." Following construction of a new return and one of these screen systems, the facility would also need to complete an optimization study. Furthermore, since EPA determined in the Final Rule that modified traveling screens with a fish-friendly return (as defined at 40 C.F.R. § 125.92(s)) are the BTA for impingement mortality and that other methods of compliance at § 125.94(c) could also satisfy this standard, the question of whether the costs of installing coarse mesh Ristroph screens or MD screens (or another impingement mortality technology) at Merrimack Station are "wholly disproportionate" to the benefits of the particular technology is not a consideration in determining the impingement BTA at Merrimack Station. Furthermore, in the Final Rule, EPA assessed costs and benefits and determined that the benefits of the Final Rule justify the costs, pursuant to the principles in Executive Orders 12866 and 13563. 79 Fed. Reg. at 48,349-50.

[16] Similarly, if it chose to install coarse mesh Ristroph screens or MD screens, it would need a new fish return.

permitting authorities to consider the extent to which technologies operated for purposes of minimizing entrainment may also be used to satisfy § 125.94(c). EPA has determined that the BTA for entrainment at Merrimack Station is seasonal operation of wedgewire screens—a technology that would satisfy the impingement BTA alternatives of maximum through-screen velocity of 0.5 fps, at least for the periods it operates. *See* Response to Comment III.4.1 and 4.2. EPA believes that this technology, when combined with PSNH's proposed fish-friendly return, an optimized rotation frequency, and perhaps even flow reductions, may allow the facility to comply with the "systems of technologies" standard at § 125.94(c)(6). Or, the Permittee may choose to comply with another impingement BTA alternative, the most likely of which would be modified traveling screens, which will also require installation of a new fish return. The facility could also choose to comply with § 125.94(c) by operating the wedgewire screens year-round, but it has commented on numerous occasions that it cannot do so based on its assessment of the potential for damage to the screens when operating in the fall and winter. Moreover, Merrimack Station's current NPDES Permit is long expired and the facility has essentially operated with 100% impingement mortality due to the lack of a fish return—a basic impingement mortality control technology. Therefore, the Final Permit sets Merrimack Station on a path to comply with § 125.94(c) as soon as practicable by immediately requiring a new fish return[17] and, once constructed, an impingement technology performance optimization study to evaluate the effectiveness of the system of technologies (i.e., seasonal wedgewire screens, new fish return, optimal rotation frequency). [18] Should the permittee later choose to comply with the impingement BTA standard using modified traveling screens, EPA could modify the permit.

[17] The Final Permit now includes a 6-month compliance schedule to install a new fish return. *See* Final Permit at Part I.E.7.d. This a change from the 2011 Draft Permit, which did not include a compliance schedule. *See* 2011 Draft Permit at Part I.E. As EPA explained in the 2017 Statement, it has been evident since issuance of the 2011 Draft Permit that the Permittee would need time to install a fish return, if required by the Final Permit. AR-618 at 23. When EPA issued the 2011 Draft Permit, it expected to include a schedule for the necessary compliance steps in an enforceable document outside of the NPDES permit, consistent with prior agency practice and interpretation of the CWA. *Id.* In the intervening time, however, the agency has changed its interpretation of the Act with respect to compliance schedules for the installation of cooling water intake structure improvements to meet new permit requirements and has decided that they may be included in an NPDES permit. *Id.* (citing 40 C.F.R. §§ 125.94(b)(1)-(2), 125.98(c), 125.94(h)). Therefore, EPA has added a compliance schedule to the Final Permit for installation of the new fish return. *See also* Response to Comment III.10.3.6. The schedule considers aspects of the schedule that Enercon proposed for the installation of fine-mesh traveling screens (including new fish return troughs). *See* AR-4 at 90.

[18] In the 2011 Draft Determinations Document, EPA proposed, based on BPJ, that the BTA to minimize impingement was a new fish return and upgraded traveling screens. AR-618 at 346. (The 2011 Draft Permit did not, however, require the installation of new traveling screens, because the proposed thermal discharge conditions would have required closed-cycle cooling to be in place, which would provide even greater reductions in impingement mortality than new traveling screens. *Id.*). EPA is not finalizing the determination in the 2011 Draft Permit that the BTA for impingement includes new travelling screens, because, after EPA issued the Draft Permit, the agency issued new regulations that affect the process for determining the BTA for minimizing impingement. As discussed above and elsewhere, *see, e.g.*, Response to Comment III.1.1, the 2014 § 316(b) regulations provide seven alternatives to satisfy the impingement BTA standard and generally allow a permittee to choose from among them. As explained above, EPA believes that the Permittee may be able to comply with the systems of technologies alternative without installing new traveling screens. EPA will consider the information in the required optimization study and modify the permit to incorporate the operating conditions and parameters identified in the study. *See* 79 Fed. Reg. at 48,321, 48,347.

3.2 Existing Impingement Technology Violates 1992 Permit Conditions

Comment III.3.2	AR-851, CLF, pp. 4-5, 27

PSNH has never installed a fish return system that would comply with the terms of its existing permit. Fish handled in PSNH's existing "fish return system" empty into a concrete pit on the riverbank above the normal water elevation. As a result, over the past fifty years, the survival rate for fish trapped (impinged) on Merrimack Station's cooling water intake screen is "*virtually zero*."[20] PSNH's cooling water intake screens are, quite literally, a death trap for Merrimack River fish. . . . EPA should require the most protective fish screening and return technology available.

. . .

Perhaps more shocking than the number of fish impinged, is what happens to them after impingement. The 1992 Permit requires that "[a]ll live fish, shellfish, and other aquatic organisms collected or trapped in the intake screens shall be returned to their natural habitat."[146] PSNH's own consultant, however, has described Merrimack Station's current fish return system as "more of a debris return system."[147] EPA correctly concludes, "Merrimack Station's present fish returns are unacceptable. The returns from both units empty into a concrete pit on the riverbank above the normal water elevation. Therefore, fish survival for impinged fish over the past 50 years of plant operation has been virtually zero."[148] That fact amounts to a gross and continuing violation of the 1992 Permit.

PSNH's blatant non-compliance with this permit condition—and EPA's failure to enforce it—raise substantial concerns. This example of longstanding PSNH disregard for a key requirement of its federal NPDES permit is a red flag signaling to EPA that it should closely scrutinize PSNH's compliance with all of the terms of its new NPDES permit going forward.

[20] Attachment D at 291.
[146] *See* AR 236, 1992 Permit, at I.A.l.c. (emphasis added).
[147] Attachment D at 270 (citing Normandeau 2007d).
[148] *Id*. at 291.

EPA Response:

CLF comments that the existing fish return system is inadequate to protect fish and return them to the receiving water. EPA agrees that the existing technology is not sufficiently protective and, moreover, is not consistent with one of the BTA compliance alternatives for impingement mortality under the Final Rule. *See* AR-618 at 289 (noting that the "existing technology, developed in the 1950s and 1960s, does not include provisions to gently handle impinged fish" and that technologies developed since are available to reduce current levels of impingement mortality). EPA agrees a fish return that transports fish back to the receiving water in a manner that minimizes mortality is a fundamental requirement for traveling screen technology. The Final Permit requires the Permittee to design, install, and operate a new fish return to address the concerns highlighted in the comment. *See also* Response to Comment III.3.1.

3.3 The Proposed Operating Requirements for Screens at Merrimack Are Impracticable

Comment III.3.3	**AR-841, UWAG, pp. 62-63**

The draft permit for Merrimack has operating requirements for the screens that are impractical. The screens must be rotated every eight hours and, if more than 40 fish are on the screens, they must be rotated continuously. Moreover, the operator must count each dead fish, identify it by species, and measure a certain percentage of the dead of each species. In practice, this is impossible. These operating requirements should be removed from the permit.

EPA Response:

This comment from UWAG asserts, without any explanation or support, that it is "impossible" to (1) rotate the traveling screens every eight hours and, if more than 40 fish are on the screens, rotate continuously; and (2) count each dead fish, identify it by species, and measure a certain percentage of the dead of each species. EPA assumes UWAG is referring to permit conditions related to unusual impingement events at Part I.D and conditions for the traveling screen operation at Part I.E.4 of the 2011 Draft Permit. In contrast to UWAG's conclusory comment, Enercon, on behalf of PSNH, concluded that, in combination with other operating conditions and technologies, continuous operation of the traveling screens from April through December constitutes the BTA for Merrimack Station. *See* AR-6 at 99. In its comments in 2012 and again in 2017, PSNH echoed Enercon's assessment and proposed continuous rotation of the existing traveling screens from April through December. *See* AR-846 at 113; AR-1548 at 126. The operator (at the time the comment was made, now former operator) has not indicated that the rotation speed or counting fish during an unusual impingement event is "impossible" or "impractical" (and in fact has proposed more frequent rotation).

Similar requirements to increase frequency of screen rotation and enumerate impinged fish during unusual impingement events have been included in other NPDES permits, for example, Wheelabrator Saugus (MA0028193), University of Massachusetts Boston (MA0040304), and Kendall Station (MA0004898). EPA has not removed the permit conditions based on this comment because UWAG provides no justification or support for its statement that these requirements are "impossible" or "impractical," the permittee has not indicated that it will have a problem complying with these requirements and in fact, has complied with these conditions during past operations, and similar conditions have been implemented in practice for other facilities' CWISs.

3.4 The Rate of Impingement at Merrimack Station is *De Minimis*

Comment III.3.4	**AR-1548, PSNH, pp. 127-131**
See also AR-846, PSNH pp. 74-80, AR-872 Normandeau pp. 133-4, 137-141, AR-1231 PSNH et al. pp. 34, Exhibit 4 pp. 11-12, and Attachment 1 pp. 8-10, AR-1549, Enercon, p. 20, AR-1207 EPRI p. 7; AR-1300, LWB, pp. 40-43	

Existing CWIS controls at Merrimack Station constitute BTA for impingement because the rate of impingement at Merrimack Station is *de minimis*.[542] PSNH demonstrated in its 2012 comments to the Draft Permit that the rate or level of impingement experienced at Merrimack Station cannot be anything other than *de minimis* and is not resulting in any adverse environmental impact ("AEI") within the Hooksett Pool.[543] To support this argument, PSNH utilized comprehensive biological sampling at Merrimack Station completed by Normandeau between 2005 and 2007. That data allowed Normandeau to estimate that Merrimack Station impinged 6,736 fish between June 2005 and June 2006 and only 1,271 fish between July 2006 and June 2007—resulting in an estimated impingement of approximately 4,005 fish in an average year.[544] To further bolster its conclusions that the rate of impingement at Merrimack Station is *de minimis*, Normandeau next converted the raw numbers for the six species that comprise in excess of 90 percent of this estimated total number of fish impinged in an average year at Merrimack Station and calculated the annual, expected adult equivalent losses due to the estimated impingement to be a mere 517 adult fish lost in an average year due to AIF at Merrimack Station. These numbers are miniscule when one considers the natural mortality of early lifestages of fish, and the exorbitant number of eggs fish produce each season, absent outside influences.

This conclusion was corroborated by PSNH in its 2012 comments by referencing an EPRI study that analyzed the economic benefits of retrofitting existing once-through cooling facilities with CCC.[545] In this study, EPRI gathered and ranked impingement data from 166 facilities with CWISs in the same regulatory category as those at Merrimack Station.[546] Merrimack Station's average annual impingement ranked 136 out of 166 facilities in EPRI's study, meaning the incidence of impingement at the facility was in the bottom 18 percent of all facilities in the database.[547] Remarkably, the total annual impingement from the 30 facilities ranked at the bottom of EPRI's database accounted for only 0.02 percent (two ten thousandths) of the impingement for all 166 facilities—demonstrating that problematic rates of impingement are limited to a specific subset of CWISs within this regulatory category—and the Merrimack Station CWISs are not within this problematic subset.[548]

Normandeau revisited this *de minimis* issue in an October 22, 2014 report submitted to EPA to examine how, if at all, its previous *de minimis* analysis should be revised in light of the 2014 final § 316(b) rule.[549] Normandeau embraced the illustrative *de minimis* flow-based examples in the final § 316(b) rule to support its 2012 conclusions. Utilizing the mean annual flow ("MAF") of the Merrimack River (4,927 cubic feet per second ("cfs")) from 1996 to 2003, Normandeau determined the Unit 1 DIF of 131 cfs withdraws 2.67% of the MAF, and the Unit 2 DIF of 312 cfs withdraws 6.33% of the MAF.[550]

The final § 316(b) rule does not utilize DIF in its *de minimis* examples, however. Instead, EPA recommends considering average AIFs,[551] which are significantly lower at Merrimack Station—especially in the last 4-7 years. Specifically, Merrimack Station Unit 1 had an AIF of 97 cfs in the

2005 through 2007 timeframe. MAF of the Merrimack River during this time was 7,241 cfs, meaning the 97 cfs of Unit 1 was a mere 1.34% of the total River MAF.[552] Unit 2's AIF during this same time period was 251 cfs, which amounts to 3.47% of the Merrimack River MAF. Utilizing the more conservative 4,927 cfs MAF from 1996 to 2003, the AIF withdrawals from 2005 through 2007 are still a mere 1.97% and 5.09% for Unit 1 and 2, respectively.[553] Normandeau also looked at the most recent three years of Merrimack Station CWIS operations at the time, from 2011 through 2013. Unit 1 had an AIF of 56 cfs, or 1.11% of the MAF of 5,021 cfs for the Merrimack River during those years. Unit 2's AIF during this period was 119 cfs, or 2.37% of the Merrimack River MAF. Utilizing again the more conservative 4,927 cfs MAF from 1996 to 2003, the AIF withdrawals from 2011 through 2013 represent 1.14% and 2.42% for Unit 1 and 2, respectively.[554] All of these examples are within the 5% percent or less MAF withdrawal percentage EPA set out in the final § 316(b) rule and support a conclusion that the rate of impingement at Merrimack Station is *de minimis*.

Furthermore, Normandeau's 2014 report provides the following additional support that the rate of impingement at Merrimack Station must be considered *de minimis*:

> An impingement characterization study was performed at Units 1 and 2 of Merrimack Station from 29 June 2005 through 28 June 2007, weekly during April through December and on alternate weeks during January through March (Normandeau 2007), providing recent and relevant data for estimating impingement abundance. Merrimack Station weekly AIFs have been reduced by about 50% since the 2005 through 2007 Study, by reducing the operation of Units 1 and 2, making the weekly average AIF from Merrimack Station from 1 January 2011 through 31 December 2013 the most current and appropriate CWIS operating regime to estimate impingement abundance and mortality for compliance with the new §316(b) regulations . . . .
>
> Weekly impingement rates (density as number of fish impinged per million gallons of water sampled, adjusted for collection efficiency; Appendix Tables B‐3 and B‐4 of Normandeau 2007) at each Unit (1 or 2) from the 2005 through 2007 Study were multiplied by the associated weekly AIF from Merrimack Station for 1 January 2011 through 31 December 2013 . . . to estimate the current weekly and annual impingement abundance of fish for the two units combined . . . . Fish species impinged at Merrimack Station during the 29 June 2005 through 28 June 2007 Study were also categorized as fragile or nonfragile species according to the specifications of §125.92(m) of the new §316(b) regulations. The only species impinged at Merrimack Station classified as a fragile species was Rainbow Smelt, which accounted for only 2.3% of the total estimated fish impingement over the two-year study (Table A1‐3). Annual impingement abundance of total fish at Merrimack

> Station was reduced by 54% in 2011 through 2013 (compared to the 2005 through 2007 study . . .) due to the recent flow reductions.[555]

To provide proper perspective, Normandeau likewise references the above-referenced 2011 EPRI national survey to highlight the averaged annual impingement rate from its 2005 through 2007 study at Merrimack Station is *de minimis*. Applying numbers that are slightly different than those included in PSNH's 2012 comments to the Draft Permit, Normandeau provides:

> The Merrimack Station annual impingement rate averaged over the two years of study (29 June 2005 through 28 June 2007) was 3,978 fish for Unit 1 and Unit 2 combined (Table A1 ‐ 2), ranking 139th among the 166 facilities responding to the EPRI national survey . . . . Merrimack Station had an annual total far below (0.27% of) the national average. In terms of rank this 2005 through 2007 annual average impingement rate places Merrimack Station in the lowest 17% of the facilities surveyed throughout the United States that had performed impingement characterization studies during the 2004 through 2007 period . . . . Based on the most recent and relevant intake flows from 1 January 2011 through 31 December 2013 applied to the weekly impingement rates from the 29 June 2005 through 28 June 2007 Study . . ., the Merrimack Station annual impingement rate was 1,834 fish for Unit 1 and Unit 2 combined . . ., which was in the **lowest 11%** of the facilities surveyed throughout the United States that had performed impingement characterization studies during the 2004 through 2007 period. Therefore, by comparison with the largest data base of reported annual impingement rates presently available from 166 electric generating facilities representative of all source water bodies throughout the continental United States and Hawaii (EPRI 2011), and using annual total impingement rates for the three most recent years of AIF (2011 ‐ 2013), impingement abundance at Merrimack Station of 0.27% of the national average is de minimis.[556]

Taken together, these data and analyses demonstrate that the rate of impingement at Merrimack Station is *de minimis*. Accordingly, existing CWIS controls and operations at Merrimack Station constitute BTA and additional technologies at the facility are not required.

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542 Should EPA erroneously disagree with this conclusion, the owner or operator of the facility has the right and obligation to choose the method of compliance with the impingement mortality standard. *See id.* at § 122.21(r)(6).
543 *See, e.g.,* AR-846 at 73-82.
544 *Id.* at 74 (citing AR-6 at 6).
545 *See* AR-846 at 81 (citing AR-842 at 7-9). EPRI's economic benefits study is described in more detail in

its comments to the 2012 Draft Permit. *See* AR-842.
546 These 166 facilities comprised 39 percent of the total population of facilities with CWISs that fall within the same regulatory category as the CWISs at Merrimack Station. *Id.* at 7.
547 *Id.*
548 *See id.*
549 *See* AR-1231, Ex. 4, Attachment 1 at 8-10.
550 *Id.* at 9.
551 *See, e.g.,* 79 Fed. Reg. at 48,309.
552 AR-1231, Ex. 4, Attachment 1 at 9.
553 *Id.*
554 *Id.*
555 *Id.* at 8.
556 *Id.* at 10 (emphasis added). Normandeau again references data from its 2014 report in its report submitted with these comments. *See* Normandeau 2017 Response at 27.

EPA Response:

PSNH comments that the existing CWIS controls and operations at Merrimack Station constitute BTA and no additional technologies are required to address impingement mortality, because the level of impingement at Merrimack Station is, in PSNH's view, *de minimis*. In support of this assertion, PSNH points to its 2012 comments, the estimated number of fish impinged and the estimated adult equivalent losses, the rate of impingement at Merrimack Station as compared to other generating stations, and the volume of water withdrawn by Merrimack Station's CWISs in comparison to the mean annual flow of the river. For the reasons that follow, EPA disagrees that impingement at Merrimack Station is *de minimis* and does not find support in any of the information presented in the comment above or in the comments provided in 2012.

EPA considers the loss of, or injury to, aquatic organisms (including fish eggs and larvae, juvenile and adult fish, and other types of organisms) from being entrained or impinged by a CWIS to constitute adverse environmental impact under CWA § 316(b). In the 2011 Draft Determinations Document (AR-618 at 230-32), EPA explains the term "adverse environmental impact" (AEI) and the basis for its interpretation. Neither statute nor regulation expressly limits the extent of adverse environmental impact that may be considered.

In the 2014 Final Rule, EPA concluded that the BTA for minimizing impingement mortality at facilities subject to the rule was "modified traveling screens," as defined in the rule.[19] 79 Fed. Reg. at 48,329; *see* 40 CFR §§ 125.92(s), 125.94(c)(5). In addition to the option to employ modified traveling screens to comply with the standard, the rule includes six alternatives an existing facility may use whose performance is equivalent to, or better than, modified traveling screens. *Id.* Consequently, the Final Rule provides that "[t]he owner or operator of an existing facility must comply with one of the alternatives in paragraphs (c)(1) through (7) of this section, except as provided in paragraphs (c)(11) or (c)(12) of this section, when approved by the" permitting authority. 40 CFR § 125.94(c). Although the comment includes a limited (and

[19] The definition includes, among other requirements, that the system have a fish handling and return system that returns fish to the source water, which PSNH concedes Merrimack Station does not have. *See* Response to Comment III.3.1.

selective) reference to the Final Rule, it inexplicably ignores the actual *de minimis* provision in the regulations—paragraph (c)(11)—which provides in relevant part:

> In limited circumstances, rates of impingement may be so low at a facility that additional impingement controls may not be justified. The Director, based on review of site-specific data submitted under 40 CFR 122.21(r), may conclude that the documented rate of impingement at the cooling water intake is so low that no additional controls are warranted.

40 CFR § 125.94(c)(11). Several themes are evident from a review of paragraph (c)(11) and are further explained in the record for the rulemaking. First, the *de minimis* provision will only be available "[i]n limited circumstances." Thus, a decision by a permitting authority that no additional impingement controls are warranted at a facility will be an infrequent occurrence. Indeed, in the record accompanying the Final Rule, EPA explained that it expects the *de minimis* provision to be "rarely used." Final Rule RTC (AR-1697) at 25 n.4; *see also id.* at 118 ("[T]he Agency intends for the *de minimis* provision to be infrequently used."), 212 (noting that only in "the most rare cases" will *de minimis* impingement be demonstrated under § 125.94(c)(11)); AR-1718 at 12-3 ("EPA intends that this provision would not be utilized often"). Second, the rate of impingement must actually be quite low, not just lower than other facilities that may themselves be much larger or withdraw from different types of water bodies. In responding to comments on the Final Rule, EPA described the provision as potentially applicable where rates of impingement are "exceptionally low." AR-1697 at 42 ("The final rule provides flexibility for the Director to decide not to require impingement controls where rates of impingement are *exceptionally low* as to be de minimis.") (emphasis added), 118 ("In seeking to avail themselves of the de minimis provision, facilities are required to submit data to the Director indicating that they experience *exceptionally low* impingement rates; the Director will then determine what measures are appropriate.") (emphasis added); *see also* AR-1718 at 12-3 ("EPA has included a provision in the final rule that permits the Director to conclude that a site-specific determination of BTA for impingement mortality is warranted at sites *with exceptionally low rates of impingement*.") (emphasis added). EPA explained the relationship between the two concepts, noting that EPA had not established "metrics for what qualifies as 'exceptionally low' impingement rates, as the Agency intends for the *de minimis* provision to be infrequently used," and citing as an example an impingement rate of "several fish per month." AR-1697 at 118. Furthermore, in disagreeing with a comment opposing an annual *de minimis* threshold on the basis that it could mask significant short-term impingement, EPA noted that "the absolute number of fish impinged is likely to be sufficiently low" that such masking would not be numerically possible and that such a facility "likely would not qualify for the de minimis provision." *Id.* at 109, 118. Third, the *de minimis* provision is within a permitting authority's *discretion* to invoke in a particular instance and is not automatically applied in any case. 40 CFR § 125.94(c)(11) ("The Director . . . *may* conclude that the documented rate of impingement at the cooling water intake is so low that no additional controls are warranted.") (emphasis added); AR-1697 at 264 ("[T]he Director has the discretion to conclude that the documented rate of impingement at the cooling water intake is so low that no additional controls are warranted.").

Reviewing the information presented in the comments in light of the *de minimis* provision in the Final Rule, the Region does not agree that the documented rate of impingement at Merrimack Station is low enough for EPA to conclude that no additional impingement controls are warranted. First, PSNH's comment and the supporting data do not suggest that Merrimack Station's impingement is exceptionally low. In particular, PSNH estimates (in its comment) that 6,736 fish were impinged during the first year of the biological study (from June 2005 to June 2006) and 1,271 fish were impinged during the second year of the study (from July 2006 to June 2007). The mean annual impingement based on these two years of monitoring is 4,005 fish, which Normandeau estimates as an annual loss of 517 adult equivalent fish.[20] Moreover, although EPA explained in the Final Rule that it was not establishing a numeric threshold for what qualifies as "exceptionally low," EPA did provide an example of several fish per month. AR-1697 at 118 (citing 77 Fed. Reg. 34,324 (June 11, 2012)). Based on PSNH's estimates above, Merrimack Station by comparison impinges several *hundred* fish per month[21]—a rate considerably higher (by two orders of magnitude) than EPA's example.

PSNH next comments that its estimates of impingement at Merrimack Station "are miniscule when one considers the natural mortality of early lifestages of fish, and the exorbitant number of eggs fish produce each season, absent outside influences." Yet PSNH offers no explanation why the production and/or mortality of eggs and larvae—which are associated with entrainment—should have any bearing on whether the mortality of thousands of juvenile and adult fish due to impingement is *de minimis*.[22] In truth, the CWISs at Merrimack Station present additional sources of mortality not accounted for by the natural mortality rates and life histories of all life stages of fish (or, in the words of the comment, "outside influences"). That an individual egg or larva may not have survived to adulthood naturally does not excuse Merrimack Station from impinging and killing thousands of juvenile and adult fish each year through the use of fundamentally inadequate impingement mortality technology at the facility (which even by PSNH's admission fails to return fish to the source waterbody), nor does it establish that the BTA standard for impingement mortality is satisfied.

[20] In its comments on the 2011 Permit (AR-872 at 141) Normandeau provided different estimates of 4,137 fish in Year 1 and 895 fish in Year 2, or 5,032 fish over the 2-year study, which it comments is nearly double the estimate of "entrapment' of 2,504 fish from 1976-1977. In all cases, the mortality of thousands of fish per year due to the inadequacy of the existing technology represents an adverse environmental impact. Normandeau also comments that impingement estimates are not a good indicator of fish population abundance. In the 2011 Draft Determinations Document, EPA compared the impingement estimates from the 1970s and 2000s to demonstrate only that impingement mortality of thousands of fish per year is an additional stressor on fish populations that may already be experiencing declines. At the same time, as explained in the response, a population-level impact is not necessary to demonstrate adverse environmental impact from impingement. *See also* AR-1300 at 40-1.

[21] Table 4-6 from Normandeau's 2007 Biological Report (AR-6 at 74) indicates the average, adjusted impingement rate at both units combined is about 17 fish per million m3 (about equivalent to the daily design flow of 287 MGD), which equates to an average of about 500 fish per month based on design flow and adjusted for screen collection efficiency. Even corrected for actual flow during the 25 months of study between 2006 and 2007 produces an estimate of thousands of fish each year and a monthly average count of almost 200 fish per month (AR-3 at 77).

[22] Nor does the Final Rule direct a permitting authority to compare a facility's impingement to the number of eggs and larvae in the waterbody when considering a claim that impingement rates are so low that no additional impingement controls are warranted.

The preamble accompanying the Final Rule explains, that "EPA does not expect that a de minimis exemption would apply to facilities with no technology present other than trash racks, a technology that nearly all facilities employ." 79 Fed. Reg. at 48,372. The existing traveling screens at Merrimack Station lack an adequate mechanism to transport fish safely back to the river, as PSNH acknowledged in its 2007 Engineering Response and its 2012 comments. *See* AR-6 at 29, 30; AR-846 at 115. The lack of a fish return trough means that *all* of the thousands of fish impinged annually at Merrimack Station's CWISs are killed. Broadly speaking, traveling screens that allow fish to suffer mortality because the fish are not returned to the receiving water are no better technology for minimizing impingement than are trash racks. The existing screens lack fundamental technology to transport fish directly to the river, which is one of the most basic features of the technology industry-wide. *See* TDD for Final Rule (AR-1718) at 6-20. In effect, the result of impingement at Merrimack Station is even worse than PSNH's estimates might otherwise suggest at a facility that employed some level of effective fish return technology, since impingement mortality at Merrimack Station is essentially equal to the rate of impingement. In addition, to the extent PSNH comments that impingement at Merrimack Station does not result in adverse impacts to fish populations in Hooksett Pool and, therefore, is *de minimis*, EPA has stated that a *de minimis* rate of impingement is to be measured at the organism level, not the population level. 79 Fed. Reg. at 48,371-72. For all of these reasons, EPA does not agree that the annual loss of thousands of individuals at Merrimack Station's obsolete traveling screens due to impingement is *de minimis*.

Second, the comment assumes without explanation that a permitting authority should invoke the *de minimis* provision for a particular facility based on the facility's impingement ranking among a list of facilities compiled by EPRI. According to the comment, it is not important that a facility impinges (and, in this case, kills) thousands of fish in a typical year, only that the facility impinges fewer fish than this select group of other facilities do. But the comment does not provide any statutory or regulatory support for this position, which is reflected nowhere in the Final Rule. *Compare* Final Rule RTC (AR-1697) at 118 (noting as a *de minimis* example a facility that impinged "several fish" per month). More specifically, the comment views Merrimack Station's impingement as *de minimis* because its average annual impingement ranked 136th out of 166 facilities (putting it in the bottom 18%) in EPRI's list. Under this view, however, scores if not hundreds of facilities would qualify for a provision that the regulation states should be applied "[i]n limited circumstances." 40 CFR § 125.94(c)(11).[23] Under PSNH's standard, almost one in

[23] These 166 facilities do not represent the universe of facilities subject to the Final Rule, but, according to PSNH, just 39% of the facilities "with CWISs that fall within the same regulatory category as the CWISs at Merrimack Station." PSNH Comments at 128 n.546. Thus, the comment suggests that a total of roughly 425 facilities are in that category. If 18% of these 425 qualified for consideration under § 125.94(c)(11), that would equate to 76 facilities—which does not square with EPA's stated expectation that the *de minimis* provision would be "rarely used." AR-1697 at 25 n.4; *see also id.* at 118 ("[T]he Agency intends for the *de minimis* provision to be infrequently used."), 212 (noting that only in "the most rare cases" will *de minimis* impingement be demonstrated under § 125.94(c)(11)); TDD at 12-3 ("EPA intends that this provision would not be utilized often"). Moreover, EPA estimated that the Final Rule would apply to 1,065 facilities. 79 Fed. Reg. at 48,305. If 18% of all facilities subject to the rule could potentially be exempted from satisfying the BTA standard for impingement mortality, almost 200 facilities could potentially qualify for a provision that a permitting authority is supposed to apply only "[i]n limited circumstances." 40 C.F.R. § 125.94(c)(11).

five facilities would qualify for a *de minimis* exemption—hardly an indication that the provision would actually be "rarely used."[24] Final Rule RTC at 25 n.4. In short, not only does PSNH fail to explain where its comments about comparative rankings to the EPRI list are reflected in the Final Rule, such comments contradict EPA's record statements about when the agency expects § 125.94(c)(11) to be potentially available.

PSNH also remarks that the bottom 30 facilities in the EPRI list account for 0.02% of impingement, which, in PSNH's reading, "demonstrates that problematic rates of impingement are limited to a specific subset of CWISs within this regulatory category" and that Merrimack Station's CWISs are not "problematic." The comment does not provide a basis for this conclusion, however, merely assuming that facilities that impinge fewer fish than the most "problematic" facilities are *ipso facto* not "problematic." The comment does not consider that this statistic could just demonstrate an obvious truth that some facilities impinge more than others. EPA does not agree that this statistic "demonstrates" that Merrimack Station's CWISs are not "problematic."

In estimating compliance with the impingement standard in the Final Rule, EPA assumed that none of the 1,682 intakes considered in the rulemaking would fall under the *de minimis* provision at 40 CFR § 125.94(c)(11). 79 Fed. Reg. 48,360. If, as PSNH suggests, a *de minimis* level of impingement can be quantified as representing some percentage of the bottom ranking facilities on a national basis, it stands to reason that a known number of these facilities would fall under the *de minimis* provision and, therefore, would have been included in EPA's evaluation of the costs of the Final Rule. That EPA did not consider any facilities *de minimis* in this analysis plainly indicates that the threshold representing a *de minimis* level of impingement constitutes more than a simple ranking of the impingement rate among all facilities subject to the Final Rule.

According to PSNH, Normandeau's comparison of intake flow to river flow supports its conclusion that impingement is *de minimis* based on the "illustrative *de minimis* flow-based examples in the final § 316(b) rule." Normandeau provides estimates of Merrimack Station's DIF and AIF over various years as a percentage of the mean annual flow (MAF) of the Merrimack River. See Table III.1, below.

Table III.1. Merrimack Station intake flow as a percentage of mean annual flow (MAF) of the Merrimack River. *See* AR-1231 at 9.

Averaging Period	Intake Flow Unit 1 + Unit 2	MAF	Percent
1996-2003	DIF 443 cfs	4,927 cfs	8.99%
2005-2007	AIF 348 cfs	7,241 cfs	4.80%
2011-2013	AIF 175 cfs	5,021 cfs	3.49%

[24] In addition, during the development of the Final Rule, EPA considered and rejected a *de minimis* claim by a facility that ranked in the bottom 19% of a similar EPRI list, concluding that "[i]t is unlikely that a rate of impingement that corresponds to . . . 19% . . . in ranking of all power plants represents an unusually low or very low rate of impingement." AR-1719.

PSNH comments that all of Normandeau's estimates[25] are "within the 5% percent or less MAF withdrawal percentage EPA set out in the final § 316(b) rule and support a conclusion that the rate of impingement at Merrimack Station is *de minimis*." To begin with, PSNH mischaracterizes the example of 5% or less MAF in the preamble to the Final Rule as a *de minimis* threshold. The preamble states:

> EPA acknowledged that there may be circumstances where flexibility in the application of the rule may be called for and the rule so provides. For example, *some* low flow facilities that withdraw a small proportion of the mean annual flow of a river *may* warrant special consideration by the Director. As an illustration, if a facility withdraws *less than 50 mgd AIF*, withdraws less than 5 percent of mean annual flow of the river on which it is located (if on a river or stream), and is not co-located with other facilities with CWISs such that it contributes to a larger share of mean annual flow, the Director *may* determine that the facility is *a candidate for consideration* under the de minimis provisions contained at § 125.94(c)(11).

79 Fed. Reg. at 48,309 (emphases added). Withdrawal as a percentage of mean annual flow of the river is given as an example of one condition the permitting authority *could* consider in making a *de minimis* determination, but it is not "set out" as a threshold for a *de minimis* determination. *Id.*; *see also id.* at 48,371 ("The Director *may* want to consider facility withdrawal rates in relation to the mean annual flow of the river…when making a de minimis determination.") (emphasis added). [26] Moreover, it is unlikely to be definitive. For instance, in the TDD for the Final Rule (AR-1718 at 5-16), EPA estimated that about 30 percent of the 331 facilities on freshwater streams or rivers with design flows greater than 2 MGD (and for which data was available) have actual intake flow greater than 5 percent of the MAF of the source waters, meaning that about 70 percent of these facilities have AIFs below 5 percent MAF. If EPA intended for a withdrawal rate of less than 5% of the MAF of the river to be a threshold for *de minimis*, 222 facilities on freshwater rivers would be excluded from having to address impingement mortality. Indeed, this is not borne out in the analysis of the Final Rule, which, as discussed above, estimated that no facilities would qualify for the de minimis provision and specifically provides that the *de minimis* provision may be applied "[i]n limited circumstances." 40 CFR § 125.94(c)(11).

The relative scale of withdrawals at facilities located on freshwater rivers and streams as a percentage of the mean annual flow in the TDD further diminishes the import of the comment's comparisons of AIF to MAF. *See* AR-1718 Exhibit 4-7, p. 4-7. The exhibit shows that more than half of electric generators and the vast majority of manufacturers currently operate CWISs that

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[25] EPA notes that in the comment, Normandeau presents withdrawal volumes of each unit as a percentage of MAF. As the intent of the consideration of MAF is to provide context for the potential impact of impingement mortality <u>by the facility</u> on the Merrimack River, it makes more sense to evaluate the cumulative total DIF or AIF of both units rather than each unit separately. *See* 79 Fed. Reg. at 48,371 (noting that, when making a *de minimis* determination, the permitting authority "may want to consider *facility* withdrawal rates in relation to the mean annual flow of the river and possible *co-location with other CWISs*") (emphases added). Table III.1 presents the total DIF and AIF at both CWISs.

[26] Recall also that the *de minimis* provision is within a permitting authority's discretion to invoke in a particular instance and is not automatically applied in any case.

withdraw less than 5% of mean annual flow. Again, if percentage of MAF were a threshold for concluding that the effects of the intake are *de minimis*, then most of the facilities subject to the Final Rule would be *de minimis*. Clearly this was not the intent, as EPA plainly states that it expects the *de minimis* provision to be "rarely used." AR-1697 at 25 n.4, 42 ("The final rule provides flexibility for the Director to decide not to require impingement controls where rates of impingement *are exceptionally low* as to be de minimis.") (emphasis added), 118 ("EPA did not establish any metrics for what qualifies as 'exceptionally low' impingement rates, as the Agency intends for the *de minimis* provision to be infrequently used"); *see also* 40 CFR § 125.94(c)(11) ("*In limited circumstances*, rates of impingement may be so low at a facility that additional impingement controls may not be justified.") (emphasis added); AR-1718 at 12-3 ("EPA intends that this provision would not be utilized often"). For all of these reasons, EPA does not find persuasive PSNH's comments justifying a *de minimis* finding based on the comparison of AIF and MAF at Merrimack Station.

For the above reasons, EPA does not agree that impingement at Merrimack Station is *de minimis*.

3.5 PSNH Should Not Be Required To Address Entrainment Mortality Given Its Average AIF Over the Last 3 Years Is Less Than 125 MGD

Comment III.3.5	**AR-1548, PSNH, pp. 131-135**

Current CWIS technologies and operations at Merrimack Station constitute BTA because the final § 316(b) rule establishes PSNH is not required to address entrainment mortality. Specifically, Merrimack Station is not subject to entrainment controls because the 3-year average AIF at the facility falls below the 125 MGD compliance threshold EPA established in the final § 316(b) rule. In this rule, BTA for entrainment is to be determined on a site-specific basis, including a potential conclusion that no entrainment controls at a facility are necessary—especially for those facilities falling below this 125 MGD AIF. As mentioned above, the regulations require only those facilities with "major cooling water withdrawals"—*i.e.*, an average greater than 125 MGD AIF over the past three years—to submit a robust series of analyses to their respective permit writers as part of the regulatory entrainment mortality assessment because EPA believes it is these facilities that have the highest likelihood of causing adverse entrainment impacts.[557] The three-year average AIF (2014-2016) of the CWISs at Merrimack Station is 69.6 MGD, well below the 125 MGD AIF compliance threshold EPA established in the final § 316(b) rule. Consequently, Merrimack Station should not be subject to entrainment controls.[558]

EPA's reason for establishing this compliance threshold for entrainment is well founded. EPA found that all of the facilities, like Merrimack Station, withdrawing less than this amount, combined, represent only 10 percent of the nationwide potential for AEI from entrainment, despite comprising approximately 70 percent of all facilities potentially subject to the final § 316(b) rule.[559] EPA logically concluded in the final rule that the 125 MGD AIF threshold is therefore "justified on a technical basis" and was selected for the purpose of "focus[ing] on the facilities with the highest intake flows and the highest likelihood of causing adverse impacts."[560] The final rule recognized that facilities, like Merrimack Station, that withdraw fewer than 125

MGD AIF are far less likely to cause entrainment impacts, and it makes practical sense to allow permitting authorities the discretion to require submission of the entrainment studies to make an informed and legally defensible entrainment determination, which often may be that no entrainment controls are justified at all.[561]

EPA recognized in the preamble to the final § 316(b) rule that it is possible a permitting authority may find it necessary to require entrainment compliance for a facility with an average AIF below 125 MGD.[562] However, it is clear that EPA expected this to be the exception and not the norm for such facilities because it went to great lengths to explain that the 125 AIF threshold was created to differentiate between larger facilities whose water withdrawals likely pose a significant risk of AEI due to entrainment from those whose withdrawals do not. Were the final rule and/or the agency to presuppose that facilities withdrawing less than 125 MGD AIF would be subject to the same entrainment requirements as those above that intake threshold, EPA's establishment of the threshold in the first place would be wholly arbitrary, capricious, and as a practical matter, pointless. Therefore, while exemption from entrainment controls is not "automatic," the final rule, at a minimum, presupposes that a facility withdrawing less than 125 MGD AIF likely represents little to no impact to aquatic organisms and thus need not specifically be forced to install costly entrainment compliance controls unless the information available to a permitting authority in fact indicates otherwise.

EPA promulgated entrainment control standards in the final rule to "establish[] a detailed specific framework for determining BTA entrainment control requirements," a critical component of which is requiring that certain information be collected by the facility and submitted to the permitting authority for consideration in making the BTA determination on a site-specific basis.[563] Indeed, EPA requires that entrainment BTA determinations be based upon the specific information provided in a number of specific studies that only facilities withdrawing greater than 125 MGD AIF are required to collect and submit. EPA's Technical Development Document accompanying the final § 316(b) rule highlights the importance of the permitting authority's access to these site-specific studies, explaining the purpose of the requirement is to allow "the permit writer [to] have access to all the information necessary for an informed decision about [a site-specific BTA determination] . . . to reduce entrainment mortality at facilities above 125 MGD AIF."[564] Thus, the requirement to collect and submit specific information about entrainment impacts is inherently tied to the underlying entrainment BTA requirements.
Exempting a facility from submitting "information necessary for an informed decision" about the appropriateness of entrainment controls, yet purporting to make such a decision in the absence of that "necessary" information, defies logic and defeats the purpose of the entrainment study requirement altogether. Permitting authorities enjoy discretion to request specific entrainment-related information from a facility with an AIF below 125 MGD.[565] Yet, EPA has not requested entrainment studies delineated in the final § 316(b) rule from PSNH. Instead, EPA has determined the studies the Company submitted prior to the promulgation of the final § 316(b) rule are sufficient—an assertion PSNH has critiqued in these comments as invalid, arbitrary and capricious.

It is clear from EPA's discussion of the 125 MGD AIF threshold in the final § 316(b) rule that facilities like Merrimack Station should be exempt from addressing entrainment absent some compelling site-specific information demonstrating actual entrainment mortality at the facility greatly exceeds what is common for facilities that withdraw less than 125 MGD. EPA has not presented or advanced any compelling site-specific information establishing entrainment at Merrimack Station exceeds some critical point, meaning entrainment controls are necessary. In fact, the evidence in the administrative record leads to the opposite conclusion. In the absence of concrete, problematic entrainment information, the 125 MGD AIF compliance threshold promulgated only three years ago by the agency dictates that Merrimack Station is one of the approximately 70 percent of all facilities subject to the final § 316(b) rule that present a negligible risk of environmental impact due to entrainment and that no technological controls are therefore necessary at the facility.

557 *See, e.g.,* 79 Fed. Reg. at 48,309.
558 The final § 316(b) rule clearly provides the three-year average 125 MGD threshold is to be based on a facility's actual (versus design) conditions. It would therefore be improper for EPA to construe PSNH's position as seeking a cap on capacity utilization at the facility or in any way suggesting such a cap would be an acceptable condition to the permit. It would not be an acceptable condition.
559 *See id.*; *see also* Final Rule TDD at 3-8 (providing that the 125 MGD AIF "threshold will capture 90 percent of the actual flows but will apply only to 30 percent of existing facilities").
560 79 Fed. Reg. at 48,309.
561 *See id.* at 48,309-10.
562 *Id.* at 48,361 ("not[ing] that facilities below the 125 [MGD] threshold are not automatically exempt from entrainment requirements").
563 *Id.* at 48,330.
564 Proposed Rule TDD at 7-7 (emphasis added).
565 79 Fed. Reg. at 48,309.

EPA Response:

PSNH comments that Merrimack Station should not be subject to any entrainment controls because its daily actual intake flow ("AIF") falls well below a 125 MGD "compliance threshold" that, according to the commenter, EPA established in the 2014 CWA § 316(b) Final Rule. EPA fundamentally disagrees. Nothing in the Final Rule "establishes" or "presupposes" that facilities with an AIF below 125 MGD have "little to no impact to aquatic organisms" and "should not be subject to entrainment controls." Simply put, there is no such "compliance threshold for entrainment" in the Rule.

EPA notes that this comment essentially restates comments that EPA rejected during promulgation of the 2014 CWA § 316(b) Final Rule.[27] As EPA stated in the preamble to the Rule:

> Contrary to a number of public comments, however, EPA is not implying or concluding that the 125 mgd threshold is an indicator that facilities withdrawing less than 125 mgd are (1) not causing any adverse impacts or (2) automatically qualify as meeting BTA. In other words, the threshold, while justified on a

[27] We reiterate that the Final Rule has since been reviewed and upheld in federal court. *See Cooling Water Intake Structure Coal. v. EPA*, 905 F.3d 49 (2d. Cir. 2018).

> technical basis, does not result in exemptions from the rule. Instead, EPA is making a policy decision on which facilities must *provide a certain level and type of information*.

79 Fed. Reg. 48,300, 48,309 (Aug. 15, 2014) (emphasis added); *see also* EPA, Technical Development Document for the Final Section 316(b) Existing Facilities Rule (May 19, 2014) at 3-8 to 3-9 (hereinafter referred to as "TDD"). Thus, while the Rule requires certain facilities to submit additional studies and other materials with their permit application materials, *see* 40 CFR § 122.21(r)(1)(B), (r)(9) - (13), these provisions do not establish a "compliance threshold" for entrainment. Indeed, the phrase "compliance threshold" does not appear in either the Final Rule or the preamble to it.

The additional permit application requirements also do not constitute a presumption that facilities below the 125 MGD threshold do not require entrainment controls or suggest that "EPA expected" that requiring entrainment controls at facilities with an AIF less than 125 MGD would "be the exception and not the norm."[28] EPA explained that "any facility *at any flow* may have an adverse environmental impact." 79 Fed. Reg. at 48,355 (emphasis added); *see also* Final Rule RTC (AR-1697) at 101-102 (disagreeing with the comment that "EPA appears to have identified 125 mgd as the flow threshold for the occurrence of adverse impacts and that any facility below that threshold should be presumed to employ BTA for both impingement and entrainment"). In the preamble to the 2014 CWA § 316(b) Final Rule, EPA also explained that it made the policy decision to include additional permit application requirements in § 122.21(r) only for relatively larger facilities partly to reduce the potential burden of the permit application process on relatively smaller facilities. *See* 79 Fed. Reg. at 48,309, 48,357. Similarly, EPA explained in the TDD that it chose the 125 MGD application requirements threshold because it "struck the appropriate balance between the goal of capturing the greatest portion of intake flow while minimizing *the study requirements* for smaller facilities." TDD at 3-8 (emphasis added). The Rule does not exempt facilities that withdraw less than 125 MGD from the Rule's BTA requirements for minimizing entrainment.

Not only are facilities below the 125 MGD threshold "not automatically exempt from entrainment requirements," as PSNH concedes in a footnote to the comment (PSNH fn 562), but EPA made clear in the Final Rule that the permitting authority may determine "that entrainment controls may need to be installed *for any cooling water intake structure*." 79 Fed. Reg. at 48,361 (emphasis added). Indeed, even facilities with an AIF at or below 2 MGD, and to whom the Final Rule therefore does not apply, *see* 40 CFR § 125.91(a), are still subject to CWA § 316(b)'s requirement to minimize adverse environmental impacts associated with the use of cooling water intake structures. *See* 40 CFR § 125.90(b). Thus, the commenter is mistaken when it characterizes EPA's decision not to subject smaller facilities to more costly study requirements as a presumption that facilities with an AIF less than 125 MGD will have "little to no impact to aquatic organisms" and do not require entrainment controls. EPA concluded that the rule

[28] The converse is also true: the 2014 CWA § 316(b) Final Rule does not create a presumption that facilities that withdraw more than 125 MGD through their cooling water intake structures must install any particular entrainment reduction technologies. BTA decisions for entrainment reduction at facilities withdrawing 2 MGD or more are made on a site-specific basis considering the variety of factors specified in 40 C.F.R. § 125.98(f).

applicability threshold of just 2 MGD "ensures that the users of cooling water causing the most adverse environmental impact are subject to the rule." 79 Fed. Reg. at 48,309. During the rulemaking, EPA considered raising this applicability threshold to 50 MGD, but decided against it, in part because facilities below 50 MGD "are twice as likely to have no controls in place for impingement or entrainment than are facilities with intake flows greater than 50 mgd." 79 Fed. Reg. at 48,308. Indeed, as EPA recognized in the Fact Sheet, the CWISs at Merrimack Station essentially have no effective means of minimizing entrainment mortality because "the mesh size of the screens is too large to exclude small life stages, and the plant's intake flow represents a significant proportion of the flow of Hooksett Pool." AR-618 at 271. In sum, the permit application requirements in the regulations simply do not establish a presumption that facilities withdrawing less than 125 MGD "should not be subject to entrainment controls." *See also, e.g.*, 79 Fed. Reg. at 48,309-10 (The 125 MGD permit application requirements are "not an indicator that facilities under that threshold are no longer of concern in the final rule."); Final Rule RTC (AR-1697) at 101-02 ("EPA's selection of 125 mgd as a threshold is not the result of an assessment of biological impacts.... [T]he 125 mgd threshold is not intended to be an indicator of impacts . . ..").

The plain language of the regulations indicates that PSNH's theory is without basis. As PSNH concedes elsewhere, the CWA § 316(b) Final Rule "applies to existing industrial facilities that withdraw greater than 2 MGD and utilize 25 percent or more of that water exclusively for cooling purposes." Comment 2 (citing 40 CFR § 125.91(a)).[29] Moreover, the Final Rule states that such existing facilities are required to meet both the impingement mortality standard at 40 CFR § 125.94(c) *and* the site-specific entrainment standard at 40 CFR § 125.94(d).[30] 40 CFR § 125.94(a).

As EPA explained in the preamble to the Rule:

> EPA has established a national BTA standard for entrainment for existing units that requires determination of BTA entrainment requirements on a site-specific basis in a structured permitting setting. The framework for determining entrainment requirements provides for the consideration at a minimum of certain specified factors that must be considered in the Director's determination of the BTA controls.

79 Fed. Reg. at 48,337. Specifically, 40 CFR § 125.94(d) provides that the permitting authority must establish BTA requirements for entrainment reduction on a site-specific basis that reflect the

[29] The commenter does not dispute that the permitted facility is a point source, that it uses CWISs with a cumulative DIF of greater than 2 MGD to withdraw water from waters of the United States, that it uses 25 percent or more of that water on an actual intake flow basis exclusively for cooling purposes, or that it is, consequently, subject to the Final Rule. *See* 40 C.F.R. § 125.91(a).

[30] In the TDD accompanying the Final Rule, EPA specifically noted that the permitting authority's "determination of BTA *for entrainment requirements* under 40 CFR 125.94(d)" is an applicable requirement of the Rule for an "[e]xisting facility with a DIF greater than 2 mgd *but AIF not greater than 125 mgd*." TDD at 3-1 (Exhibit 3-2) (emphases added).

permitting authority's determination of the maximum reduction in entrainment warranted "after consideration of the relevant factors *as specified in §125.98*" (emphasis added). Factors that the permitting authority *must* consider are specified in 40 CFR § 125.98(f)(2), while factors that it *may* consider are listed in 40 CFR § 125.98(f)(3).[31] Notably, neither list includes consideration of whether the facility's AIF is above or below 125 MGD or, indeed, what the facility's AIF is at all.

Instead, the permitting authority is required to consider the "[n]umbers and types of organisms entrained," the "particulate emissions or other pollutants associated with entrainment technologies[, l]and availability inasmuch as it relates to the feasibility of entrainment technology[, r]emaining useful plant life[, and q]uantified and qualitative social benefits and costs of available entrainment technologies." 40 CFR § 125.98(f)(2). The 125 MGD threshold established in the application requirements of § 122.21(r) simply does not represent a presumption that facilities withdrawing less than this amount are having "little to no impact." As the Fact Sheet recounts, Merrimack Station accounts for the loss of millions of eggs and larvae every year and withdrawals at the time of the Draft Permit represented a sizeable fraction of the available river flow. AR-618 at 244-255. The information available to EPA in this proceeding establishes the reasonableness of the Agency's conclusion that entrainment and impingement losses from Merrimack Station's current operation constitute adverse environmental impacts. *See* AR-618 at 244-262. PSNH's assertions that Merrimack Station should not be subject to entrainment controls because its three-year average AIF falls well below a supposed 125 MGD "compliance threshold" established in the Final § 316(b) Rule, or even that the regulations provide that entrainment controls for facilities that withdraw less than 125 MGD would "be the exception," find no basis in the regulation.[32]

In short, the 2014 CWA § 316(b) Final Rule applies to facilities like Merrimack Station withdrawing more than 2 MGD of water, *see also* 2014 CWA § 316(b) Final Rule, Response to Comments at 72 (Entrainment "requirements are applicable to all in-scope facilities (including those with intake flows at or below 125 AIF)."), and it does not establish a 125 MGD "compliance threshold" for entrainment. PSNH's comment that the Final Rule establishes a presumption or "presupposes" that facilities withdrawing less than 125 MGD will be "exempt from addressing entrainment absent some compelling site-specific information" that entrainment at the facility "greatly exceeds what is common for [other similarly-sized] facilities" and/or "exceeds some critical point" is similarly unfounded. (Nor does PSNH explain what level of mortality this would be or how it derived these standards). To the contrary, as EPA stated in the Final Rule, EPA did not conclude that facilities withdrawing less than 125 MGD are not causing any adverse impacts or automatically qualify as meeting BTA. 79 Fed. Reg. at 48,309; *see also*

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[31] Moreover, in an ongoing permit proceeding such as this one, the permitting authority's "BTA determination *may* be based *on some* or all of the factors in paragraphs (f)(2) and (3) of this section." 40 C.F.R. § 125.98(g) (emphases added). *See also* Response to Comment III.2.2, III.2.3.

[32] Furthermore, PSNH's theory finds no support in the statute. CWA § 316(b) does not exempt from the requirements of § 316(b) CWISs at facilities whose AIF is less than 125 MGD. By the same token, neither the statute nor regulations mandate that particular entrainment reduction technologies be used by facilities withdrawing *more* than 125 MGD of water. Again, the 2014 CWA § 316(b) Final Rule calls for site-specific, case-by-case BTA determinations for entrainment control.

Final Rule RTC (AR-1697) at 101-102 ("EPA's selection of 125 mgd as a threshold is not the result of an assessment of biological impacts.... [T]he 125 mgd threshold is not intended to be an indicator of impacts . . ..."). The statutory language requires that the location, design, construction, and capacity of cooling water intake structures reflect the best technology available for minimizing adverse environmental impact. EPA has established, both in the 2011 Draft Determinations Document (AR-618 at 244-262) and in this Response to Comments, that entrainment of millions of eggs and larvae at Merrimack Station's CWISs annually is an adverse environmental impact that must be minimized by implementing technology based on consideration of the appropriate factors at 40 CFR § 125.98(f).

3.6 Entrainment at Merrimack Station is *De Minimis*

Comment III.3.6	**AR-1548, PSNH, pp. 135-137**
See also AR-846, PSNH, p. 70-82; AR-872, Normandeau, pp. 125-143; AR-852, CLF, p. 5; AR-1300, LWB, pp. 38-42	

Normandeau has concluded time and again that the levels of entrainment at Merrimack Station are *de minimis*.[566] The rationale for Normandeau's conclusions are fully set out in its reports and were summarized by PSNH in its comments to the 2011 Draft Permit.[567] In short, Normandeau's comprehensive biological sampling between 2005 to 2007 revealed that an estimated 2.95 million ichthyoplankton were entrained at Merrimack Station in 2006 and approximately 2.5 million were actually entrained in 2007 based on AIF numbers.[568] Normandeau took these estimated, actual entrainment numbers and calculated the potential entrainment estimations if the plant's CWISs operated at maximum DIF capacity throughout the year. This analysis forecast that less than 3.5 million ichthyoplankton would be entrained in an average year.[569]

Normandeau next calculated the annual, expected adult equivalent losses due to the estimated entrainment based on AIF to put the raw entrainment number into proper perspective by accounting for the natural mortality of early lifestages of fish, coupled with the exorbitant number of eggs fish produce each season. Utilizing the raw numbers for the six species that comprise in excess of 90 percent of the total fish impinged and entrained in an average year at Merrimack Station, Normandeau calculated that 14,061 adult fish would be lost in an average year due to entrainment of ichthyoplankton at the plant based on AIF.[570]

PSNH compared these entrainment numbers in its comments to the 2011 Draft Permit to the same EPRI study referenced in Part III.C.1., above, to illustrate how trivial they are compared to the breadth of facilities subject to the CWIS regulations.[571] EPRI collected entrainment data from 90 facilities and Merrimack Station's annual entrainment estimate ranked 75 out of 90 facilities, meaning it is in the bottom 17 percent of all facilities in the database.[572] Notably, the entrainment losses from the 16 facilities ranked at the bottom of EPRI's database made up a mere 0.04 percent (four ten thousandths) of the entrainment losses from all 90 facilities that provided entrainment data for the EPRI study.[573]

The *de minimis* exception set out the 2014 final § 316(b) rule further bolsters the conclusion that entrainment is *de minimis* at Merrimack Station. While the regulatory provision and MAF-based examples provided in the final rule apply principally to impingement, EPA makes clear the only reason the "specific regulatory language for *de minimis* entrainment was" not included in the final rule is because "the entrainment requirements are already determined" on a site-specific basis, meaning the permit writer has the opportunity to take into consideration any and all unique characteristics of a given facility—including those that support a finding that entrainment is *de minimis*.[574] Accordingly, the 2014 Normandeau analysis described in Part III.C.1. (Comment III.3.4), above—demonstrating that the AIF of Units 1 and 2 have collectively accounted for less than five percent of the MAF of the Merrimack River over the entire course of Normandeau's data sets—applies equally to assessing what impacts, if any, have been caused by entrainment. This too supports a conclusion that the levels of entrainment at Merrimack Station are *de minimis*.

Taken together, these comprehensive analyses—coupled with the breadth of additional evidence and data included in the administrative record—unquestionably demonstrate that entrainment levels at Merrimack Station are *de minimis* and that no additional CWIS technologies and/or controls are necessary to satisfy the § 316(b) BTA standard.

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566 *See* AR-1170 at 141-143; *see generally* AR-2.
567 *See* AR-846 at 75-82; *see generally* AR-6. Also included in PSNH's comments, as well as Normandeau's comments to the 2011 Draft Permit (AR-1170), are a number of points of contention between EPA and Normandeau regarding the collection and/or analyzing methods Normandeau employed in its studies. *See, e.g.,* AR-846 at 75-80. EPA has never responded to the comments and critiques set out in the 2012 comments from PSNH and Normandeau and failed again to do so in the agency's Statement. These comments and critiques are well-founded and remain valid.
Notably, EPA's 2011 criticism of Normandeau's use of the adult equivalency method has since been undercut by the agency's 2014 final § 316(b) rule. In that rule, EPA specifically acknowledges that *de minimis* analyses may utilize an "age-one equivalent count" because: [I]nformation in the record indicates that an overwhelming majority of eggs, larvae and juveniles do not survive into adulthood and the [age-one equivalent count ("A1E")] calculations adjust for differences in survivorship based on species and age-specific mortality rates. EPA recognizes that using A1Es simplifies a complex ecological situation, because some of the smaller fish would provide an ecological benefit to other species as food even if they would not survive to adulthood. Recognizing this as one nonmonetized benefit in the analysis, using an A1E approach is the most reasonable approach available because to date, there is insufficient data to account for the extent to which organisms that do not survive to adulthood provide a benefit to other organisms which can be reliably monetized. *See* 79 Fed. Reg. at 48,371, 48,403.
568 *See* AR-2.
569 *See* AR-6 at 12.
570 *Id.* at 4.
571 AR-846 at 81.
572 *Id.* (citing AR-842 at 7).
573 *Id.* (citing AR-842 at 7).
574 79 Fed. Reg. at 48,372.

EPA Response:

PSNH comments that levels of entrainment (both as raw number of individuals and adult equivalent fish based on actual flow) at Merrimack Station are *de minimis*. PSNH also comments that entrainment at Merrimack Station is *de minimis* because it is lower than entrainment at 74 other facilities in an EPRI database that are also subject to the CWIS regulations. According to PSNH, section 125.94(c)(11) in the Final Rule and EPA's examples in the preamble comparing a facility's intake flow to the mean annual flow ("MAF") of the water body from which it withdraws apply not just to impingement, but also to entrainment. PSNH then concludes that its MAF-based argument in Comment III.3.4 therefore "applies equally" to assessing the impacts of Merrimack Station's entrainment. Based on its position that entrainment is *de minimis*, PSNH concludes that no additional technologies or controls are necessary to satisfy the BTA standard for § 316(b) at Merrimack Station.

EPA does not agree that the entrainment numbers recounted in the comment should be considered *de minimis* for Merrimack Station. Neither the Clean Water Act nor the applicable regulations provide a definition for the term "*de minimis*," but it is shorthand for the Latin phrase "*De minimis non curat lex*" (often translated as "the law does not concern itself with trifles") and generally understood to mean a "trifling," "trivial," or "negligible" amount. Black's Law Dictionary (11th ed. 2019). Thus, PSNH essentially comments that removing 2.5 to 3 million ichthyoplankton (most of which are larvae) from the Hooksett Pool every year is a trivial amount that the Clean Water Act was not intended to reach. PSNH does not offer any legal support as to why § 316(b) should not reach such entrainment. Instead, both here and in its 2012 comments, PSNH attempts to defend as *de minimis* what its consultant, Normandeau, concedes are "large" numbers, AR-1170 at 142, by arguing that the natural mortality of early life stages is high and that fish produce an "exorbitant number of eggs" each season. As an initial matter, PSNH does not explain the relevance of the comment that fish produce an "exorbitant number of eggs" where the vast majority of life stages entrained at Merrimack Station are larvae, not eggs. *See* AR-618 at 244-51. In any event, EPA has a long-standing record of considering adverse environmental impacts in terms of eggs and larvae. *See, e.g.*, 79 Fed. Reg. at 48,303 ("The withdrawal of cooling water by existing facilities removes and kills hundreds of billions of aquatic organisms from waters of the United States each year, including plankton (small aquatic animals, including fish eggs and larvae), fish, crustaceans, shellfish, sea turtles, marine mammals, and many other forms of aquatic life. Most impacts are to early life stages of fish and shellfish."). EPA, in this case and in the Final Rule, recognizes that the direct loss of millions of early life stages to entrainment is itself an environmental impact that is adverse to the aquatic environment of the Merrimack River.[33] That an individual egg or larva killed by entrainment would likely not have survived to

[33] PSNH, in a footnote to its comment above, notes that in 2012 it identified "a number of points of contention between EPA and Normandeau regarding the collection and/or analyzing methods Normandeau employed in its studies," including that sampling was not conducted in March, several comments regarding how EPA characterized entrainment at Merrimack Station, and that EPA incorrectly omitted from its analysis a sample from May 2016 in which no eggs and larvae were entrained at Unit 1, which PSNH comments artificially overinflated the entrainment estimate. *See* AR-846 at 70-76; AR-872 at 129-133; AR-1300 at 40-2. EPA noted only that there may be eggs and larvae present prior to April 1, as there is no biological reason to expect that larvae naturally appear on April 1 as opposed to March 29. Having said that, EPA has not, either in the Fact Sheet or in responding to comments, suggested that the relatively smaller number of eggs and larvae that may be captured in late March would meaningfully impact either the estimated number entrained or the determination that entrainment at Merrimack Station is an adverse environmental impact that must be minimized with appropriate entrainment controls. Similarly, the omission of the May 2006 datapoint ultimately results in a difference of 400,000 eggs and larvae. Normandeau also comments (AR-872 at 129) that it incorrectly classified post-larval white suckers entrained in June 2007 and that

adulthood naturally does not excuse Merrimack Station from killing millions of organisms each year due to the absence of available entrainment control technology at the facility, and it does not establish that section 316(b) of the Clean Water Act should not concern itself with Merrimack Station's CWISs. The CWISs at Merrimack Station represent additional sources of mortality not accounted for by the natural mortality rates and reproductive strategies of fish. AR-618 at 254; *see also id.* ("[E]ntrainment losses may deplete the compensatory reserve that fish species may rely upon to ensure their health and survival under natural conditions."). Entrainment mortality may also represent "a significant reduction in available forage for older juvenile fish and other aquatic organisms that typically prey on them," which, while difficult to quantify, "creates added stress on the Hooksett Pool ecosystem." AR-618 at 254. Although PSNH criticizes EPA's statements on this point in the Fact Sheet as "wrongfully omitting the value these [entrained] fish and ichthyoplankton have in providing a food source to many species within the ecosystem," PSNH 2012 Comments at 78 (citing AR-618 at 250-51, 254), PSNH's criticisms miss EPA's point that entrained eggs and larvae may no longer be available to the organisms that typically prey on them, which can alter typical predator/prey relationships and create added stress on the system. AR-618 at 254; *see also* 79 Fed. Reg. at 48,303 (noting potential indirect, ecosystem-level effects of entrainment, including "(1) disruption of aquatic food webs resulting from the loss of . . . entrained organisms that provide food for other species, (2) disruption of nutrient cycling and other biochemical processes, (3) alteration of species composition and overall levels of biodiversity, and (4) degradation of the overall aquatic environment.").[34] EPA maintains that the 2006-2007 entrainment data do not represent a trifling level of entrainment.[35]

PSNH comments that the expected adult equivalent losses, as calculated by its consultant, Normandeau, put the entrainment losses into "proper perspective" by accounting for the natural

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the entrained individuals were actually post-yolk sac larvae. The corrected estimate is 0 post-larval white sucker and 1,153,611 post-yolk sac larval white sucker entrained. This correction changes the estimate of adult equivalent losses, but does not alter EPA's conclusion that entrainment at Merrimack Station results in adverse environmental impact, which is not based on assessment of adult equivalents. Similarly, Normandeau's comments (AR-872 at 130-2) about larval drift to Hooksett Pool, whether certain species are "prone to entrainment," the taxonomic identification of certain species, and the comparison of entrainment numbers to fish abundance data would not alter EPA's determination that the loss of 3.4 million ichthyoplankton annually (as Normandeau estimated) or 3.8 million annually (as EPA estimated) is an adverse impact that must be addressed with the BTA. As such, the omission of the single data point does not alter EPA's determination or demonstrate that the BTA standard is satisfied. Likewise, PSNH's criticisms, *see* AR-846 at 80, of EPA's discussion of Normandeau's entrainment analysis do not support a finding that annual entrainment of 3.4 million ichthyoplankton (as Normandeau estimated) is *de minimis*.

[34] Both Normandeau (AR-872 at 132-3) and Barnthouse (AR-1300 at 39-40) comment that EPA did not justify its arguments that loss of forage as a result of entrainment and entrained organisms are still available as forage for other species, so there is no loss of biomass. EPA considers the loss of aquatic organisms, including phytoplankton and zooplankton, can have cascading effects through food webs. *See* 79 Fed. Reg. 48,319. *See also* 66 Fed. Reg. 65,263. Even beyond their potential role as forage, EPA considers the direct mortality of aquatic organisms from impingement and entrainment at CWISs an adverse environmental impact. *See* 79 Fed. Reg. 48,319-21.

[35] Even if such levels could be considered low, it would not necessarily mean that they are evidence of negligible impact; they "may reflect the compromised state of fish populations in Hooksett Pool, with fewer adult fish available to contribute to the ichthyoplankton community." AR-618 at 253; *see also id.* at 251 ("Fish population assessments using trapnet sampling data, which Merrimack Station described in a 1976 report as 'the most quantifiable sampling technique employed in the Merrimack River Program,' indicate that fish abundance declined by 89.5 percent between the 1970s and 2000s.").

mortality discussed above. According to Normandeau, more than 14,000 adult fish would be lost annually from the Merrimack River based on actual intake flows during the 2006-2007 biological study. AR-6 at 12. Even if the number of adult equivalents were the "proper perspective" in which to view such losses,[36] EPA sees nothing trivial about the removal of over 14,000 adult fish annually from the Hooksett Pool. *See* Response to Comment III.3.4 (disagreeing with the comment that impingement of roughly 4,000 fish per year is *de minimis*); *see also* AR-618 at 252-54. Further, PSNH's comment contains no new explanation for its conclusion, leaning instead on the rationale Normandeau offered in comments on the 2011 Draft Permit on behalf of PSNH asserting that such losses should be considered *de minimis*. In those comments, Normandeau states that a "complete census of the number of fish in Hooksett Pool would be necessary to determine if this is a substantial component of the fish community," conceding, however, that such a census "does not exist." AR-1170 at 142 (emphasis added). Lacking the information it deems "necessary" to support its assertion that such entrainment is negligible, Normandeau then posits that the entrainment losses are *de minimis* because, "[i]f entrainment substantially affected fish populations, it would be reasonable to expect that the abundance of fish with the greatest [adult equivalent] losses would be declining." *Id.* EPA fundamentally disagrees with this premise; any argument that entrainment losses that are not shown to produce a population-level effect are *ipso facto de minimis* conflicts with EPA's long-standing and judicially-upheld interpretation of § 316(b) that entrainment can constitute adverse environmental impact even without demonstrable population-level effects. *See Riverkeeper, Inc. v. EPA*, 475 F.3d 83, 123–25 & n.36 (2d Cir. 2007) ("*Riverkeeper II*"), *rev'd on other grounds, Entergy Corp. v. Riverkeeper, Inc.*, 556 U.S. 208 (2009); *Riverkeeper, Inc. v. EPA*, 358 F.3d 174, 196-97 (2d Cir. 2004) ("*Riverkeeper I*"); *see also* Final Rule Response to Comments (RTC) AR-1697 at 101 ("EPA disagrees that the presence of community- or population-level impacts is required before an AEI has occurred."); 105-107 ("[I]t is inconsistent with 'minimizing adverse environmental impacts' to adopt standards based on ensuring only against the most drastic consequences – decline and destruction of fish populations – rather than preventing these in the first instance through the reduction of impingement and entrainment."). The comments of PSNH and its consultant fail to support the assertion that the loss of 14,000 adult fish at Merrimack Station is *de minimis*.

In 2012, PSNH (AR-846 at 77) and Normandeau (AR-872 at 129) commented that adult equivalency analysis is an accepted standard method for estimating actual impacts to fish populations. EPA agrees that adult equivalency or age-one equivalent counts are widely used by the scientific community, including by EPA in the Final Rule. However, use of adult or age-one equivalent methodology is not essential for establishing adverse environmental impact because, again, demonstrating entrainment impacts to fish populations is not necessary to demonstrate that an environmental impact is adverse. *See supra*; AR-618 at 230-32. While age-one or adult equivalents may be a valid methodology for some analyses related to establishing requirements

[36] The comment provides no legal support for PSNH's position. We note that EPA's entrainment BTA regulations do not specify that the permitting authority consider the number of adult-equivalents entrained, whereas they do specify consideration of the "[n]umbers and types of organisms entrained." 40 C.F.R. § 125.98(f)(2)(i) (emphasis added). We do not suggest that a permitting authority shall not consider adult-equivalents in an entrainment BTA determination, *see, e.g.*, *id.* § 125.98(f)(3)(i), but simply that any suggestion that adult-equivalency is the only relevant inquiry is not reflected in the regulation.

under § 316(b), it is not—as PSNH concedes (AR-846 at 77)—the only factor to consider in assessing the adverse environmental impact of entrainment. AR-618 at 250-51. This type of analysis ignores the substantial non-natural mortality of many millions of organisms. Indeed, the Final Rule does not use adult equivalent fish in the context of assessing adverse environmental impact.[37] *See, e.g.*, 79 Fed. Reg. at 48,303 ("Aquatic organisms drawn into CWIS are either impinged (I) on components of the intake structure or entrained (E) in the cooling system itself. In CWA section 316(b) and in this rulemaking, these impacts are referred to as *adverse environmental impact* (AEI)."); *see also* 40 CFR § 125.98(f)(2)(i). As mentioned earlier, eggs and larvae are a food source for many species. Losses within these life stages may disrupt food webs at multiple trophic levels and have ripple effects, as predators that lose forage due to entrainment may have to shift to other organisms, and compete with other predators, or search elsewhere for prey. AR-618 at 250-51.

In footnote 567 to the above comment, PSNH comments that "EPA's 2011 criticism of Normandeau's use of the adult equivalency method has since been undercut by the agency's 2014 final § 316(b) rule" and claims that EPA "specifically acknowledges that de minimis analyses may utilize an 'age-one equivalent count." The comment provides no reference to any "criticism" of adult equivalency in the 2011 Draft Determinations Document. EPA summarized entrainment data using both the numbers of individuals entrained and the estimated adult equivalents while noting that adult equivalent loss is "not the only factor to consider." AR-618 at 250. EPA sees no conflict with this assessment and the 2014 Final Rule nor does the Final Rule indicate that adult equivalents may be used to support a finding that entrainment is de minimis. PSNH cites to 79 Fed. Reg. at 48,371-72, on which EPA states that EPA "considers low rates of impingement to be measured as an organism or age-one equivalent count." We note, however, that this reference is specifically to impingement, not entrainment. In fact, as discussed herein, the Final Rule does not include a *de minimis* provision for entrainment as it does for impingement, *see* 79 Fed. Reg. 48,372, but rather requires the permitting authority to consider, among other factors, the number of organisms entrained when establishing site-specific entrainment controls. 40 CFR § 125.98(f)(2)(i) (emphasis added). PSNH also includes in footnote 567 a quotation from the preamble to the Final Rule in which EPA discusses age-one equivalents in relation to the Benefits Analysis prepared for the Rule.[38] *See* 79 Fed. Reg. at 48,403. In that analysis, EPA used several metrics, including age-one equivalents and the individual number of eggs, larvae, juveniles, and adults, to quantify the reduction in impingement mortality and entrainment likely to result from implementation of the preferred and proposed regulatory options. *See* 79 Fed. Reg. at 48,402-04. EPA also recognized that adult equivalent losses may be a useful metric in a benefits analysis, particularly where impingement mortality and entrainment data are collected from multiple

[37] PSNH and Normandeau (AR-872 at 129) also comment that EPA incorrectly compared the estimates of yellow perch collected during electrofishing and trapnet sampling in the Merrimack River to the adult equivalent losses from impingement and entrainment in 2007. EPA agrees that the electrofishing and trapnet data are not intended as a complete census of the population, nor did EPA suggest this is so. The 2011 Draft Determinations Document (AR-618 at 251) simply suggests that the electrofishing and trapnet data demonstrate that the abundance of yellow perch in the Merrimack River is low and indicates that this population may be disproportionately impacted by further stressors, such as mortality as a result of being exposed to the CWISs.

[38] Note that, for the Benefits Analysis in the Final Rule, EPA assumed no facilities would have *de minimis* rates of impingement. *See* 79 Fed. Reg. 48,360.

facilities using different protocols, methods, equipment, and volume of intake flows. *Id.* Converting sampling counts to adult equivalents in such a case may help to standardize estimates across multiple facilities. *See* 79 Fed. Reg. at 48,402. In neither case does the discussion of age-one equivalents in the Final Rule "undercut" EPA's statements in the Fact Sheet regarding Normandeau's use of adult equivalents to assess entrainment at Merrimack Station. And, in any event, as noted earlier, EPA does not agree that loss of 14,000 adult fish is a trivial annual amount.

PSNH also comments that the level of entrainment reflected in the 2006-2007 data should be considered trivial and beyond the reach of § 316(b) because it is lower than the entrainment at 74 other facilities in an EPRI list of 90 facilities. Neither PSNH nor EPRI, however, cite any statutory or regulatory support for this position. For entrainment, the Final Rule sets forth a framework for a site-specific analysis that requires the permitting authority to consider a relatively short list of specific factors and provides the permitting authority with the discretion to consider several additional specific factors. 40 CFR § 125.98(f)(2), (3). Importantly, neither list of factors includes a comparison of a facility's entrainment numbers to that of some other unrelated, larger facility on a different water body, let alone to one in the limited group captured in the EPRI study.[39] *See id.*

Further, EPA disagrees that the *de minimis* provision set out in the Final Rule (at 40 CFR § 125.94(c)(11)) supports a conclusion that entrainment at Merrimack Station is *de minimis*. Section 125.94(c)(11) applies by its terms and location to the BTA determination for *impingement* mortality, not entrainment.[40] *See also* 79 Fed. Reg. at 48,322 ("EPA notes that these provisions for impingement mortality [including the § 125.94(c)(11) "*De minimis rate of impingement*" provision] would not apply to entrainment.") (underlining added). Thus, while PSNH claims that the *de minimis* provision applies "principally to impingement," in fact, EPA did not intend § 125.94(c)(11) to apply to entrainment at all.[41] The Final Rule does not include any *de minimis* provision for entrainment, but, as noted, sets forth a framework for analysis that requires the permitting authority to determine the maximum reduction in entrainment warranted after

[39] Even according to PSNH, the EPRI study gathered entrainment data for just 90 facilities—21% of the roughly 425 facilities it estimated were subject to the Phase II regulations. AR-846 at 81. Moreover, EPA estimated that a total of 1,065 facilities will be subject to the Final Rule, including 544 Electric Generators. 79 Fed. Reg. at 48,305.

[40] "*De minimis rate of impingement*. In limited circumstances, rates of impingement may be so low at a facility that additional impingement controls may not be justified. The Director, based on review of site-specific data submitted under 40 CFR 122.21(r), may conclude that the documented rate of impingement at the cooling water intake is so low that no additional controls are warranted. For threatened or endangered species, all unauthorized take is prohibited by the Endangered Species Act of 1973 (16 U.S.C. 1531 *et seq.*). Notice of a determination that no additional impingement controls are warranted must be included in the draft or proposed permit and the Director's response to all comments on this determination must be included in the record for the final permit." (underlining added). Moreover, paragraph (11) is within paragraph (c), entitled "*BTA Standards for Impingement Mortality*." (underlining added).

[41] Even if it did apply, it would undermine PSNH's conclusion that entrainment at Merrimack Station is *de minimis*. For instance, EPA stated in the Final Rule that § 125.94(c)(11) would be "rarely used" and invoked only where rates are "exceptionally low." *See* Response to PSNH Comment III.3.4. EPA provided as an example a facility with an impingement rate of several fish per month. *See id.* Here, by contrast, Normandeau estimated that Merrimack Station entrained an adult-equivalent of several thousand fish per month during the entrainment season.

consideration of a number of relevant factors, including the social benefits and costs of available entrainment controls. Only after consideration of the mandatory factors may a permitting authority conclude that no additional entrainment controls are warranted based on the facts of the individual case.

Similarly, EPA does not agree with the comment that the mean annual flow (MAF) example in the preamble to the Final Rule applies to entrainment (or that PSNH's MAF-based argument in Comment III.3.4 therefore "applies equally" to entrainment). PSNH provides no support for this assertion, and, in fact, the preamble contradicts it. In particular, the discussion in the preamble about the MAF example concludes by specifying that a permitting authority may determine that such a facility "is a candidate for consideration *under the de minimis provisions contained at § 125.94(c)(11)*," 79 Fed. Reg. at 48,309 (emphasis added), which of course is the very provision EPA made clear does not apply to entrainment.[42]

In its 2012 comments on the 2011 Draft Permit, PSNH criticizes EPA for failing to consider certain factors in EPA's 1977 "Draft Guidance for Evaluating the Adverse Impact of Cooling Water Intake Structures on the Aquatic Environment" for assessing adverse impact, while simultaneously arguing (somewhat incongruously) that EPA may not use that guidance "as having the force of law." AR-846 at 73, 79-80 & n.37. As an initial matter, EPA has since rescinded this draft guidance document. *See* Memorandum from David Ross, EPA Assistant Adm'r (Aug. 6, 2019) (AR-1739). But, in any event, EPA agrees that the statute and the Final Rule govern the analysis to be undertaken, not the draft guidance. Section 316(b) requires that the location, design, construction, and capacity of cooling water intake structures reflect the best technology available for minimizing adverse environmental impact. EPA considers the loss of, or injury to, aquatic organisms (including fish eggs and larvae, juvenile and adult fish, and other types of organisms) from being entrained or impinged by a CWIS to constitute adverse environmental impact under § 316(b). The 2011 Draft Determinations Document (AR-618 at 230-33) clearly explains the term "adverse environmental impact" (AEI) and the basis for its interpretation. Neither statute nor regulation specifies an impact threshold above which a CWIS's effects must rise before the BTA requirement is triggered.[43] Furthermore, the Final Rule sets out

[42] In its comments on the 2011 Draft Permit, Normandeau argues with EPA's conclusions about the impacts of entrainment based in part of the relative volume of water withdrawn at the CWISs because, according to Normandeau, there is "no quantitative evidence that entrainment at Merrimack Station is related to the fraction of the river withdrawn" and entrainment and the greatest withdrawals (as percentage of river flow) occur in months when ichthyoplankton abundance is low. *See* AR-872 at 132-3, 136. *See also* AR-1300 at 38-9. EPA has a long history of relating entrainment to the volume of water withdrawn and equates reductions in entrainment proportional to the reductions in flow achieved through a particular technology (e.g., a 95% reduction in entrainment based on the 95% reduction in flow achieved with closed-cycle cooling). In the 2011 Draft Determinations Document (AR-618 at 254, 314), EPA notes that the CWIS, at times, can withdraw a large proportion of the flow of the river, which could extend to a sizeable fraction of the eggs and larvae present at the time. As Normandeau points out, the lowest river flows, and highest proportion of river withdrawn through the CWISs, occurs in August and September when the density of eggs and larvae is relatively low. At the same time, EPA's determination that entrainment of millions of eggs and larvae annually is an adverse environmental impact is not predicated on the fraction of the river withdrawn.

[43] As mentioned above, the legislative history behind CWA § 316(b) is sparse, but in the House Consideration of the Report of the Conference Committee for the final 1972 CWA Amendments, Representative Clausen stated that "Section 316(b) requires the location, design, construction and capacity of cooling water intake structures of steam-

at 40 CFR § 125.98(f)(2) the factors that a permitting authority must consider when establishing site-specific entrainment controls for CWISs, which include not just the number of organisms entrained, but also the social benefits and costs of available technologies and other factors. The Final Rule provides that the BTA standards for entrainment "must reflect the [permitting authority's] determination of the maximum reduction in entrainment warranted <u>after</u> consideration of the relevant factors as specified in §125.98." 40 CFR § 125.94(d) (emphasis added); *id.* § 125.98(f) (requiring the permit to "reflect the [permitting authority's] determination of the maximum reduction in entrainment warranted <u>after</u> consideration of factors relevant for determining the best technology available for minimizing adverse environmental impact at each facility") (emphasis added); *see also id.* § 125.98(f)(4) (providing that a permitting authority may determine that no additional entrainment controls are necessary, "[i]f all technologies considered have social costs not justified by the social benefits"); 79 Fed. Reg. at 48,372 ("Since the entrainment requirements are already determined by the Director for each site, EPA concluded that specific regulatory language for de minimis entrainment was unnecessary."). In other words, a facility's entrainment levels should be considered in the context of the social benefits and costs associated with each available control. The Final Rule provides a framework for determining whether a particular level of reduction is reasonable in light of, among other things, the levels of entrainment and the social costs and benefits of lowering them further. Generally-speaking, reducing truly low levels of entrainment would be expected to provide fewer social benefits, making entrainment controls with higher social costs less reasonable. Thus, EPA agrees that entrainment numbers are an important factor to be considered in a BTA determination (including a determination that no additional entrainment controls are warranted), but PSNH's overall comment is premised on the notion that a permitting authority would look only at a facility's entrainment numbers, conclude they are at a *de minimis* level, and simply stop its analysis. Not only are the raw numbers (or PSNH's adult-equivalent estimates for that matter) not low enough here to justify such an approach, the analysis framework laid out in the regulations disfavors it.[44] In the 2011 Draft Determinations Document, EPA considered not just the numbers and types of organisms entrained, but additional relevant factors included at § 125.98(f), including social costs and benefits. Additionally, EPA indicated in the 2017 Statement that it would re-evaluate whether wedgewire screens are the BTA for Merrimack Station and that it would consider the § 125.98(f)(2) and (3) factors in that evaluation. 2017 Statement at 17-21. EPA does so in the responses to PSNH Comments III.4 and 5.3.

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electric generating plants to reflect the best technology available for minimizing *any* adverse environmental impact" (emphasis added). 1972 Legislative History at 264. At the same time, EPA has interpreted "minimize" to mean "reduce to the smallest amount, extent, or degree reasonably possible" in the context of § 316(b). 40 C.F.R. § 125.92(r). The majority opinion in *Entergy* discusses the term "minimize" in the context of considering whether EPA has discretion to consider a comparison of the costs and benefits of alternative technologies. 556 U.S. 208, 219-20 (2009). Both interpretations include an implicit limitation of reasonableness. The Final Rule, at 40 C.F.R. § 125.98(f)(2) and (3), sets out a list of factors that the permitting authority must or may consider in establishing site-specific entrainment controls, which essentially provides a framework for determining whether a particular level of reduction is reasonable. *See also* AR-618 at 232-33.[44] Such an approach would also be inconsistent with PSNH's own comment that EPA should consider all the factors set forth in § 125.98(f). *See* Comment III.2.2.

[44] Such an approach would also be inconsistent with PSNH's own comment that EPA should consider all the factors set forth in § 125.98(f). *See* Comment III.2.2.

4.0 Wedgewire Screens are a Feasible Technology for Merrimack Station

Comment III.4(i)	**AR-1548, PSNH, pp. 137-139**
See also AR-846, PSNH, pp. 116-118; AR-841, UWAG, p. 62	

As explained above, PSNH is not required to address entrainment mortality at Merrimack Station because (1) the daily AIF at the facility falls below the 125 MGD compliance threshold EPA established in the final § 316(b) rule, and (2) the rate of entrainment at Merrimack Station is *de minimis*. Merrimack Station also is not required to select one of the seven pre-approved impingement mortality options set out in 40 C.F.R. § 125.94(c), because the rate of impingement at the Station is *de minimis*. PSNH's existing CWIS technologies—traveling screens and its existing fish return system—satisfy the requirements of § 316(b). However, despite the efficacy of the existing technology, PSNH, with an eye to the future and with knowledge of the successful studies conducted at Indian Point, implemented a pilot study to determine the feasibility of wider-slot wedgewire screens in the Merrimack River.

PSNH notified EPA in an April 12, 2017 letter that the Company was preparing to perform an entrainment-related analysis at Merrimack Station.[575] In the letter, PSNH acknowledged it was not obligated to complete any such analysis unless EPA specifically requested such work (which it had not).[576] Nevertheless, PSNH prepared and submitted to EPA for its consideration a Study Plan detailing the entrainment-related analysis.[577] PSNH respectfully requested EPA timely notify the Company of any objections and/or issues the agency had with any aspect of the Plan.[578] The agency never responded to PSNH's correspondence. PSNH interpreted EPA's inaction as acceptance of PSNH's entrainment initiative, which is confirmed in the Statement: "[T]he Agency welcomes submission of the [on-site pilot testing] data by PSNH as soon as it becomes available."[579]

The Study Plan was jointly executed by PSNH's consultants, Enercon and Normandeau, and, as explained below, revealed wedgewire screens are technologically feasible at Merrimack Station and reduce overall entrainment by 89%, compared to current operations at the facility.[580] The installation of 3.0 mm wedgewire screens with a designed through-screen velocity of less than 0.5 fps at Merrimack Station operated annually from April through July would therefore substantially reduce the already *de minimis* level of entrainment at the Station at a greatly reduced cost as compared to CCC.[581]

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575 *See generally* AR-1357.
576 *Id.* at 4.
577 *See* AR-1361.
578 AR-1357 at 3.
579 AR-1534 at 20.
580 *See, e.g.,* Normandeau 2017 Response at 26-27.
581 Seasonal operation of the wedgewire screens would also have the co-benefit of further reducing already *de minimis* impingement levels at Merrimack Station because the design through-screen velocity of the screens is less than 0.5 fps. *See, e.g.,* Enercon 2017 Comments at 32.

EPA Response:

PSNH begins by reiterating its comments that it is not required to address entrainment at Merrimack Station because the AIF is less than 125 MGD under the Final Rule and because entrainment is *de minimis*. EPA disagrees with, and responds to, these comments in Response to Comments III.3.5 and 3.6, above. In Response to Comment III.3.4, EPA also disagrees with, and responds to, PSNH's comments that impingement mortality at Merrimack Station is *de minimis*. The Final Permit requires improvements to the existing technology to minimize impingement mortality consistent with the compliance alternatives under the Final Rule at 40 CFR § 125.94(c).

Having established that the Permittee must address impingement mortality and entrainment at Merrimack Station in Response to Comment III.3 (and associated comments), EPA focuses here on PSNH's proposed BTA at Merrimack Station as it applies to <u>entrainment</u>. PSNH describes "traveling screens and its existing fish return system" as satisfying the requirements of § 316(b).[45] In this comment, PSNH describes the pilot study completed during the summer of 2017 (which it said it did "despite the efficacy of the existing technology") to determine the feasibility of reducing the Facility's entrainment by installing wedgewire screens in the Merrimack River to work with the Facility's cooling water intake structures. The comment presents wedgewire screens as a feasible technology to minimize entrainment. In comments submitted by PSNH in 2012 and again in comments submitted in 2017, *see* Comment III.3(i) and 3.1, PSNH also suggested that, in combination with a new fish return system, operational changes of continuous screen rotation and rescheduled maintenance outages constitutes BTA. According to PSNH, rescheduling the annual planned maintenance outage of Unit 2 to occur from mid-May to mid-June (during typical peak entrainment) – which would be subject to ISO approval – would reduce annual impingement by approximately 41 percent and entrainment by approximately 40 percent. AR-6 at 91-93.

Turning first to the maintenance outage, the 2011 Draft Determinations Document considered PSNH's proposal and recognized that reducing flow by suspending operations when early life stages are present could reduce entrainment, particularly if the outage period coincides with peak

[45] In 2012, PSNH also commented that existing circumstances at Merrimack Station already result in flow reductions through the CWISs and a substantial decrease in overall entrainment. *See* Comment III.3.1. Specifically, PSNH argues that existing operational flow reductions at Merrimack Station occurring due to maintenance outages, Unit 2 single pump operation, and de-icing recirculation flow result in a combined annual flow reduction from a full flow baseline of 6.3 percent at Unit 1 and 9.0% at Unit 2. In addition, the loss of intake pumping efficiency due to head loss from design full pond elevation due to hydropower operation of the Garvins Falls (upstream) and Hooksett (downstream) hydroelectric stations accounts for a 22.9% intake flow reduction for Unit 1 and a 14.5% intake flow reduction for Unit 2. PSNH estimates that these flow reductions result in an overall annual reduction of adult equivalent losses of 17% for entrainment *See* AR-6 at 96. *See also* AR-846 at 113 n. 60. EPA considered available information about the flows used in the Engineering and Biological Reports (AR-6 at 17, AR-210 Attachment I), and determined that actual flow reductions (and proportional entrainment reductions) are likely between 10% and 20%, which is not as effective as other available technologies for reducing entrainment. In addition, Normandeau derived estimates of entrainment at both design flow and actual intake flow, which already reflect pump efficiency. *See* AR-2 at 52, 74, 77. EPA maintains that it is unlikely that the existing operational measures result in significant reductions in entrainment in comparison to wedgewire screens.

entrainment, as PSNH had proposed. *See* AR-618 at 297. However, EPA concluded that this technology was not by itself BTA, because it does not cover the entire period when fish eggs and larvae are present and would not address entrainment losses from Unit 1 at all.[46] *Id.* PSNH commented that EPA erred in rejecting rescheduling maintenance outages as an available technology to minimize entrainment based on the fact that the outage periods do not encompass the entire period during which fish eggs and larvae are present in the Hooksett Pool. *See* AR-846 at 116. The comment ignores the additional reason that EPA cited—namely, that the proposed outage schedule does nothing to minimize entrainment at the CWIS for Unit 1. *Id*. Thus, while the proposed maintenance schedule addressed some entrainment impacts of the CWIS for Unit 2, the comment does not dispute that it would in no way "minimize" the entrainment impacts of Unit 1's CWIS and, thus, would not satisfy the 2014 Final Rule. *See* 40 CFR § 125.94(d) (requiring the permitting authority to "establish BTA standards for entrainment for each intake on a site-specific basis") (emphasis added). In addition, although EPA agrees that § 316(b) does not require every facility to "eliminate completely" the adverse environmental impact of its CWISs, to "minimize" in the context of § 316(b) likewise does not mean merely to achieve some reduction in impact of a CWIS. Rather, it means "to reduce to the smallest amount, extent, or degree reasonably possible." 40 CFR § 125.92(r); AR-618 at 232; *see* 40 CFR § 125.83 (defining "minimize" identically); *see also Entergy Corp. v. Riverkeeper, Inc*., 556 U.S. 208, 219 (2009) (recognizing the regulatory definition of "minimize" at 40 CFR § 125.83 and acknowledging EPA's "discretion to determine the extent of reduction that is warranted under the circumstances").

In this case, as PSNH acknowledges in the comment, an alternative technology, seasonal use of wedgewire screens, is available and will achieve an estimated entrainment reduction of 89% compared to current operations at the facility.[47] Enercon estimated that the rescheduled Unit 2 maintenance outage by itself (which would only address entrainment from Unit 2) would result in a 27% reduction based on biological data from 2006-2007 (AR-6 at 95) which is substantially less than the entrainment reduction that wedgewire screens are expected to achieve. The overall entrainment reduction is limited particularly because, according to PSNH, back-to-back outages are impractical and the latest the outage could be scheduled is mid-June based on operational constraints and power pool demands. *See* AR-6 at 93. While a maintenance outage would eliminate entrainment proportional to the Unit 2 flow reduction during a period of relatively high entrainment density, the entrainment reduction would only extend for the duration of the outage (roughly one month)[48] and would only be achieved at Unit 2. In addition, the effective reduction in entrainment may change if the peak entrainment period shifts earlier or later by a few days or weeks based on natural conditions in any given year, or if the duration of the outage is shorter than average (33 days). EPA maintains that the limited duration of the outage and the fact that Unit 1 would continue to have no entrainment controls limits the potential benefits of the Unit 2 outage as the sole BTA for entrainment. However, EPA considered the potential additional reduction in entrainment that could be achieved by rescheduling Unit 2 maintenance outages from

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[46] EPA did conclude that scheduling the annual Unit 2 maintenance outage for mid-May to mid-June could be a component of the BTA in combination with other technologies or operational conditions to minimize impingement and entrainment during other periods. AR-618 at 297-98.
[47] It also addresses entrainment at both units.
[48] By comparison, PSNH's 2006 and 2007 data indicate that larvae may be entrained by the facility during more than four months of the year. AR-618 at 247, 251.

mid-May to mid-June in combination with installing wedgewire screens. Using the weekly entrainment densities observed in 2017 during the wedgewire screen pilot test, *see* AR-1550, EPA confirmed that the expected reduction in entrainment from the use of wedgewire screens (as compared to a control representing the existing open-cycle cooling technology) is 89%. Including an outage at Unit 2 lasting from mid-day on May 12 through June 15 (33.6 days) would increase the entrainment reduction to about 93% at an estimated additional cost (according to Enercon) of $150,140 (in $2017).[49] *See* AR-6 at 92-93. Enercon does not explain why it expects the Permittee to incur this cost for the Unit 2 outage.[50] It is possible that this cost could be associated with lost generation that Merrimack Station would incur by shifting the outage by one month. Since 2012, Merrimack Station has operated a total of 72 days (out of 600, or about 12% of the time) between May 12 and June 15, so it is not clear that there would be a measurable cost associated with lost generation for shifting the outage (at least in most years). In sum, the entrainment reduction achieved by shifting the Unit 2 maintenance outage is unclear because the timing of the entrainment peak may shift year to year, the timing of the outage is subject to approval by ISO New England, and the duration of the outage will be somewhat less than 33 days in most years. While EPA questions the basis for the annual cost of shifting the outage, the estimated annual cost ($150,000) is about three times the estimated annual costs (parasitic losses and operation and maintenance) for wedgewire screens ($30,000 - $40,000). *See* AR-1565 at 11, 16. After considering the relative costs of the outage and expected benefits, EPA determined that shifting the outage is not a component of the BTA for entrainment at Merrimack Station. At the same time, Unit 2 must undergo an annual maintenance outage and scheduling this outage from mid-May to mid-June will reduce entrainment on top of the reductions estimated to be achieved with wedgewire screens. The Final Permit at Part I.G.3 includes a narrative condition to schedule the Unit 2 maintenance outage, to the extent practicable, in mid-May to mid-June as a best management practice. Optimizing the timing of this outage to coincide with the typical peak entrainment period, when practicable, will help to reduce adverse impacts from entrainment.

In considering PSNH's comments and the relevant factors at 40 CFR § 125.98(f)(2) and (3), EPA has determined that seasonal use of wedgewire screens is the BTA for entrainment at Merrimack Station. EPA addresses detailed comments on the pilot study and the cost of the wedgewire screens in Responses to Comment III.4.1, 5.2, and 5.2, below. EPA presents its consideration of the relevant factors for establishing entrainment controls at Merrimack Station in Response to Comment III.5.3. While wedgewire screens is the BTA for entrainment, rescheduling the Unit 2 maintenance outage during mid-May to mid-June will reduce entrainment slightly more than the screens alone (by about 4%) and an annual maintenance outage at Unit 2 must be scheduled regardless of the effect on entrainment. Because it will further reduce entrainment, and because it must be scheduled anyway, the Final Permit includes a narrative condition that Merrimack Station schedule its annual Unit 2 maintenance outage from mid-May to mid-June for entrainment *to the extent practicable*. Any scheduled outage is subject to approval from ISO-NE. The Permittee

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[49] To maintain consistency with the PSNH's 2017 comments and the cost and benefits valuation provided by NERA, EPA uses cost values in 2017 dollars throughout this Response to Comments document. Using $2017 values is not likely to significantly affect the cost and benefit valuation because the average inflation rate from 2017 to 2020 was relatively low (e.g., $1.00 in $2017 is equivalent to about $1.06 in $2020) and because all of the dollar values would be affected equally.

[50] It does not appear that NERA considered the inclusion of the Unit 2 maintenance outage in its cost benefit analyses in either 2012 or 2017. *See* AR-1128; AR-1565.

must provide an explanation to EPA and NHDES in the event that the annual outage cannot be scheduled from mid-May to mid-June.

The 2011 Draft Determinations Document explains that requirements that address cooling water structures must satisfy both CWA § 316(b) and any more stringent requirements necessary to satisfy applicable state water quality standards. *See* AR-618 at 224-25, 345-46. *See also* N.H. Code R. Env-Wq 1701.02(b) (Applicability). New Hampshire state water quality standards require that:

> (b) All surface waters shall be restored to meet the water quality criteria for their designated classification including existing and designated uses, and to maintain the chemical, physical, and biological integrity of surface waters.
>
> (c) All surface waters shall provide, wherever attainable, for the protection and propagation of fish, shellfish and wildlife, and for recreation in and on the surface waters.
>
> (d) Unless the flows are caused by naturally occurring conditions, surface water quantity shall be maintained at levels adequate to protect existing and designated uses.

Env-Wq 1701.03(b), (c), & (d) (Water Use Classifications). The state's standards also prescribe the following water quality criterion for "biological and aquatic community integrity":

> (a) The surface waters shall support and maintain a balanced, integrated, and adaptive community of organisms having a species composition, diversity, and functional organization comparable to that of similar natural habitats of a region.
>
> (b) Differences from naturally occurring conditions shall be limited to non-detrimental differences in community structure and function.

Env-Wq 1703.19; *see also id.* 1702.07 (definition of "biological integrity"). In 2011, EPA concluded that allowing the facility "to continue, unchecked, to kill and injure by entrainment and impingement an appreciable number and percentage of the fish larvae, fish eggs, and juvenile and adult fish in the Hooksett Pool, including the larvae of species exhibiting population declines in the pool, would be inconsistent with New Hampshire water quality standards." AR-618 at 345-46.

EPA maintains, as it did in 2011, that such year-round operation of the plant as a baseload facility with the existing technology (once-through cooling and a debris sluice with essentially 100% mortality) would not satisfy either CWA § 316(b) or the state water quality standards for biological and aquatic community integrity referenced above. However, seasonal use of narrow-slot (maximum 3.0 mm) wedgewire screens for entrainment, combined with technology in compliance with one of the alternatives under 40 CFR § 125.94(c) (e.g., the "systems of technologies" option at 40 CFR § 125.94(c)(6), *see* Response to Comment III.3.1), will be consistent with the requirements of the 2014 Final Rule and will minimize the adverse environmental impacts of impingement and entrainment at Merrimack Station's CWIS. While EPA concluded in 2011 that seasonal closed-cycle cooling, coupled with an upgraded fish return and travelling screens would satisfy New Hampshire's water quality standards, AR-618 at 345-46, EPA did not have occasion to consider whether wedgewire screens would also satisfy New Hampshire's water quality standards, because EPA did not consider them to be an available technology at the time, *id.* at 273-80. Thus, EPA is now considering for the first time whether permit requirements for the use of wedgewire screen technology at Merrimack Station will satisfy New Hampshire water quality standards.

In 2011, EPA concluded that, "if the permit's CWIS-related requirements were made significantly less stringent they would be inconsistent with the state's water quality standards as they would likely interfere with attaining the state's water quality criterion for protecting biological and aquatic community integrity." *Id.* at 346. Based on new information and new CWIS regulations since 2011, EPA has concluded that wedgewire screens *are* available and has changed the CWIS-related requirements in the Final Permit to require use of wedgewire screens during the entrainment season and the use of a new, well-functioning fish return and the existing traveling screens when the wedgewire screens are not in use. The requirements of the Final Permit will minimize adverse environmental impact to an extent not significantly less stringent than would have resulted from the requirements proposed in the 2011 Draft Permit, in part because they will significantly reduce impingement and substantially reduce entrainment (by Normandeau's estimate as much as 89%). *See* Responses to Comments III.3.1, 4.1, 4.2. Moreover, the Final Permit establishes stringent thermal discharge limits (based on a CWA § 316(a) variance) that recognize and, in effect, require Merrimack Station's continued operation as a peaking plant. Thus, the thermal limits cap the facility's operations consistent with its practice since around 2012. This will also have the effect of preventing increases in intake flows and, consequently, impingement and entrainment. For these reasons, EPA concludes that the Final Permit's requirements will also satisfy state water quality standards but if the requirements were made significantly less stringent, the resulting increase in entrainment and impingement would not satisfy state water quality standards. EPA expects that New Hampshire will certify the Final Permit under CWA § 401(a).

4.1 Wedgewire Screens Would Reduce Environmental Impacts

Comment III.4.1	**AR-1548, PSNH, p. 139-140** **AR-1549, Enercon** **AR-1550, Normandeau**
See also AR-846, PSNH, p. 108-110	

EPA acknowledges in its Statement that wedgewire screens:

> [C]an be implemented in the Hooksett Pool section of the Merrimack River, and that this technology may be more effective at reducing the Facility's entrainment than previously thought . . . . In particular, a newly proposed screen design variation (*i.e.,* "wedgewire half-screens") would result in a smaller installation without excessive interference with public uses of the river. . . . Furthermore, additional data has been submitted suggesting that adequate sweeping flows are likely to exist during the time period when the majority of eggs and larvae are present.[582]

PSNH agrees. The Study Plan Enercon and Normandeau carried out this year during the peak entrainment period at the facility confirms EPA's above-referenced statements. Specifically, the study validated that wedgewire screens can be installed and successfully operated at Merrimack Station and, as mentioned above, demonstrated that the 3.0 mm slot width wedgewire screens result in an estimated overall entrainment reduction of 89% compared to current CWIS operations at the facility.[583] Normandeau's 2017 report submitted contemporaneously with these comments provides the detailed results of entrainment reductions from the Study Plan, including a breakdown of the species entrained, entrainment densities, evaluations of the entrainment reductions by life stage and taxon group, and analyses of the frequencies and densities of aquatic organisms entrained based on length;[584] whereas Enercon's 2017 report submitted contemporaneously with these comments explains in detail the proposed design, procurement, construction, and installation of the wedgewire screens, including the ideal number, orientation, and location of the screens in the waterbody, as well as the costs and timing associated with the installation of the technology.[585]

Analyses from Normandeau and Enercon ultimately confirmed use of the wedgewire half-screens with larger diameters yields significant reductions in entrainment and are well suited for the Merrimack River due to its relatively shallow depths in the vicinity of the plant. Also, utilization of larger diameter screens reduces the number of screens required and avoids potential interference with public uses of the waterbody.[586]

582 AR-1534 at 18.
583 *See, e.g.*, Normandeau 2017 Response at 26-27.
584 *See generally* Normandeau 2017 Wedgewire Report. This report also includes the results of a site-specific current velocity study to quantify the speed of the current, as well as the direction of it. *See id.* at 14-15.
585 *See generally* Enercon 2017 Comments.
586 Enercon 2017 Comments at 66.

EPA Response:

PSNH's comment concludes that seasonal use of wedgewire screens is a suitable technology to reduce entrainment at Merrimack Station. EPA acknowledged in its 2017 Statement that wedgewire screens can potentially be implemented in the Hooksett Pool and that it was reconsidering wedgewire screens as the possible BTA for Merrimack Station in light of public comments and new information. AR-1534 at 18. As PSNH indicates in its comment, the reports provided by Enercon and Normandeau in conjunction with PSNH's comments provide additional, site-specific analysis on the technical feasibility and biological effectiveness of wedgewire screens at Merrimack Station. PSNH comments that the 2017 pilot study results indicate that the 3.0 mm slot width wedgewire screens can achieve an estimated overall entrainment reduction of 89% compared to current CWIS operations at the facility. *See also* AR-1549 at 7, 56 and AR-1550 at 18-19. The pilot study confirms that the technology can effectively reduce entrainment under site-specific conditions and enabled Normandeau to more precisely estimate the potential benefits of wedgewire screens as numbers of organisms saved. *See* AR-1567. PSNH comments that these reports, which EPA responds to in detail below, confirm that the proposed design of 3-mm slot wedgewire half-screens yields substantial reductions in entrainment and are suitable for the relatively shallow depth of the Merrimack River in the vicinity of the plant. Importantly, the proposed design reduces the number of screens required and minimizes potential interference with public uses of the waterbody, which was a concern discussed in the 2011 Draft Determinations Document.

4.2 PSNH Confirmed 3.0 mm Wedgewire Screens Operated Annually in April through July Would be Suitable for Merrimack Station

Comment III.4.2	**AR-1548, PSNH, pp. 140-148** **AR-1549, Enercon, pp. 6-70**
See also AR-846, PSNH, pp. 103-108; AR-864, Enercon, pp. 8-12; AR-872, Normandeau, pp. 134-135; AR-1231 Exhibit 4, Enercon, pp. 11-12, 26; AR-1353, PSNH, pp. 7-8	

PSNH and its consultants have previously explained why 3.0 mm slot size screens are well-suited for Merrimack Station.[587] Specifically, wedgewire screens with this slot width: (1) are beneficial from a maintenance and operational standpoint because they help reduce fouling and debris accumulation issues; (2) require fewer screens to be installed while allowing the system to operate with a desired through-screen velocity of less than 0.5 fps; and (3) are capable of reducing entrainment not only through physical exclusion but also through hydraulic bypass and behavioral avoidance. Each of these factors is discussed below.

Concerns regarding biofouling and clogging associated with wedgewire screens are not unique to Merrimack Station. EPA and EPRI have expressed industry-wide concerns regarding biofouling issues with systems with small slot-widths. Specifically, in its Technical Development Document that accompanied the 2006 Effluent Guidelines Program Plan, EPA provided:

> The Agency is not aware of any fine-mesh wedgewire screens that have been installed at power plants with high intake flows (>100 MGD). However, they have been used at some power plants with lower intake flow requirements (25-50 MGD) that would be comparable to a large power plant with a closed-cycle cooling system. With the exception of Logan, the Agency has not identified any full-scale performance data for these systems. They would be even more susceptible to clogging than wide-mesh wedgewire screens (especially in marine environments). It is unclear whether this simply would necessitate more intensive maintenance or preclude their day-to-day use at many sites. Their successful application at Logan and Cope and the historic test data from Florida, Maryland, and Delaware at least suggests promise for addressing both fish impingement and entrainment of eggs and larvae. However, based on the fine-mesh screen experience at Big Bend Units 3 and 4, it is clear that frequent maintenance would be required.[588]

EPRI has also noted these issues:

> Several full-scale CWIS applications of cylindrical wedge-wire continue to perform satisfactorily. However, these applications employ coarse bar spacings (10 mm). Therefore, other than the existence of encouraging data from small-scale laboratory and pilot field facilities, there is still little information on the use for this technology for protecting early life stages. The potential use of 0.5- to 2.0-mm bar spacing to protect early life stages of fish (particularly eggs and early larvae) has not been evaluated at a CWIS. Therefore, larger-scale pilot studies are needed to identify the full biological potential of these screens. Also, there is a need for further research into biofouling control before the potential applicability of wedge-wire screens can be fully assessed. Biofouling, particularly on internal surfaces that are not readily accessible, remains a concern with both large and small slot sizes.
>
> Results of small-scale field studies conducted primarily in the 1970's and 1980's have shown that substantial fouling can occur over time in all types of water.[589]

When debris accumulates or organisms colonize on numerous functional parts of wedgewire systems, the passage of cooling water flow is impeded and operation of the intake screening equipment itself may be interrupted. Some mesh openings actually become blocked, thereby restricting the flow of water through the screen and increasing the velocity through the unblocked portions of the screen. Less open screen area also results in a higher pressure drop through the screens, which can impair the performance of a facility's circulating water pumps and reduce fish protection by increasing the through-screen intake velocity.[590]

The slot-width of the wedgewire screens is a key variable in the potential risk of biofouling at a facility. This is so because biofouling organisms first attach to a solid piece of screen and, as the organisms grow, the thickness of the biolayer decreases the open portion of the screen. A screen with a greater percentage of solid wire (*i.e.*, one with smaller percent open area) thus will provide space for a greater number of organisms to attach themselves, meaning the resulting biolayer will obstruct the open area of the screen at a faster rate.[591] Biofouling organisms can also bridge the gap between solid portions of the screen to block flow completely. 3.0 mm slot width wedgewire screens alleviate many of these fouling and debris accumulation issues, and these issues would be further minimized by construction of the system with the proposed air burst system[592] and construction of the screen mesh with a Z-alloy that is proven to substantially reduce biofouling compared to stainless steel screens.[593]

As to the number of screens to be installed, EPA provides in its Statement that one of the primary reasons the agency previously rejected the use of wedgewire screen technologies at Merrimack Station is because:

> PSNH's proposed design to serve Merrimack Station's cooling water intake structures, while accommodating the potential limitations of the physical setting (e.g., water depth, current, rate of sediment deposition), would require so many screens and would occupy such a large area of the river, that it would excessively interfere with public uses of the waterway . . . . In its 2007 report responding to an EPA request for information, AR-6, PSNH's consultant Enercon estimated that 24 to 36 [cylindrical wedgewire ("CWW")] screens 5 feet in length and 3 feet in diameter would be required. In its 2009 report providing a supplemental response to EPA's request for information, AR-4, Enercon estimated that 44 to 76 CWW screens 80 inches in length and 2 feet in diameter would be required. The ranges in the number of CWW screens reflect differences in slot size.[594]

These issues are alleviated through the use of 96-inch, 3.0 mm slot-width wedgewire half-screens, as Enercon has determined only seven of these screens would be necessary for the facility.[595] And, because the screens extend approximately four feet from the river bottom, they will not interfere with public recreation in the Merrimack River.[596] Furthermore, the use of 3.0 mm screens means a desirable through-screen velocity of less than 0.5 fps can be maintained; as Enercon discovered during the design phase that installing wedgewire screens with a higher through-screen velocity would result in "an unacceptably high head loss (i.e., energy loss due to friction) through the screens . . . [that] would result in reduced water level within the intake bays, potentially causing cavitation and damage to the circulating water pumps."[597]

Entrainment reductions at Merrimack Station from not only physical exclusion but also hydraulic bypass and behavioral avoidance are optimal with 3.0 mm wedgewire screens, as well. Hydraulic bypass occurs when the wedgewire screens are perpendicularly aligned to the prevailing current in the waterbody and the strength of these natural currents cause organisms to be swept past the screens instead of passing through them. It occurs when the ratio of sweeping flow velocity to through-slot flow velocity of the wedgewire screens is 1:1 or greater. The higher the ratio, the more likely inertia carries otherwise entrainable organisms past wedgewire screens without issue.

Normandeau and Enercon confirmed that a constant and high sweeping flow velocity was present in April through July.[598] The wedgewire screens proposed for Merrimack Station would have a through-screen velocity of 0.4 fps;[599] and, the average observed sweeping flow in the Merrimack River was 2.9 fps during field operations conducted during the peak entrainment period in 2009 and 2012.[600] This results in a ratio of sweeping velocity to the through-slot velocity of the screens of approximately 7:1.[601] The sweeping flows observed during execution of the 2017 Study Plan were 1.0 fps or greater for almost the entirety of the test, resulting in a ratio of 2:1 or greater.[602]

Reductions in entrainment due to larval avoidance are unique to wedgewire screen technologies and occur because the screens have a relatively small "zone of hydraulic influence."

The scope of this zone varies depending upon the length of the screen, the through-slot velocity, and the sweeping flow, coupled with the premise that fish larva are capable of swimming fast in short bursts. The zone of hydraulic influence has an inverse relationship with sweeping flow, meaning as the sweeping flow increases, the zone of hydraulic influence will decrease. Given the small size of the zone of hydraulic influence for wedgewire screens, a single short and fast swimming burst is all fish larva often need to escape this zone and avoid becoming entrained. Larval avoidance is optimized by correctly aligning the slot openings of the screens relative to the sweeping flow direction.

Normandeau provided the following discussion of laboratory and field analyses for the primary exclusionary methods expected to occur in the Merrimack River following installation of the wedgewire screens:

> Applied research in both a laboratory flume and in the Hudson River estuary using test CWW screens demonstrated that the entrainment reduction performance of CWW screens is related to three factors: physical exclusion by the slot width of passive eggs and larvae, behavioral avoidance of the intake flow by the actively swimming larvae, and the hydraulic bypass of eggs and larvae due to sweeping flow of river currents along the surface of the wedgewire screen when they are installed so the river flow is in a direction perpendicular to the slot openings (i.e., parallel to the slot width). CWW screens (12 inch and 18 inch diameter) with slot widths of 2, 3, 6, and 9 mm were tested in a large hydraulic flume using approximately 450,000 fish larvae (including 207,000 White Sucker larvae) and an equal number of neutrally buoyant 1 mm diameter beads (representing fish eggs) at flume velocities of 0.25, 0.50, 1.0, 1.5, and 2.0 feet per second (fps), with through-slot velocities of 0.25 and 0.50 fps, for a total of 24 combinations of slot width, flume velocity, and through-slot velocity among 4,647 individual tests. Physical exclusion was observed to reduce entrainment in a direct relation to limiting dimensions of the test subjects, particularly passive test subjects like beads (eggs) and anesthetized larvae. Fish eggs, larvae, or juveniles with a greatest body depth larger than the slot width were physically excluded and not entrained. Behavioral avoidance was observed to be higher for the two smaller slot widths (2 mm and 3 mm) and for a lower through-slot velocity. Overall, avoidance and hydraulic bypass were higher at higher ratios of sweeping velocity to through-slot velocity, with typically 80% or more of the larvae 12 mm in total length or larger capable of actively swimming to avoid entrainment at a ratio of sweeping velocity to slot velocity greater than 1:1 (Mattson et al. 2011, 2014, and 2015). These mechanistic flume studies demonstrated that hydraulic bypass and avoidance were the prevailing modes of the entrainment reduction effectiveness for

> CWW screens if installed with the river flow perpendicular to the slot width and a sweeping velocity to slot velocity of 1:1 or greater (Mattson et al. 2011).
>
> Field testing of a CWW screen conducted during the 2011 entrainment season in the Hudson River estuary at Indian Point confirmed the entrainment reduction performance observations from the laboratory flume tests. Entrainment sampling was performed at Indian Point *in situ* for 96 continuous hours each week for 24 consecutive weeks from mid-April through mid-September 2011 (Mattson et al. 2014 and 2015). A total of 1,104 pairs of two-hour pumped samples (100 m^3 each) were collected from a 2 mm slot width CWW test screen with a 0.25 fps throughslot velocity deployed 35 feet below the water surface and paired with control samples from coincident 1 m^2 Tucker trawl tows (300 m^3 each) deployed at 35 feet of depth and into the prevailing current immediately upstream from the test CWW screen. A total of 31 ichthyoplankton taxa and 275,245 individuals (83% post yolk-sac larvae) were collected and analyzed from these pairs of Hudson River samples filtered through a 300 micron mesh net. Larval avoidance of the test screen was observed to increase with increasing larval length for the most abundant species (striped bass, 35%; and Bay Anchovy, 28%) as predicted in the flume, and the overall entrainment reduction for 2 mm CWW screens at Indian Point was estimated to be 78% (Mattson et al. 2015).[603]

Lastly, the appropriate time period to operate the wedgewire screen technologies annually at Merrimack Station would be April through July because the overwhelming majority of entrainment occurs at the facility during this time period and because fouling of the screens in other months of the year becomes a potential concern due to traditionally low river flow. Specifically, Normandeau's 2006 and 2007 biological data indicates that the greatest entrainment potential at Merrimack Station typically occurs between late May and late June[604] and Normandeau recently provided that 96.3 percent of total annual entrainment at the facility occurs in April through July.[605]

In its Statement, EPA repeatedly references its belief and conclusion from the 2011 Draft Permit Fact Sheet that entrainment needs to be addressed annually in August "based on the biological data."[606] Yet, a review of that Fact Sheet does not support this assertion and, in fact, reveals EPA actually acknowledges multiple times that entrainment "taper[s] off" in August.[607] A cursory review of Table 11-4 in that Fact Sheet corroborates this fact.[608] EPA instead appears to couch its conclusion that entrainment controls in August are necessary because Merrimack Station's flow withdrawal rates, as a percentage of available river flow, are on average slightly higher than the preceding months.[609] This argument fails, however, when one takes into consideration that few, if any, entrainable organisms are present in the waterbody segment—a fact that is corroborated by a detailed review of Normandeau's data and corresponding conclusions.[610] In actual fact, EPA has failed to put forth any concrete and/or detailed analyses as to why entrainment controls are necessary at Merrimack Station in August. Accordingly, its conclusions are arbitrary and capricious and must be replaced with Normandeau's well-reasoned and scientifically defensible conclusions that entrainment controls are necessary at the facility only in April through July.

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587 *See, e.g.*, AR-1352, Attachment 1.
588 AR-644 at 5-7 (emphasis added).
589 AR-1399 at 66.
590 *See* Enercon 2017 Comments.
591 *See* A.Y. Fedorenko, *Guidelines for Minimizing Entrainment and Impingement of Aquatic Organisms at Marine Intakes in British Columbia*, CANADIAN MANUSCRIPT REPORT OF FISHERIES AND AQUATIC SCIENCES, 54 (1991). This manuscript is attached hereto as Exhibit 20.
592 *See, e.g.*, Enercon 2017 Comments at 21. The proposed air burst system "uses periodic bursts of compressed air to blow accumulated objects from the screens, preventing blockage that can lead to higher capture velocities and pressure drops." *Id.*
593 AR-1352, Attachment 1 at 10; Enercon 2017 Comments at 52-53, 63.
594 AR-1534 at 17, 17 n.3.
595 *See, e.g.,* Enercon 2017 Comments at 66.
596 *See id*.
597 AR-1352, Attachment 1 at 10.
598 *See* Enercon 2017 Comments at 9-10; Normandeau 2017 Wedgewire Report at 14.
599 *See* Enercon 2017 Comments at 9-10.
600 *Id.* at 9.
601 *Id.*
602 *Id.* at 10.
603 AR-1352, Attachment 1 of Attachment 1 at 1-2.
604 AR-2 at 41.
605 Normandeau 2017 Response at 27.
606 *See, e.g.,* AR-1534 at 12-13.
607 *See, e.g.,* AR-618 at 251.
608 *Id.* at 249-50.
609 *See, e.g., id.* at 254.
610 In fact, this increased withdrawal percentage reflects the reality that flows in the Merrimack River typically begin to decrease in August and continue to decrease through November. Given the number of entrainable organisms present in the waterbody in August is negligible, these decreased flows actually further support a conclusion that the wedgewire screens should not be operated during this time because of the increased likelihood that debris could interfere with, damage, and/or clog the screens. Enercon addresses this issue: The primary reason for operating the site with wedgewire screens during part of the year is to limit unnecessary exposure of the screens to potentially damaging objects. The current design for the screens recommends the placement of bollards around the screens when they are not in use to reduce the risk of damage from objects (e.g., submerged tree limbs, refuse, other waterborne debris, etc.) that are travelling downstream on the river currents. Submerged debris can collide with the screens, damaging and altering the form of the screen and/or hampering the ability of the screen to operate properly. An alteration to the shape of the screen could decrease the velocity ratio, decrease the hydraulic bypass, and/or alter the slot size of individual slots. Any of these alterations would decrease the effectiveness of the screens' ability to reduce entrainment.
While the screens are not in operation, bollards placed around the screens would keep them protected from river borne objects. The Station would employ divers to remove the protective bollards and perform inspections/repairs prior to the season of operation. Removal of the bollards helps to maintain the hydraulic flow around the screens while they are in operation. The screens would then be placed into operation during the peak entrainment season. At the end of the operation season, divers would return the protective bollards to the screens and the intake bypass system would be employed, effectively removing the screens from operation. Operation of the screens is

recommended from April 1st to July 31st to provide an effective reduction in entrainment while limiting the unnecessary exposure of the screens to potentially damaging objects. The remaining months of the year when entrainment is at a minimum, the screens would be inoperative and protected . . . to minimize risk of damage to the screens. Enercon 2017 Comments at 67-68.

EPA Response:

PSNH comments that the proposed design with 3.0 mm slot half-wedgewire screens is feasible for reducing entrainment at Merrimack Station from a maintenance and operations standpoint, because fewer screens are required, and because the screens effectively exclude organisms both by physical exclusion as well as by hydraulic bypass and behavioral avoidance. PSNH expands on each of these issues in its comments and in the supporting documents provided by Normandeau and Enercon. Finally, PSNH comments that seasonal use of screens, ending in July, is supported by biological data and that EPA has not provided a justification for requiring that screens be operable in August. EPA responds to the comment above, as well as related comments submitted by Enercon and Normandeau and included as Exhibits to PSNH's comments on the 2017 Statement. In addition, EPA addresses PSNH's 2012 comments on the 2011 Draft Determinations Document related to the potential availability of wedgewire screens in this response.

In the 2011 Draft Determinations Document, EPA rejected wedgewire screens as an available technology based, in part, on its conclusion that the necessary conditions (i.e., sweeping currents, depth) are not present in the Merrimack River on a consistent and reliable basis during the period when fish eggs and larvae are present. *See* AR-618 at 271-280. PSNH initially rejected the technology for Merrimack Station due to the potential for frazil ice to disrupt cooling flow during the winter and because the amount of space that would be required for the large number of screens proposed (23 total) would potentially impact use of the river. *See* AR-6 at 84. PSNH revised this initial finding in its 2009 supplemental evaluation of alternative technologies and, for the first time, proposed seasonal use (April through July) which, according to PSNH, eliminates concerns raised about frazil ice formation and low river flows. *See* AR-4 at 3-10; AR-618 at 274. The 2009 Report did not explain why this screen design with an estimated surface area of 25,000 ft^2, and which includes more screens than the 2007 Report, would not be expected to impact recreational use of the river where the 2007 Report did raise this concern. *See* AR-4 at 17-18.

The 2017 Statement explained that comments on the Draft Permit questioned the draft determination that the physical limitations of Hooksett Pool prevent the use of wedgewire screens. *See* AR-1534 at 18-19. In particular, the 2017 Statement suggested that the half-screen wedgewire design PSNH first proposed in 2014 (AR-1231) and submitted again in 2016 (AR-1352) and with its 2017 comments (AR-1549) appears to be better suited for Merrimack Station than a traditional cylindrical wedgewire screens, may address concerns about adequate depth and the number of screens, and that additional data submitted indicate that adequate sweeping flows exist during the time period when the majority of eggs and larvae will be present. *See id.*; *see also* AR-846, AR-864, AR-872, AR-1231, Exhibit 4 and Attachment 1 to Exhibit 4; AR-1352, Attachment 1, and AR-1361. The 2017 Statement explained that EPA was reconsidering wedgewire screens as the possible BTA for entrainment at Merrimack Station in light of public comments and new information submitted during and subsequent to the public notice of the 2011 Draft Permit (including the design first proposed by PSNH in 2014 and which additional reports and comments have refined), which collectively suggest that an effective screen array may be implemented in the Hooksett Pool section of the Merrimack River, and that the technology may be more effective in this case than previously thought. *See* AR-1534 at 19-21.

The wedgewire screen designs initially proposed in the 2007 Engineering Response, AR-6, and 2009 Supplement Response, AR-4, indicated that a large number of screens (23 to 76) would be required to meet the appropriate slot and velocity specifications for Merrimack Station. One reason that PSNH (in 2007) and EPA identified for rejecting wedgewire screens was that the proposed installations would interfere with recreational use of the river. *See* AR-618 at 276-77. The half-screen wedgewire design PSNH first proposed in 2014 (AR-1231) and submitted again in 2016 (AR-1352) and with its 2017 comments (AR-1549) proposes to install just 7 narrow-slot screens (2 at Unit 1 and 5 at Unit 2). *See also* AR-1534 at 18. Therefore, the design first proposed by PSNH in 2014, and which additional reports and comments have refined, will not interfere with recreational uses of the river. Another concern that EPA raised was the lack of experience with installations of the size initially proposed. *See* AR-618 at 278. The relatively small number of screens in the proposed design, however, is consistent with other, existing installations of wedgewire screens. *See* AR-864 at 8-9. Finally, the significantly reduced size of the proposed array minimizes the likelihood that a drifting organism will be exposed to the wedgewire screens at all as compared to the large field of screens that extended out as far as 100 feet into the river proposed at the time of the 2011 Draft Permit. *See* AR-4 at 9.

In the 2011 Draft Determinations Document, EPA stated that it was unclear if adequate water depths exist to accommodate wedgewire screens in Hooksett Pool, noting that a study of water depths had not been conducted. *See* AR-618 at 277. EPA also raised concerns that the large area required for the size of the installation could potentially accelerate accretion of sediment and that maintaining depths through dredging could be impeded by the number of screens. *See id*. By contrast, the half-screen design of just 7 screens installed in a single line along the western bank in front of the intake substantially decreases the size of the installation and, with it, the potential for accelerated sedimentation and difficulty maintaining adequate water depth through dredging. *See* AR-1352 Attachment 2 at 11. Furthermore, in its comments on the 2011 Draft Permit (AR-872 at 134), Normandeau summarized the results of its 2009 bathymetric survey of the Merrimack River near the CWISs., noting that water depth in the vicinity of both intakes is about 13 feet. *See also* AR-1231 Attachment 4. The area in front of the intakes is shallowest (6 ft) downstream of the CWISs and typical depths range from about 9 to 13 feet. *See* AR-872 Figure 4-3. Depths are likely to represent the upper range because the study was conducted in May when flows are high, but the bathymetric data provided with Normandeau's 2012 comments nonetheless indicate that the depths at the intake will accommodate the half-screen design, which requires only clearance above the screen (rather than a cylindrical screen, which requires clearance both above and below the screen) and was designed for a depth of 6-8 feet (AR-1352, AR-1549).

In the 2011 Draft Determinations Document, EPA proposed that sweeping currents necessary to ensure eggs, larvae, and fouling debris are swept past the screens are insufficient at critical times. *See* AR-618 at 275. In 2009, Enercon agreed that periods of low flow could cause clogging and block the flow of water to the Station, prompting it to propose operating the screens through July and use an automated pressurized airburst system to clear the screens. *See* AR-4 at 3. EPA reviewed available data of river current speeds for the 2011 Draft Permit and concluded that, because river current speeds dropped below 1 fps (the minimum flow identified by Enercon in 2009) in August and on "various dates" throughout June and July, wedgewire screens would not perform effectively. In its comments on the 2011 Draft Permit, PSNH, with support from Normandeau and Enercon, maintain that a minimum sweeping velocity of 1 fps is not required for successful use of wedgewire screens and note that screens have been successfully deployed in lakes and reservoirs with little sweeping flow. *See* AR-846 at 103-104, AR-864 at 10. In addition, Enercon comments that the period of greatest entrainment, and therefore the greatest potential for wedgewire screens to reduce entrainment, is in May and June when average river flows are higher and the period most likely to have low flows that could interfere with the effectiveness of the screen is August through November, when entrainment potential is low. *See* AR-846 at 103, AR-864 at 10. In its comments on the 2014 Draft Permit, Normandeau summarized the results of studies that evaluated the relationship between flow and entrainment. *See* AR-1231 Exhibit 4, Attachment 1; *see also* AR-1352 Attachment 1 of Attachment 1. In these studies, larval avoidance and bypass increased as the ratio of ambient to sweeping flow increased and was sufficient so long as a ratio of at least 1:1 was maintained. *See* AR-1231 Exhibit 4, Attachment 1; *see also* AR-1352 Attachment 1 of Attachment 1; AR-1418; AR-1420; AR-1421; AR-246. In the 2017 Statement, EPA summarized results of the studies indicating that, in addition to physical exclusion, wedgewire screens reduce entrainment through hydraulic bypass and larval avoidance as long as a minimum ambient velocity relative to the design through-slot velocity is maintained. *See* AR-1534 at 19. In particular, these studies indicate that a minimum ambient velocity of 1 fps in not necessary for wedgewire screens to effectively reduce entrainment, which, as explained above, was a primary consideration in excluding wedgewire screens on the basis of inadequate sweeping flow in the 2011 Draft Determinations Document.

In addition to comments and supporting documentation that flows greater than 1 fps are not necessary to ensure that wedgewire screens function effectively, PSNH provided river current data in its comments on the 2012 and 2014 Draft Permits. *See* AR-846 at 103-106; AR-864 at 9-11; AR-1231 Exhibit 4 at 11-12; AR-1550 at 14. According to PSNH and Enercon (referencing AR-1231 Exhibit 4 Attachment 1), the mean sweeping velocity during field observations in May and June of 2009 and 2010 was 2.9 fps, which would provide a sweeping flow to through-slot velocity ratio of 7:1. At the proposed design through-screen velocity of 0.4 fps, a velocity ratio of 2:1 could be maintained at an ambient current of 1 fps, which is about 1/3 of the average observed sweeping flow in the study. While the full data set from the field observations was not provided, nor did Enercon or Normandeau report the range of sweeping flow during this time period, the reported river flows during the end of May and beginning of June in both years was below average and the mean velocity over both years was well over the minimum level of 0.4 fps necessary to achieve a ratio of at least 1:1. *See* AR-1673, AR-1674. Normandeau recorded sweeping flows during the 2017 wedgewire pilot study and provided additional data confirming the conclusions from the 2009-2010 study. *See* AR-1550 at 14. The median sweeping flow from May 22 to July 25, 2017 ranged from 1.29 fps upstream of the screens to 1.19 fps downstream of the screens, which would result in a sweeping flow to through-slot velocity of about 3:1. Compared to the long-term average flows for the USGS Goffs Falls Gage, river flows during May and June in 2009 and 2010 were below average, while river flows in May through July 2017 tended to be higher than average.[51] *See* AR-1673, AR-1674, AR-1675. The data for years with below- and above-average flows suggest that sweeping flows are typically greater than 0.5 fps, which would ensure a ratio of at least 1:1 (based on a slot velocity of 0.4 fps). The data provided in support of its 2012 comments and the supplemental data provided with its 2017 comments indicate that minimum ratios will be greater than 1:1 and will provide adequate sweeping flow to ensure that the screens will effectively minimize entrainment during the period when they will be operated and, in particular, during the period of peak entrainment in May and June. Enercon also notes that, while PSNH maintains that impingement is *de minimis*, maintaining a slot velocity of 0.4 fps, which preserves the appropriate ratio of slot to sweeping velocity for reducing entrainment, will also reduce impingement consistent with the maximum design through-slot velocity of 0.5 fps under the Final 316(b) Rule. 40 CFR § 125.94(c)(2). *See* AR-1549 at 63-64.

According to the comment, provided there is adequate sweeping flow (addressed above), significant entrainment reductions were achieved with a 3-mm wedgewire screens through a combination of physical exclusion, hydraulic bypass, and behavioral avoidance. In the 2011 Draft Determinations Document, EPA stated that slot sizes of 1.5 mm or larger would not adequately reduce entrainment. *See* AR-618 at 278. At the time, the prevailing empirical evidence indicated that wedgewire screens primarily reduced entrainment through physical exclusion. For this reason, slot sizes were thought to have to be small enough to exclude the smallest of entrainable organisms (*e.g.*, 0.5 mm). Designing screens to exclude the smallest organisms necessarily increased both the number of screens required and the potential for severe fouling issues. *See id*. The studies from 2010 through 2012, summarized in the 2017 Statement, observed substantial reductions in entrainment even for larvae with a limiting body depth smaller than the slot size. The laboratory and field studies conducted after the 2011 Draft Permit (but prior to the 2017 Statement) support Normandeau's comments that a slot size based solely on physical exclusion may be overly conservative and place major constraints on the technology by requiring more screens and greater potential for fouling issues and that a larger slot size (i.e., up to 3 mm) has the potential to significantly reduce entrainment. *See, e.g.* AR-1231 Exhibit 4 Attachment 1, AR-246. *See also* AR-1534 at 18-19.

Normandeau's 2017 pilot study of 3 mm screens at Merrimack Station confirmed the conclusions from comments and studies submitted since the 2011 Draft Permit and which prompted EPA to reconsider this technology for the Final Permit. Normandeau observed an 89% reduction in entrainment of eggs and larvae compared to compared to control densities. AR-1550 at 18, 29. *See also* AR-1549 at 7. The 3-mm slot wedgewire screens entrained more eggs (72 eggs) than the control study (2 eggs), but overall eggs accounted for less than 1% of organisms entrained in 2017. *See* AR-1550 at 40. Normandeau observed a 96% reduction in entrainment of post-yolk sac larvae, and relatively high exclusion (87%) of length classes that were physically small enough to

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[51] In the 2011 Draft Determinations Document, EPA states that the 2009 current study was conducted in "early May" based on Normandeau's characterization (AR-246) and that river flows in early May were relatively high. An estimate of current based on this period could be overestimated. In subsequent comments, Normandeau clarified that a 2009 Acoustic Doppler Current Profiler (ADCP) study was conducted from May 17 through June 13, 2009, during which river flows were below average. *See* AR-1231. Normandeau also provided additional current data from 2010 and 2017 over a range of conditions that also suggests that typical current speeds will maintain a ratio of ambient velocity to through-screen velocity greater than 1:1.

pass through the 3 mm slot size. AR-1550 at 18, 30, 47-48. In the 2011 Draft Determinations Document, EPA posited that wedgewire screens may be less suited for Merrimack Station because entrainment is dominated by larvae and larvae are more fragile even than eggs, potentially require even smaller slot sizes (thus more screens) due to small body depth measurements, and are not likely to survive limited contact with the screens. *See* AR-618 at 278-9. New laboratory and field studies about the biological and operational efficacy of wedgewire screens in between the 2011 Draft Permit and 2017 Statement suggest that, in fact, Merrimack Station may be an ideal site for wedgewire screens because entrainment is dominated by post-yolk sac larvae (particularly white sucker), which are larger and better able to actively avoid the screens with sufficiently low through-slot velocities. *See* AR-1534 at 19. In the pilot study, the test screens were observed to most effectively reduce entrainment of post-yolk sac larvae. *See* AR-1550. The 2017 site-specific study of the proposed wedgewire screen design at Merrimack Station provides additional support to demonstrate that wedgewire screens can operate effectively and will significantly reduce entrainment at Merrimack Station.

Based on review of new information (e.g., laboratory and field studies) since the 2011 Draft Permit, comments submitted on the 2011 Draft Permit, 2014 Draft Permit, and 2017 Statement, and supplemental information submitted between comment periods, EPA concludes that wedgewire screens are a feasible technology at Merrimack Station and will reduce entrainment "to the smallest amount, extent, or degree reasonably possible," 40 CFR § 125.92(r) (defining "minimize" in the context of § 316(b)). At the same time, EPA maintains that larvae that contact the screens may suffer mortality and that, while the pilot study confirms earlier comments and studies suggesting that entrainment will be greatly reduced with wedgewire screens, there is still a level of uncertainty associated with this technology in comparison to the relative surety of entrainment reductions that would be achieved through the flow reduction associated with closed-cycle cooling. The additional laboratory and field studies, including site-specific evaluations for Merrimack Station, indicate that entrainment will be substantially reduced with a small installation of screens. The significant decrease in the size of the installation and number of screens from the designs proposed prior to the 2011 Draft Permit will minimize the likelihood that drifting organisms encounter the screens. These same studies suggest that the relatively low through-slot velocity (designed at 0.4 fps), average ambient flows expected during periods of peak entrainment, and composition of drifting organisms in the Merrimack River will also maximize the potential for entrainment reductions through hydraulic bypass and larval avoidance. Finally, Merrimack Station has recently exhibited reduced operations during spring and summer when entrainment densities are highest. The Facility operates at relatively low capacity from April through June, which will in turn reduce the actual number of days that the Facility is withdrawing significant volumes of cooling water. *See* Response to Comment II.3.2 (and associated sub-comments). The Final Permit also establishes a best management practice to schedule the annual maintenance outage at Unit 2 to coincide with peak entrainment and thermal limits that include a limitation on the capacity factor, which together ensure that the reduced operations in May and June will continue for the next permit cycle. Combined, these factors support the conclusion that entrainment will be substantially reduced from existing conditions even if there is some level of uncertainty around the exact entrainment reduction (estimated by Normandeau to be as high as 89%). For these reasons, EPA concludes that any uncertainty is not so great as to preclude a reasoned decision that wedgewire screens are an available and effective technology for minimizing entrainment at Merrimack Station.

In its comment, PSNH, with additional supporting comments from Enercon and Normandeau, maintains that entrainment technology is required only through July and argues that EPA failed to justify why entrainment controls would be necessary in August. *See* AR-1549 at 62, 67-68. *See also* AR-618 at 275. According to Enercon, 97% of entrainment was observed to occur between mid-May and early August during the two-year study of entrainment at Merrimack Station. *See* AR-1549 at 67. Enercon comments that operating the screens from April 1 to July 31 will cover approximately 95% of the entrained species discussed in the 2007 Normandeau Report. *Id*. EPA agrees that the entrainment studies performed at Merrimack Station indicate that the presence of early life stages declines beginning in August. At the same time, the 2017 Wedgewire Study observed early life stages in the Merrimack River through at least the 16th week of the study (August 21 - August 27). AR-1550 at 41-42. In the earlier entrainment study, early life stages of carp and minnow were present through the week of August 27. AR-2 Appendix A at 37-38.

PSNH further comments that operating the screens in August is not warranted "because fouling of the screens . . . becomes a potential concern due to traditionally low river flow." According to Enercon, the primary reason to restrict operation to April through July is to limit unnecessary exposure of the screens to potentially damaging objects (e.g., submerged tree limbs, refuse, other debris), though Enercon does not specifically tie such exposure to low river flow. Nor does PSNH explain why debris would be more likely to damage the screens during August except to state that river flow tends be lower. By contrast, EPRI commented that "[p]rior history suggests debris fouling would be triggered by *high*-flow events, particularly during spring and fall." AR-1577 (EPRI 2017 Comments) at 2-7 (emphasis added). PSNH's comments elsewhere similarly undermine the theory regarding low river flow that it expresses in the above comment. *See* Comment III.6.2 n.696 (noting "slower river velocities and a lack of heavy debris in the waterbody during" September). Lower river flows could potentially encourage growth of fouling organisms, but backflushing the screens (or operating an airburst technology, if installed), combined with the Z-alloy material and larger slot size should limit this impact. According to Enercon, the 2017 pilot study confirmed that the "Z-alloy" coating[52] mitigated the effects of biofouling on the wedgewire screen and that when a blockage occurred, backflushing the screen successfully removed large debris. *See* AR-1549 at 28-29, 56-59. Furthermore, Enercon also commented that "blockage of the screens . . . due to either biofouling or largescale debris is expected to be successfully mitigated by the Z-Alloy screen and inclusion of the [air burst system]." Enercon 2017 Comments at 59. Thus, PSNH's comment that the screens should not be operated in August because of increased chances of fouling does not find support in PSNH's submissions and is in some ways contradicted by PSNH's submissions and other information in the record. EPA has also included an emergency intake provision in the Final Permit that would enable the Permittee to operate the existing traveling screens in the event that the screens become fouled or clogged such that continued operation may result in damage. *See also* Response to Comment III.4.3.

[52] Enercon proposes to use screens coated with Z-alloy, which is an anti-fouling, copper-nickel alloy coating designed to prevent or reduce the growth of colonizing organisms.

EPA maintains that, based on limited entrainment sampling (in 2006 and 2017), early life stages are present in the Merrimack River through the month of August, although densities are low as compared to July. *See* AR-2 (Table A-3) and AR-1550 (Table 4-2). Operating the screens through August will ensure that entrainment technology is in place during years when the larval period is naturally later than the few years when samples were collected and larvae are still present into early August. Moreover, the comments do not explain why low river velocities in August would increase the likelihood that the screens would be subject to damage by floating logs, branches, or other debris (and was contradicted by comments submitted by EPRI). Fouling may present an additional challenge, but the design of the screens and emergency intake provisions should limit these impacts. The Final Permit requires operation of the wedgewire screens from April 1 through August 15. If the Permittee documents a high frequency of fouling, screen damage, or operation of the emergency intake during August once the screens are installed and operational, the Permittee may request a permit modification to limit operation of the screens to exclude this period.

4.3 An Emergency Bypass for Wedgewire Screens Is Imperative and Consistent with Sound Engineering Practices

Comment III.4.3	AR-1548, PSNH, p. 154-157

EPA specifically seeks comments regarding the use of an emergency bypass mechanism for the wedgewire screen technologies considered for Merrimack Station.[636] Installation and operation of this emergency bypass mechanism is essential to allow the facility to adequately avert potentially catastrophic issues in the event of a significant blockage or damage to the wedgewire screens. A bypass feature of this kind is consistent with sound engineering practices and, when put in use, would protect and prevent harm to valuable infrastructure at the facility by providing the necessary flow of water to cool plant processes, which sustains on-line operations and reduces risks of large equipment thermal transients, incremental wear and damage, and other adverse conditions. Conversely, eliminating the bypass feature would result in added direct costs and reduced reliability at Merrimack Station—both of which negatively impact customer benefits—because the aforementioned conditions would occur more frequently than if a bypass feature were installed for the wedgewire screen technology.

The bypass system is primarily needed to ensure that a continuous supply of cooling water is always available to Merrimack Station. Were the wedgewire screens to become partially or completely blocked, a reduction in the water level within the screen houses would occur. At a certain point, the pumps would become damaged due to air intrusion, pressure differentials, and vortex formation unless the pumps were tripped. A tripping of the pumps means operations at Merrimack Station would likewise be tripped. This would result in lost generating capacity for the Station and loss of cooling to equipment within the plant. Installation of a bypass system ensures operational reliability at the facility by guaranteeing a continuous supply of cooling water would be available. This helps maintain power generation, but is also critical for maintaining the safety and reliability of plant equipment.

EPA discusses the bypass feature as a means for PSNH to operate the wedgewire screen technologies annually during the month of August to address entrainment. PSNH maintains that entrainment at Merrimack Station is *de minimis* and, even if EPA disagrees with this *de minimis* conclusion, that entrainment controls during the month of August are not necessary because ichthyoplankton are not common in the Hooksett Pool in August.[637] As stated above, the foundation for EPA's belief that entrainment controls in August are necessary is due to Merrimack Station's comparatively larger flow withdrawal rates, as a percentage of available river flow.[638] However, when the negligible quantity of entrainable organisms present in the waterbody in August is taken into consideration, this comparatively larger flow withdrawal rate actually undercuts EPA's premise. The reason Merrimack Station's relative withdrawal rates have historically increased in August is because overall flows in the Merrimack River typically begin to diminish and continue to decrease through November. Overall lower flows within the waterbody mean there's an increased likelihood that debris (e.g., submerged tree limbs, refuse, etc.) could interfere with, damage, and/or clog the wedgewire screens. Enercon provides that operating the wedgewire screens in August or at any time other than April through July unnecessarily exposes the screens to damaging objects that could impair and/or alter the shape of the screens, which could ultimately "decrease the effectiveness of the screens' ability to reduce entrainment."[639] For these reasons, Enercon has proposed placing bollards around the screens when they are not in use to protect them and minimize the risk of damage due to objects traveling downstream.[640]

In the end, the installation and use of bypass gates associated with wedgewire screens is consistent with sound engineering practices. The gates serve an imperative emergency function of preventing catastrophic damage to critical infrastructure at the facility. They should not, however, be relied upon by EPA as a basis to justify requiring entrainment control technologies annually in August or during any period other than April through July. The studies and biological data in the administrative record make clear that entrainment at Merrimack Station is *de minimis*. Even if EPA disagrees, operation of entrainment control technologies in August is not necessary because there are few entrainable organisms present in the waterbody and because use of the technologies during this lower run-of-river flow period unnecessarily subjects the infrastructure to an increase of damage or destruction due to waterborne debris.

636 AR-1534 at 20-22.
637 *See, e.g.,* AR-1170 at 126.
638 *See, e.g.,* AR-618 at 254.
639 *See* Enercon 2017 Comments at 67-68.
640 *See id.* at 68.

EPA Response:

As the comment indicates, EPA invited comment on the need for emergency intake capability for the wedgewire screen installation at Merrimack Station due to the potential for fouling and clogging. *See* 2017 Statement at 20-21, 22. In its comment, PSNH first reiterates its conclusion that entrainment at Merrimack Station is *de minimis* and then maintains that an emergency intake or bypass capability will be necessary, if the permit requires wedgewire screens. PSNH also provides supplemental information from Enercon about the need for a bypass to the screens due to the potential consequences, should the wedgewire screens become fouled or clogged. PSNH, with support from Enercon, also comments that the screens should only operate from April through July, even if a bypass is authorized.

As discussed in Response to Comment III.5.2, wedgewire screens with narrow slot sizes potentially achieve greater reductions in entrainment, particularly for the smaller, floating life stages, like eggs and yolk-sac larvae, which have little to no ability to swim away from the screens. EPA has reviewed the comments by PSNH and Enercon and agrees that, given the risk that fouling and clogging could have serious negative consequences to the cooling water pumps, heat exchangers, and associated equipment, an emergency intake is a reasonable countermeasure to prevent the catastrophic loss of equipment in the event of a sudden, unanticipated blockage.

EPA is persuaded that incorporating an emergency intake into the design of the BTA for entrainment is justified given the risk that clogging could result in operational problems that lead to damaged equipment and render the plant inoperable. However, the emergency intake cannot take the place of proper operation and maintenance of the screens, including operation of the airburst system, visual inspections, and manual cleaning. *See* 40 CFR § 122.41(e). In addition, the wedgewire screen design should incorporate certain features designed to reduce the potential for clogging, such as selecting the optimal slot size, the use of antifouling coatings and biofouling-resistant alloys, and the potential for backwashing the screens. Enercon recommends the use of bollards or posts around the screens when not in use to reduce the risk of damage from tree limbs, refuse, and other waterborne debris. Enercon comments that removal of the bollards while the screens are operating is necessary to maintain hydraulic flow around the screens. AR-1549 at 68. EPA recommends that the Permittee also investigate whether bollards can be used year-round while preserving the hydraulic flow at the screens (e.g., by placing them farther from the screens) or whether other deflecting structures, such as debris-deflecting nose cones, may be used while the screens are operating to eliminate the risk associated with free-floating debris contacting and damaging the screens. When the Permittee is operating the emergency intake the traveling screens must be operated consistent with the conditions of the permit.

PSNH and Enercon also comment that operation of the screens in August is not necessary because ichthyoplankton are not common in Hooksett Pool in this month. EPA agrees that seasonal use of the wedgewire screens is warranted because entrainment at Merrimack Station is limited to the spring and summer months. Biological monitoring during 2006, 2007, and 2017 confirms that the majority of entrainment occurs from May through July. *See* AR-6, AR-1550. EPA has responded in detail to comments on the seasonal use of screens and the appropriate period for their operation in Response to Comment III.4.2, above. EPA concludes that the optimal period for operating the screens to minimize entrainment is April 1 to August 15. This conclusion is based on the biological life history characteristics of the fish in Hooksett Pool and supported by the biological data collected by PSNH in support of the Draft and Final Permits. Authorizing use of an emergency intake ensures that the Station is protected from catastrophic failure of the cooling system and does not impact the biological justification for seasonal operation of the screens.

PSNH comments that authorization of a bypass or emergency intake should not be used to justify operating the screens after July because low river flows typically associated with later months "mean there's an increased likelihood that debris (e.g., submerged tree limbs, refuse, etc.) could interfere with, damage, and/or clog the wedgewire screens." PSNH provides no real explanation for this assertion, or any citation, data, or other evidence. As a result, the basis for the comment is unclear, but to the extent it purports to rely on Enercon's 2017 comments, we note that Enercon does not specifically assert that low flows increase the likelihood for screen interference, damage, or clogging. *See* AR-1549 at 67-68. Moreover, later comments offered by PSNH and comments from EPRI espouse the opposite view—that damage or debris fouling is more likely to occur during months with high flows. *See* PSNH Comment III.6.2 n.696 (noting "slower river velocities and a lack of heavy debris in the waterbody during" September); AR-1577 at 2-6 to 2-7 ("Prior history suggests that debris fouling would be triggered by high-flow events, particularly during spring and fall."). To EPA, this appears a more reasonable conclusion, since higher flows are intuitively more likely to dislodge submerged limbs and larger debris, potentially sending them downriver. In addition, information from Normandeau and Enercon likewise appears to undermine PSNH's comment that low flows mean greater chances for interference or clogging. During impingement sampling between June 2005 and June 2007, Normandeau collected debris washed from the traveling screens during 24-hour and 6- or 13-day samples. *See* AR-2 at 8 and Appendix Table B-2. While the traveling screen debris study did not include larger items (*e.g.*, submerged tree limbs) that would have been excluded by the bar racks at the entrance to the CWISs, it is useful as an indication of when debris loads in the river may be highest. The highest volume of debris was collected in October and November, when fallen leaves (a potential source of clogging) likely made up a large percentage of debris. On average, the dominant debris type collected in August 2005 and 2006 tended to be aquatic rather than terrestrial, and the volume of debris was similar to debris loads from April through July when the Permittee has proposed to operate the screens. Furthermore, Enercon commented that "blockage of the screens . . . due to either biofouling or largescale debris is expected to be successfully mitigated by the Z-Alloy screen and inclusion of the [air burst system]." AR-1549 at 59. Taken together, the above comments and information from Enercon, EPRI, and Normandeau, undercut PSNH's current (and unexplained) comment that lower flows after July increase the likelihood that debris will interfere with, damage and/or clog the screens.

EPA is required to determine the maximum reduction in entrainment warranted based on the best available information. EPA based the seasonal operational conditions in the Final Permit on biological sampling data and the life history characteristics of the fish in Hooksett Pool. Most (95% or more) early life stages of species in the Merrimack River are present from April through the end of July. *See* AR-618 at 86-115, 244-251. Still, larval carp and minnow as well as larval sunfish were still present in early August during the limited sampling conducted in 2006. While PSNH speculates that the likelihood of exposure to potentially damaging debris will be higher during low flow periods, it offers no evidence, and actually advances a contrary view in a later comment. *See* Comment III.6.2 n.696; *see also* Comment III.9.5. Moreover, other comments and information in the record, including site-specific data, further undermine the comment. Therefore, EPA finds that comment unpersuasive. *See also* Response to Comment III.5.2.

PSNH and Enercon propose use of an emergency intake to prevent catastrophic damage to equipment, including cooling water pumps, due to an unanticipated blockage. *See* AR-1549 at 69-70. The emergency intake should be used as a last resort (following proper design, operation, and maintenance) when, due to factors beyond the reasonable control of the permittee, continuing to withdraw cooling water through the wedgewire screens would result in loss of human life, personal injury, or severe property damage. The emergency intake is included as a safety feature of the wedgewire screen installation—the technology that, after consideration of the factors relevant to this determination, EPA concluded is the BTA for entrainment—in that it reduces the risk of equipment damage due to blockages. When the emergency intake is in use, however, there will be no technology operating to reduce entrainment at the CWISs, though the Permittee must operate the traveling screens to continue to minimize impingement mortality consistent with the requirements of the permit. *See also* Response to Comment III.9.8. For this reason, Part I.E.4 of the Final Permit requires the Permittee to minimize use of the emergency intake system to the greatest extent possible. Further, it requires the Permittee to notify EPA (within twenty-four hours of initiating any use of the emergency intake system) of the reason that the wedgewire screens were taken off-line and identify all actions taken or to be taken to address the cause, and minimize the use, of the emergency intake. The Final Permit also requires that the permittee notify EPA within twenty-four hours of the resumption of full operation of the wedgewire screens. The notification requirements will enable EPA to evaluate the use of the emergency system and to revisit the permit conditions if frequent operation occurs.

5.0 Closed-cycle Cooling Is Not BTA for Merrimack Station

Comment III.5(i)	AR-1548, PSNH, p. 157

In its 2011 Draft Permit, EPA utilized its BPJ to require extreme measures as BTA for the CWISs at Merrimack Station. EPA sought to require PSNH to, among other things, limit the intake flow volume of both CWISs at Merrimack Station to a level consistent with operating in CCC mode from, at a minimum, April 1 through August 31 of each year. PSNH and other interested stakeholders disputed these determinations as arbitrary and capricious in their February 2012 comments to the Draft Permit.

Since that time, CCC was rejected as BTA for CWISs in EPA's final § 316(b) rule. Instead, the final rule provides broad flexibility to facilities to comply with the CWA 316(b) BTA standard, including seven pre-approved control technologies from which a facility may choose to satisfy the impingement BTA standard, as well as a *de minimis* exception that requires no additional controls because the rate of impingement at the facility is low. For entrainment, BTA is to be decided on a site-specific basis and also includes a possible determination that no entrainment controls at a facility are necessary.

PSNH went to great lengths in its 2012 comments to explain why EPA's § 316(b) BTA determination requiring the installation of CCC at Merrimack Station was arbitrary, capricious, and contrary to law. PSNH reasserts many of the same arguments below, with updates to account for changes in factual and regulatory circumstances that have occurred in the intervening five years.

EPA Response:

In making case-by-case BTA determinations based on best professional judgment (BPJ) prior to the promulgation of the 2014 Final § 316(b) Rule, Region 1 generally looked by analogy to the CWA §§ 301, 304, and 306 for guidance in identifying relevant factors to consider in determining the BTA under § 316(b), though EPA is not legally required to consider the factors in those provisions. *See Riverkeeper I*, 358 F.3d at 187 ("[I]t is permissible for EPA to look to those sections for guidance but to decide that not every statutory directive contained therein is applicable to the Rule"). *See also* permit proceedings for MA0003654 (Brayton Point Station), MA0004928 (Mirant Canal Station), MA0028193 (Wheelabrator Saugus, Inc.), and MA0003905 (General Electric Aviation). In addition to these factors, Region 1 consistently considers the relative costs and benefits of available technologies in its case-by-case, BPJ BTA determinations. In *Entergy*, the Supreme Court held that EPA was permitted to consider a comparison of the relative costs and benefits of the technological options in determination of what is "best" under CWA § 316(b)'s BTA standard. *See Entergy*, 129 S.Ct at 1505 n.5. *See* AR-618 at 234-238. Therefore, EPA correctly considered a number of factors, including secondary environmental effects and cumulative impacts, relative costs and benefits, and (by analogy) factors under sections 301, 304, and 306 of the CWA in its case-by-case, BPJ-based BTA Determination. *See* AR-618 at 147-164 and 325-345. EPA maintains that at the time of the Draft Permit, prior to the 2104 Final § 316(b) Rule, the case-by-case BTA determination based on best professional judgement (BPJ) was made consistent with other case-by-case, BPJ determinations in the Region at the time.

Since the Draft Permit was issued, EPA promulgated regulations establishing requirements under § 316(b) for existing manufacturing and industrial facilities. The comment states that EPA "rejected" closed-cycle cooling as BTA in the Final Rule. To the extent this is meant to suggest that the Final Rule therefore prohibits a permitting authority from determining that closed-cycle cooling is the BTA for a particular facility, EPA disagrees. In the Final Rule, EPA concluded that flow reduction commensurate with closed-cycle cooling reduces entrainment and impingement mortality to the greatest extent and is the most effective performing technology. However, EPA also determined that closed-cycle cooling should not be the basis for a uniform, national BTA entrainment standard for existing facilities because of issues with land availability, air emissions, and useful plant life. The extent of these limitations on installation of closed-cycle cooling systems nationwide could not be precisely identified, leading EPA to conclude that these factors were more appropriately considered in a site-specific determination. While EPA rejected closed-cycle cooling technology as the BTA for the industry as a whole, EPA did not rule out closed-cycle cooling as an appropriate BTA for individual sites. *See* Final Rule Response to Comment at 165-66, 188-89. Instead, the site-specific framework was created to reflect EPA's assessment that there is no single technology basis that is BTA for entrainment at existing facilities. The entrainment provisions of the Final Rule establish a process for a site-specific determination of entrainment controls at existing CWISs and direct the permitting authority to consider a number of factors that are best accounted for on a site-specific basis. *See* 79 Fed. Reg. 48,342. In this way, a site-specific determination for entrainment under the Final Rule may conclude that the BTA is closed-cycle cooling for a given facility and fine mesh screens at another. In addition, the national standard for impingement mortality is based on modified traveling screens with fish returns, but the Final Rule provides for a number of other compliance alternatives that are equivalent or better in performance than this standard, including closed-cycle cooling. 40 CFR § 125.94(c).

When establishing site-specific entrainment requirements under the Final Rule, EPA must consider the number of organisms entrained, emissions, land availability, remaining useful plant life, and social costs and benefits, though the Rule provides the permitting authority with the discretion to assign differing weight to each factor. *See* 40 CFR § 125.98(f)(2). EPA may also consider additional factors, including thermal impacts, reliability, and water consumption. *See* 40 CFR § 125.98(f)(3). Although it is not bound to consider these factors under the ongoing permit proceedings provision of the Final Rule (40 CFR § 125.98(g)), EPA considers all of the relevant factors for each of the available entrainment technologies in making its BTA determination for Merrimack Station. *See* Response to Comment III.6.3.

PSNH provided comments in 2012, which it largely reiterated in its comments on the 2017 Statement, that closed-cycle cooling is not an available technology at Merrimack Station. EPA responds to each of these comments below. After considering these comments, as well as the relevant factors at 40 CFR § 125.98(f)(2) and (3), as directed or authorized, respectively, by the Final Rule, EPA maintains that closed-cycle cooling is available and would reduce entrainment at Merrimack Station. See Response to Comment III.5.1 and 5.3 (and associated comments). At the same time, in response to comments submitted by PSNH and others in 2012 and in 2017, EPA has determined that wedgewire screens are also an available technology that would reduce entrainment at Merrimack Station. Moreover, after considering the relative costs and benefits of closed-cycle cooling in comparison to wedgewire screens in accordance with 40 CFR § 125.98(f)(2)(v), EPA has determined that the BTA for entrainment at Merrimack Station is the seasonal operation of wedgewire screens. *See* Response to Comment III.5.2.

5.1 CCC Is Not an Available Technology at Merrimack Station Because It May Not Be Technologically Feasible and Cannot Be Installed at an Economically Practicable Cost

Comment III.5.1	**AR-1548, PSNH, p. 158**
See also AR-846, PSNH, pp. 68-69, 99-100; AR-864, Enercon, p. 9; AR-841, UWAG, pp. 63-66; AR-1549, Enercon, pp. 11-17	

To be classified as BTA pursuant to CWA § 316(b), a given technological treatment system must be both technologically feasible and economically practicable. The CWA's legislative history makes clear that this BTA standard is to be interpreted to mean "best technology available commercially at an economically practicable cost."[641] EPA has, in turn, interpreted this legislative history to mean "that the application of [BTA] should not impose an impracticable and unbearable economic burden" upon the regulated entity.[642]

PSNH and its consultant, Enercon, explained in numerous reports and submissions to the agency that certain site-specific factors, such as the need for a new pumping station and condenser cleaning system, coupled with logistical issues with existing piping interfaces, limited land availability, site layout constraints, operating parameters, and water treatment and quality issues, all raise serious questions or doubts regarding whether retrofitting CCC at Merrimack Station is technologically feasible.[643] PSNH also explained in its 2012 comments to the 2011 Draft Permit that the outrageous sticker price of CCC means the technology cannot be installed at Merrimack Station at an economically practicable cost. Accordingly, CCC cannot constitute BTA for the facility. Set out below is an updated discussion of the economic impracticability of requiring CCC to be installed at Merrimack Station, along with an examination of the mandatory and suggested factors set out in the final § 316(b) rule that demonstrate why installation of CCC is not technology feasible at the facility.

641 *See* WPCA 1972 Legislative History.
642 *See* 69 Fed. Reg. at 41,604.
643 *See, e.g.,* AR-6; AR-846; AR-864.

EPA Response:

In its 2007 Engineering Report, Enercon stated that "the costs of retrofitting such a cooling tower for use in a closed-cycle cooling configuration for both units at the Station would be wholly disproportionate to any environmental benefits that could be conferred by doing so (and, to the extent that it is relevant, closed-loop cooling using a mechanical draft cooling tower would not be the most cost-effective technology available for minimizing AEI, and would raise concerns about negative environmental impacts, energy production, and efficiency)." AR-6 at 32. Thus, Enercon raised the potential for adverse impacts from installation of cooling towers but did not conclude that closed-cycle cooling would be technologically or economically infeasible at Merrimack Station. *See* AR-618 at 143 ("PSNH does not contest the availability of mechanical draft hybrid wet-dry cooling tower technology for Merrimack Station."). Enercon, instead, concluded that, in its opinion, the costs of the technology would be wholly disproportionate to the benefits. PSNH also expressed concerns about the vapor plume, which EPA addressed. *See* AR-618 at 164-167.

In their 2011 and 2017 comments, however, PSNH and Enercon, with supporting reports provided by NERA, *see* AR-1128; AR-1565, state that closed-cycle cooling is neither technologically nor economically feasible at Merrimack Station.

At the time of the Draft Permit in 2011, there were no effective national categorical standards applying to § 316(b) to the CWISs at Merrimack Station. Therefore, EPA developed permit conditions under CWA § 316(b) by determining the BTA on a BPJ, site-specific basis. *See* AR-618 at 221, 225. Neither the CWA nor EPA regulations dictated a specific methodology for developing permit limits based on BPJ at the time of the Draft Permit. EPA considered the location, design, construction, and capacity of the CWIS and available technologies. *See* AR-618 at 227-28. Neither statute nor regulations define the term "available" but in terms of the BTA technology standard, the term is accepted to mean technological feasibility. *Id*. EPA also has read availability to mean economic feasibility. *Id.* at 229. In the 2011 Draft Determinations Document, EPA explained, as stated in the comment, that a technology is deemed available on a case-by-case, BPJ basis only if it is both technologically and economically feasible for the facility in question. *Id*.

Since the Draft Permit, EPA has promulgated regulations establishing requirements under CWA § 316(b) for existing facilities like Merrimack Station. The 2014 Final Rule sets forth a number of compliance alternatives for meeting the BTA standard for impingement mortality and a framework for the permitting authority to establish site-specific entrainment controls. EPA notes that in the following comments, PSNH suggests that EPA's draft analysis inadequately considered certain factors when determining whether closed-cycle cooling was an available technology (e.g., land availability, water usage, emissions). However, EPA first established these as factors that must or may be considered in the 2014 Final Rule, after issuance of the Draft Permit. As discussed elsewhere in this Response to Comments, EPA is considering each of the factors listed at 40 CFR § 125.98(f)(2) and (3) in making a final determination of the BTA for entrainment at Merrimack Station. These factors include land availability, air emissions, water usage, the number of organisms entrained, energy reliability, as well as the costs and benefits of available technologies. *See* Response to Comment III.5.3. In its 2017 Statement, EPA also discussed application of the 2014 Final Rule to the Merrimack Station permit and invited public comment on the relevant issues. *See, e.g.,* AR 1534, pp. 14-15. *See also* Response to Comments III.1 and III.2 (and associated sub-comments).

5.2 Consideration of Costs and Benefits of Available Entrainment Technologies

5.2.1 Wedgewire Screens are Far More Cost Effective Than CCC

Comment III.5.2.1	AR-1548, PSNH, pp. 148-154

The costs and relative benefits associated with any CWIS technology must be considered in rendering a BTA determination pursuant to § 316(b). The limited legislative history of § 316(b) makes this clear. Specifically, that legislative history provides that BTA should be interpreted to mean "best technology available commercially <u>at an economically practicable cost</u>."[611] Since at least 1977, EPA has compared costs and benefits in making BTA determinations to minimize AEI pursuant to § 316(b).[612] In *Seabrook*, the EAB noted that "consideration ought to be given to costs in determining the degree of minimization" required under § 316(b) and supported this assertion by providing that if costs and relative benefits were not to be considered in such technological analyses, cooling towers would be required "at every plant that could afford to install them, regardless of whether or not any significant degree of entrainment or [impingement] was anticipated."[613] This is not the case. Thus, the Board concluded that it is not "reasonable to interpret Section 316(b) as requiring technology whose cost is wholly disproportionate to the environmental benefit gained."[614]

EPA embraced this "wholly disproportionate" standard in conducting cost-benefit analyses—and consistently rejected CCC as too costly and unjustified in light of the potential environmental benefits—under § 316(b) until it issued a proposed rule for CWISs at Phase II existing facilities in 2002.[615] Specifically, in that rule proposal, EPA developed a "significantly greater" standard for measuring costs versus relative benefits and provided the following justification for doing so:

> [T]he new facility rule required costs to be "wholly

> disproportionate" to the costs EPA considered when establishing the requirement at issue rather than "significantly greater" as proposed today. EPA's record for the Phase I rule shows that
>
> those facilities could technically achieve and economically afford the requirements of the Phase I rule. New facilities have greater flexibility than existing facilities in selecting the location of their intakes and technologies for minimizing adverse environmental impact so as to avoid potentially high costs. Therefore, EPA believes it appropriate to push new facilities to a more stringent economic standard. Additionally, looking at the question in terms of its national effects on the economy, EPA notes that in contrast to the Phase I rule, this rule would affect facilities responsible for a significant portion (about 55 percent) of existing electric generating capacity, whereas the new facility rule only affects a small portion of electric generating capacity projected to be available in the future (about 5 percent). EPA believes it is appropriate to set a lower cost threshold in this rule to avoid economically impracticable impacts on energy prices, production costs, and energy production that could occur if large numbers of Phase II existing facilities incurred costs that are more than significantly greater than but not wholly disproportionate to the costs in EPA's record.[616]

In short, EPA chose the "significantly greater" standard (instead of the "wholly disproportionate" test) to signal its understanding that existing facilities have less flexibility in selecting locations and technologies, that the rule will affect a much larger portion of the generating capacity, and that a less extreme standard will avoid "economically impracticable impacts on energy prices[.]"[617]

EPA's use of the "significantly greater" standard in its 2004 Phase II rule and its established practice of considering costs and relative benefits in making § 316(b) BTA determinations was challenged and eventually heard by the U.S. Supreme Court. Specifically, in *Entergy*,[618] the U.S. Supreme Court definitively confirmed that § 316(b) allows the permit writer to consider costs and benefits in determining BTA to minimize AEI. Although the Supreme Court ultimately left it to EPA's discretion to decide how to take into account costs and benefits in § 316(b) actions, it made clear that such considerations are acceptable. Specifically, the Supreme Court provided that:

> "[B]est technology" may . . . describe the technology that *most efficiently* produces some good. In common parlance one could certainly use the phrase "best technology" to refer to that which produces a good at the lowest per-unit cost, even if it produces a lesser quantity of that good than other available technologies.[619]

As additional support, the Supreme Court provided that the term "minimize," as used in §

316(b), "admits of degree and is not necessarily used to refer exclusively to the 'greatest possible reduction.'"[620] The Supreme Court also recognized EPA's prior use of the term "wholly disproportionate" compared to its use of "significantly greater" in the rule at issue, and stated that although the standards may be somewhat different, "there is nothing in the statute that would indicate that the former is a permissible interpretation while the latter is not."[621] Thus, the Supreme Court concluded, use of either the "significantly greater" or more rigorous "wholly disproportionate" tests are both acceptable for considering the costs and relative benefits for § 316(b) BTA determinations at existing facilities.[622]

EPA enjoys some latitude on what constitutes a ratio of costs that are not "significantly greater than" or "wholly disproportionate" to the relative benefits of a given technology. However, its discretion is not unfettered. In the past 40+ years of rulemaking by the agency, coupled with occasional statements throughout this time frame that explicitly address this issue, a threshold or ceiling of cost-benefit ratios has been established. For instance, in 1991, EPA Region 4 generated a document entitled "Some Specific Comments on CWA § 316(b) Issues," in which it stated that:

> [T]here are no published EPA guidelines relating to what constitutes wholly disproportionate; however, a factor of 10 or more may be a reasonable factor to be used. That is, expenditures of perhaps 10 times the annual environmental damage might be a reasonable basis for evaluation.[623]

This document plainly establishes a recommended ratio of around 10 to 1 as the threshold for determining whether costs are wholly disproportionate to benefits.[624]

The quantifiable costs and relative benefits of EPA's final § 316(b) rule have a ratio of 8.25 to 1 and/or 10.29 to 1, utilizing a 3 percent and 7 percent discount rate, respectively, and this does not include the costs associated with technologies that may be necessary to address entrainment:[625]

> The cost of additional technologies that may be required to meet the site-specific BTA for entrainment are not included in this analysis because . . . EPA cannot estimate, with any level of certainty, what site-specific determinations will be made based on the analyses that will be generated as a result of the national BTA standard for entrainment decision-making established by [the final rule].[626]

EPA notably referenced the *Entergy* opinion in its final § 316(b) rule to support the agency's proposition that when setting national performance standards for CWISs under 316(b), the permitting agency should compare the costs and benefits of various technologies.[627] Furthermore, there is nothing in the final § 316(b) rule to suggest the "significantly greater" and/or "wholly disproportionate" cost-benefit standards were revoked or superseded by language in the agency's 2014 rulemaking. Accordingly, these cost-benefit standards remain in effect and must govern EPA's BTA decision-making process.

PSNH's consultant, NERA, assessed the costs and relative benefits of wedgewire screen technologies in a 2012 report[628] submitted to EPA in response to its 2011 Draft Permit and has completed a revised assessment in its 2017 report submitted to the agency contemporaneously with these comments.[629] NERA's report was completed in accordance with the tenets of the final § 316(b) rule[630] and adheres to the principles set out in EPA's Guidelines for Preparing Economic Analyses.[631] In other words, the latest social benefits and costs analysis by NERA "is of sufficient rigor"[632] and must therefore be considered by EPA in rendering its BTA determination for entrainment. Utilizing existing CWIS operations at the Merrimack Station as the baseline, NERA concludes that the cost-benefit ratio for the installation of wedgewire screens at the facility is 192 to 1 and 295 to 1 in 2017 dollars, utilizing discount rates of three and seven percent, respectively.[633] Stated plainly, this means that for every dollar of benefit generated by the installation of wedgewire screens, $192 or $295 would have to be paid in costs to install and operate the technology. These ratios grossly fail EPA's "wholly disproportionate" and/or "significantly greater" cost-benefit standards and far exceed the threshold ratios of approximately 8 to 1 and/or 10 to 1 the agency has advanced as the proper metric for rendering § 316(b) BTA determinations.[634] Accordingly, EPA cannot reasonably classify wedgewire screens as BTA for entrainment at Merrimack Station. Notwithstanding their inability to satisfy EPA's cost-benefit standards, PSNH has shown through its pilot study that installation of 3.0 mm wedgewire screens with a designed through-screen velocity of less than 0.5 fps at Merrimack Station, operated annually from April through July, is highly effective at reducing entrainment at substantially less cost as compared to CCC.[635]

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611 *See* Legislative History of the Water Pollution Control Act Amendments of 1972, 93rd Cong., 1st Sess., 264 (1973) (emphasis added). Hereinafter, references to this document will be cited as "WPCA 1972 Legislative History."

612 *See In the Matter of Pub. Serv. Co. of N.H. (Seabrook Station Units 1 and 2)*, NPDES Appeal No. 76-7, 1977 WL 22370, at *7 (EAB June 10, 1977), *aff'd after remand*, *Seacoast Anti-Pollution League v. Costle*, 597 F.2d 306 (1st Cir. 1979).

613 *Id.*

614 *Id.* (emphasis added); *see also In re Cent. Hudson Gas & Elec. Corp.*, Op. EPA Gen. Counsel No. 63, 1977 WL 28250, at *8 (OGC July 29, 1977) (citing the *Seabrook* Board's "wholly disproportionate" standard with approval and providing that minimization of AEI required under § 316(b) "must be tempered by economic considerations."). "EPA ultimately must demonstrate that the present value of the cumulative annual cost of modifications to [CWISs] is not wholly out of proportion to the magnitude of the estimated environmental gains." *Id.* at *7; *see also In the Matter of Pub. Serv. Co. of N.H.(Seabrook Station, Units 1 and 2)*, NPDES Appeal No. 76-7, 1978 WL 21140, at *20 (EAB Aug. 4, 1978) (refusing to require the permittee to move its intake structure further offshore beyond the presently proposed site because to do so would be "wholly disproportionate to any environmental benefit"), *aff'd*, *Seacoast*, 597 F.2d at 311.

615 *See* 67 Fed. Reg. 17,121 (April 9, 2002) (codified at 40 C.F.R. pts. 9, 122, 123, 124, and 125).

616 *Id.* at 17,145-46 (emphasis added).

617 *See* 68 Fed. Reg. 13,521, 13,541 (Mar. 19, 2003) (codified at 40 C.F.R. pt. 125).

618 556 U.S.at 226.

619 *Id.* at 218.

620 *Id* at 219.

621 *Id.* at 225.

622 *Id.*; *see also Voices of the Wetlands v. State Water Res. Control Bd.*, 257 P.3d 81, 104-06 (Cal. 2011) (upholding a permit writer's use of the wholly disproportionate cost-benefit analysis instead of the 2004 Phase II

regulation's "significantly greater" test in assessing § 316(b) BTA determinations and providing that *Entergy* makes clear that the "wholly disproportionate" test is more stringent than the significantly greater test employed in EPA's 2004 § 316(b) rule).

623 AR-671 at IV-52.

624 This ratio is consistent with the Department of Interior's determination of the point at which restoration costs would be considered "grossly disproportionate" and therefore not recoverable as natural resource damages. *See* 61 Fed. Reg. 20,560, 20,602 (May 7, 1996) (codified 43 C.F.R. pt. 11). However, numerous courts have found more proportional cost-benefit ratios necessary to satisfy analogous standards in other contexts. *See, e.g., State of Ohio v. U.S. Dep't of the Interior*, 880 F.2d 432, 443, n. 7 (D.C. Cir. 1989), *reh. denied en banc*, 897 F.2d 1151 (1989), (providing, in dictum, that "grossly disproportionate" could mean damages three times the amount of use value); *Gen. Ry. Signal Co. v. Wash. Metro. Area Transit Auth.*, 875 F.2d 320, 326 (D.C. Cir. 1989), *cert. denied*, 494 U.S. 1056 (1990) (concluding that a cost-benefit ratio of 2.3-to-1 or less is reasonable); *see also* 69 Fed. Reg. 41,575, 41,662, 41,666 (July 9, 2004) (codified at 40 C.F.R. pts. 9, 122, 123, 124, and 125) (rejecting CCC with a cost-benefit ratio of 42 to 1 as BTA in EPA's 2004 rule for Phase II existing facilities and instead adopting compliance alternatives with a ratio of approximately 4.5 to 1).

625 *See* 79 Fed. Reg. at 48,303-04.

626 *Id.* at 48,304.

627 *See id.* at 48,313, 48,318, 48,351.

628 *See* AR-1199.

629 *See generally* NERA 2017 Report.

630 *See* 40 C.F.R. §§ 122.21(r)(10)(iii), (r)(11).

631 EPA, Guidelines for Preparing Economic Analyses (Dec. 17, 2010), available at https://yosemite.epa.gov/ee/epa/eerm.nsf/vwAN/EE-0568-50.pdf/$file/EE-0568-50.pdf. Hereinafter, references to this document will be cited as "EPA Guidelines for Preparing Economic Analyses."

632 40 C.F.R. § 125.98(f)(2)(v).

633 *See, e.g.,* NERA 2017 Report at E-4.

634 *See* 79 Fed. Reg. at 48,303-04; AR-671 at 52.

635 Enercon explains in its 2017 comments that the non-water quality and other environmental impacts associated with wedgewire screens are miniscule compared to those associated with CCC, which are discussed in detail below. *See* 40 C.F.R. §§ 122.21(r)(12); 125.98(f)(2), (3). The only anticipated parasitic load associated with the screens is the operation of the air burst system compressors, which Enercon estimates would require approximately 172 MW-hr per year. Enercon 2017 Comments at 7. And, unlike CCC technologies, there are no water consumption and land availability issues, anticipated increases in air emissions, or icing/fogging concerns associated with operation of wedgewire screens at Merrimack Station. *See, e.g., id.* at 12-16.

5.2.2 The Costs to Install CCC at Merrimack Station Are Wholly Disproportionate, Significantly Greater, or Simply Unreasonable Compared to the Expected Environmental Benefits

Comment III.5.2.2	**AR-1548, PSNH, pp. 159-162**
See also AR-846, PSNH, pp. 68-9, 82-98; AR-841, UWAG, pp. 63-66; AR-1131, Ohio Utility Group, pp. 2-3	

In 2012, PSNH discussed in its comments to the Draft Permit the comprehensive cost-benefit work of its consultant, NERA, and its conclusions that the cost-benefit ratio for CCC at Merrimack Station would be 974 to 1 and that the incremental costs to the incremental benefits of CCC relative to cylindrical wedgewire screens was an astounding 4,317 to 1.[644] PSNH likewise outlined the myriad deficiencies and inconsistencies in the supposed cost-benefit analysis EPA set out in its 2011 Fact Sheet, including those errors noted by NERA in its analyses.[645] The zenith of these collective critiques is that in assessing costs as a mandatory

BTA factor, EPA engaged in nothing more than an affordability determination and the agency repeatedly failed to adhere to its own standards, guidance, and prior precedent in rigorously assessing whether the benefits of CCC compared to relative costs constitutes BTA at Merrimack Station. PSNH and NERA presented clear evidence that installation of CCC as BTA is unwarranted, arbitrary, and capricious.[646]

EPA has never responded to these comments and elected not to do so again in its latest Statement. Moreover, EPA failed to address in its Statement whether the agency believes its only attempted assessment of CWIS costs and relative benefits in the administrative record—the aforementioned affordability determination set out in its 2011 Fact Sheet—satisfies the relevant study requirements set out in 40 CFR Part 122 and/or the "sufficient rigor" standard the agency established in its 2014 final § 316(b) rule.[647] Specifically, in making the "[q]uantified and qualitative social benefits and costs of available entrainment technologies" a factor EPA must evaluate in rendering a legally defensible entrainment BTA determination, the agency requires the benefit and cost information to be of sufficient rigor to ensure it is based on sound engineering and science.[648] EPA's 2011 assessment ignored the objective scientific data PSNH and its consultants had previously submitted to the agency that would have provided a reasonable basis for quantitatively assessing anticipated benefits and, instead, relied upon a disjointed patchwork of qualitative benefits analyses that, without question, lacks the requisite "rigor" to be of any value to the agency.

NERA revisited and revised its 2012 cost-benefit ratio in its 2017 report to reflect the requirements and considerations included in EPA's final § 316(b) rule, the agency's updated Guidelines for Preparing Economic Analyses, more detailed preliminary estimates on the costs to install and operate CCC,[649] and benefits information that has likewise been updated to incorporate new available information.[650] NERA's 2017 Report was prepared in accordance with the requirements of the Benefits Valuation Study and cost evaluations-portion of the Comprehensive Technical Feasibility and Cost Evaluation Study EPA describes in the final § 316(b) rule and requires facilities with a 3-year average AIF of 125 MGD or more to submit as part of the NPDES permit application.[651] Moreover, no one could reasonably contend NERA's report lacks the "sufficient rigor" required to be utilized by the agency to render a reasoned BTA determination, as it thoroughly evaluates and quantifies each of the key cost and benefit metrics EPA recommends in the final § 316(b) rule, as well as other industry guidelines.[652] The cumulative effect of this new information is a new cost-benefit ratio for the installation of CCC at Merrimack Station that has dramatically increased. Specifically, NERA concluded **the cost-benefit ratio for CCC is now 1,714 to 1 and 2,333 to 1** in 2017 dollars, utilizing discount rates of three and seven percent, respectively.[653] Thus, for every dollar of benefit generated by the installation of CCC, $1,714 or $2,333 would have to be paid in costs to install and operate the technology.

NERA also assessed the ratio of the incremental costs to the incremental benefits of CCC relative to wedgewire screens. Remarkably, that ratio is an astounding $10,081 to 1 in 2017 dollars utilizing a three percent discount rate, meaning that an additional $10,081 would have to be paid for every $1 of additional benefit provided by CCC compared to wedgewire screens at Merrimack Station.[654] Using a seven percent discount rate, the incremental cost-benefit ratio between wedgewire screens and CCC is $18,499 to 1 in 2017 dollars. Again, that means an additional $18,499 would have to be paid for every $1 of additional benefit provided by CCC compared to wedgewire screens at Merrimack Station.[655]

These ratios woefully fail EPA's "wholly disproportionate" and/or "significantly greater" cost-benefit standards and far exceed the threshold ratios of approximately 8 to 1 and/or 10 to 1 the agency has advanced as the proper metric for rendering § 316(b) BTA determinations.[656] Accordingly, the agency should not and legally cannot render a BTA determination requiring CCC technologies at Merrimack Station that would withstand judicial scrutiny.

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644 *See* AR-846 at 88-89.
645 *See id.*
646 EPA is likewise required to consider the costs associated with achieving an effluent reduction in rendering a legally defensible BAT determination for thermal discharges. *See* 33 U.S.C. § 1314(b)(2)(B) (requiring EPA to consider, among other things, the cost of achieving an effluent reduction in rendering a BAT determination for thermal discharges). The critiques and arguments set out in PSNH's 2012 comments and NERA's 2012 report regarding the lack of rigor in EPA's assessment of the costs of CCC technologies therefore apply equally to EPA's § 316(a) BAT determination for Merrimack Station.
647 *See* 40 C.F.R. §§ 122.21(r)(10)(iii), (r)(11); *id.* at § 125.98(f)(2)(v).
648 *See id.*; *see also* 79 Fed. Reg. at 48,367-68.
649 Enercon provided much of this preliminary cost data to NERA and cautions that it is generally accepted in the industry that the total costs formulated in the conceptual design stage of a project almost always increase dramatically in the subsequent stages of the project. *See* Enercon 2017 Comments at 13-14.
650 *See* NERA 2017 Report.
651 40 C.F.R. §§ 122.21(r)(10)(iii), (r)(11).
652 *See* 40 C.F.R. § 125.98(f)(2); *see, e.g.,* EPA Guidelines for Preparing Economic Analyses.
653 *See, e.g.,* NERA 2017 Report at E-4.
654 *See id.*
655 *See id.*
656 *See* 79 Fed. Reg. at 48,303-04; AR-671 at 52.

5.2.3 Closed-Cycle Cooling is Economically Feasible at Merrimack Station

Comment III.5.2.3	**AR-851, CLF, p. 13**

EPA concluded that installing CCC technology at Merrimack Station is economically feasible and that PSNH has not demonstrated otherwise.[55] In examining the costs of installing CCC technology, EPA correctly questioned PSNH's estimate of lost profits associated with construction outage periods during the conversion to CCC. PSNH estimated such lost profits to total $9.1 million.[56] The lost profits were entirely associated with three weeks of operation that PSNH estimated the construction would take on top of the plant's regular four-week outage for regularly scheduled maintenance.[57] EPA correctly noted that PSNH's estimate of lost profits may err on the high side because:

> [F]irst, PSNH has used the units' nameplate ratings rather than the lower production capability ratings that PSNH currently claims in its reports to the regional system operator; and second, PSNH has assumed that the units would

> have been operating at 100 percent capacity rather than a lower figure reflecting the facility's recent actual capacity factors.[58]

PSNH's estimate of its annual operating costs is also biased high. PSNH again calculated its estimate of annual recurring costs based on the assumption that equipment, such as the new booster pumps and tower fans, would be operating and consume electricity in all hours of each year.[59] EPA correctly noted that such constant operation is unlikely, calculated that the annual costs would decrease by approximately $850,000 if PSNH had used Merrimack Station's actual capacity factor over the last eight years, and would come down even further if adjustment for fan usage during the cooler months were included.[60] As with many of the assumptions in its analysis, however, EPA gave PSNH the benefit of the doubt and used the company's estimates.[61] In spite of PSNH's artificially inflated cost estimates for annual operations costs, EPA still correctly concluded that installing CCC at Merrimack Station was economically achievable.

[55] Attachment D at 148.
[56] PSNH's estimate of $8.8 million was in 2007 dollars. EPA brought that value forward to 2010 dollars, which resulted in a figure of $9.1 million. *Id.* at 150.
[57] *Id.*
[58] *Id.*
[59] *Id.* at 152.
[60] *Id.*
[61] *Id.* at 153.

EPA Response to Comments III.5.2.1, 5.2.2, and 5.2.3:

EPA received a number of comments in 2012 and in 2017 related to how the relative costs and benefits of available CWIS technologies should be considered. In its comments, PSNH summarized its understanding of the rulemaking and legislative history as it pertains to the consideration of costs and benefits under Section 316(b) of the CWA. PSNH commented on what it perceived as short-comings in EPA's analysis of costs and benefits in the 2011 Draft Determinations Document and, in 2012, provided a new economic assessment of costs and benefits of available technologies, including closed-cycle cooling, wedgewire screens, and traveling screen upgrades, prepared by NERA. *See* AR-1128. In 2017, NERA updated this economic assessment for two of the technologies – closed-cycle cooling and wedgewire screens – because of the new requirements of the 2014 Final Rule. *See* AR-1565. In addition, CLF submitted comments on the economic feasibility of closed-cycle cooling at Merrimack Station. In this response, EPA addresses PSNH's comments on costs and benefits, the economic analyses provided by NERA, CLF's comments on costs, and associated related comments on costs and benefits submitted by other parties as indicated above.

Legislative History

PSNH asserts that the costs and relative benefits associated with any CWIS technology must be considered in rendering a BTA determination pursuant to § 316(b). In the 2011 Draft Determinations Document, EPA summarized the legal requirements, including an explanation of how EPA considered costs and benefits for a case-by-case, BPJ-based determination at the time of the 2011 Draft Permit. *See* AR-618 at 234-38, 325-28. Specifically, EPA identified:

> In Entergy, the Court held that EPA was permitted to consider a comparison of the relative costs and benefits of the technological options in its determination of which technology is "best" under CWA § 316(b)'s BTA standard. *See id*. at 1506 n.5 (determining which available technology is best "…may well involve consideration of the technology's relative costs and benefits"), *rev'g in part, Riverkeeper*, 475F.3d 83. *See also generally id*. at 1508-10.

Id. at 234. At the same time, in the 2011 Draft Determinations Document, EPA recognized that, while authorized to consider costs and benefits, it was clear that EPA did not have to do so.[53] *Id*. at 235-36 (citing *Entergy* at 1508 and *ConocoPhillips Co. v. EPA* , 612 F.3d 822, 828 (5th Cir. 2010)); *see also* 79 Fed. Reg. 48,351. Given that EPA could, but was not required to, consider costs and benefits in making a BTA determination, there was no specific test mandated for use in this regard. The 2011 Draft Determinations Document explained that EPA used a "significantly greater than" test in the (suspended) 2004 Phase II Rule, while also noting that this was the first and only use of this test and that all other cases of rulemaking or BPJ permitting under § 316(b) used either a "wholly disproportionate test" or did not compare costs and benefits at all. *See* AR-618 at 236 n.70.

For the 2011 Draft Permit, EPA compared the costs and quantified entrainment reductions of available technologies to assess the benefit of available technologies using information submitted by PSNH and information gathered or developed by EPA. *See* AR-618 at 325-26. EPA also qualitatively evaluated the benefits of reducing entrainment at Merrimack Station, including, but not limited to, benefits to species that have experienced recent population declines (e.g., American shad), benefits to recreationally important species, and the value of enhancing protection for the Merrimack River. *Id*. at 335-38. EPA did not attempt to generate a complete monetized estimate of benefits. This is reasonable and appropriate in this case for a number of reasons, including because undertaking a study to translate the eggs, larvae, and fish saved, along with ecological improvements that result from the entrainment reductions under each BTA option, into a dollar value that fully represents the benefit of each BTA option would be extremely difficult and expensive, and would require specialized expertise outside of the Region, particularly for a BPJ-based determination prior to the 2014 Final Rule.[54] Moreover, such studies to value ecological benefits may be subject to substantial controversy. Therefore, for the

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[53] Regarding the *Entergy* decision, PSNH states "[a]lthough the Supreme Court ultimately left it to EPA's discretion to decide how to take into account costs and benefits in § 316(b) actions, it made clear that such considerations are acceptable." EPA again clarifies that in *Entergy Corp. v. Riverkeeper, Inc*. 556 U.S. 208 (2009), the Supreme Court held that the CWA gives EPA the discretion to rely on cost-benefit analysis in establishing § 316(b) permitting requirements. In other words, the discretion was left to EPA to decide not only how, but whether, to take into account costs and benefits in § 316(b) actions.

[54] As an example of the difficulty in monetizing expected benefits from entrainment reductions, EPA developed and fielded an original stated preference survey to estimate willingness-to-pay for improvements to fishery resources from the Final Rule but was unable to finalize the results. For the Final Rule, EPA estimated partial nonuse benefits using the benefits transfer approach and, due to the challenges associated with estimating nonuse benefits, included a qualitative assessment of some nonuse benefits. *See* 79 Fed. Reg. at 48,406.

Merrimack Station permit, EPA quantified the benefits of impingement and entrainment reductions (in terms of individuals saved), qualitatively considered the benefits of those reductions, and compared the benefits to the relative costs of the available BTA options. *See* AR-618 at 333-334. EPA maintains that the consideration of costs and benefits of available BTA options for the 2011 Draft Permit was appropriate based on the law, facts, policy and other available information at the time of issuance.

Consideration of Costs and Benefits under the 2014 Final Rule

Setting aside how EPA considered costs and benefits for its BPJ-based BTA determination in the 2011 Draft Permit, the final determination of the BTA at Merrimack Station is now subject to the 2014 Final Rule. Pursuant to EPA's Final Rule, the permitting authority must establish site-specific entrainment requirements reflecting its determination of the "maximum reduction in entrainment warranted after consideration" of a number factors, including "[q]uantified and qualitative social benefits and costs of available entrainment technologies when such information on both benefits and costs is of sufficient rigor to make a decision." 40 CFR § 125.98(f)(2)(v). Additionally, the regulations specify that the permitting authority "may reject an otherwise available technology as a BTA standard for entrainment if the social costs are not justified by the social benefits." 40 CFR § 125.98(f)(4).

The Final Rule does not specify that EPA must use a particular cost-benefit test. According to PSNH, "there is nothing in the final § 316(b) rule to suggest the 'significantly greater' and/or 'wholly disproportionate' cost-benefit standards were revoked or superseded," and it argues that "these cost-benefit standards remain in effect and must govern EPA's BTA decision-making process." Yet, as EPA has explained in the 2011 Draft Determinations Document and in this Response to Comment, prior to the 2014 Final Rule there was no requirement that EPA consider costs and benefits when making a BTA determination, let alone a requirement that either the "significantly greater than" or "wholly disproportionate" standard be applied. As neither test was ever "in effect" as a legal requirement, no regulation was required to "revoke" or "supersede" these standards as they apply to determinations under § 316(b). The majority opinion in *Entergy Corp. v. Riverkeeper, Inc.*, 556 U.S. 208 (2009), allowed that in considering costs and benefits, the "wholly disproportionate" standard and the "significantly greater than" standard, or some other test, would all be within EPA's discretion under the statute. The Court did not conclude that EPA's consideration of costs and benefits under §316(b) *must* use a particular standard.[55]

[55] The Response to Comments for the Final Rule explains that EPA may choose how to consider cost-benefit analyses in determining appropriate site-specific permit requirements for entrainment. *See* AR-1697 at 94. EPA notes that the terms "wholly disproportionate" and "significantly greater than" are not used in reference to the consideration of costs and benefits when establishing entrainment requirements for existing units in the regulations at 40 C.F.R. Part 125 Subpart J, the preamble to the Final Rule (79 Fed. Reg. 48,300), or the supporting documentation for the Final Rule (*i.e.*, the Technical Development Document, Economic Analysis, or Benefits Analysis for the Final Rule). That neither the "wholly disproportionate" and "significantly greater than" tests were specified in the Rule indicates that it was EPA's intention to leave the permitting authority discretion to choose precisely how to consider the costs and benefits of available technologies.

In considering the costs and benefits of the available entrainment control technologies for the Merrimack Station Final Permit, EPA applied the Final Rule, which provides that site-specific requirements must reflect "the maximum reduction in entrainment warranted after consideration of factors relevant for determining the best technology available for minimizing adverse impact at each facility," 40 CFR § 125.98(f), and allows EPA to "reject an otherwise available technology if the social costs are not justified by the social benefits," *id*. § 125.98(f)(4). When making a site-specific BTA determination for entrainment under the Final Rule, EPA must consider the monetized, quantified, and qualitative social benefits and social costs of available controls, including ecological benefits and benefits to threatened and endangered species. 40 CFR § 125.98(f)(2)(v). EPA's assessment of benefits must take into account all benefits, including categories such as recreational, commercial, and other use benefits; benefits associated with reduced thermal discharges; reduced losses to threatened and endangered species, altered food webs; benefits accruing nonlocally due to migration of fish; nutrient cycling effects; and other nonuse benefits. *See* 79 Fed. Reg. 48,351.

In support of PSNH's 2017 comments, NERA prepared an economic assessment of the costs and benefits of installing and operating wedgewire screens and closed-cycle cooling at Merrimack Station. *See* AR-1565. This economic assessment builds upon the *Preliminary Economic Analysis of Cooling water Intake Alternatives at Merrimack Station* (AR-1128) prepared by NERA and submitted in support of PSNH's comments on the 2011 Draft Permit, which in turn was based, in part, on the initial cost information provided by Enercon in the 2007 Engineering Report, AR-6, and Enercon's updated cost information included with its 2012 comments (AR-864). The methodology of NERA's 2017 analysis is consistent with the requirements of the Final Rule, specifically the information submission requirements for the Comprehensive Technical Feasibility and Cost Evaluation Study and Benefits Valuation Study. 40 CFR § 122.21(r)(10)(iii), (11). The 2017 economic analysis is the most recent and comprehensive, and it largely builds on analyses already submitted by PSNH or in support of PSNH's comments on the 2011 Draft Permit. For these reasons, EPA evaluates this analysis to support its consideration of the relative costs and benefits of two available technologies for reducing entrainment: wedgewire screens and closed-cycle cooling.[56]

[56] The 2012 economic analysis compared the relative costs and benefits of closed-cycle cooling, wedgewire screens, and traveling screen upgrades. AR-1128. The coarse-mesh traveling screen upgrades are intended to reduce impingement mortality and are not effective for entrainment. Consistent with the Final Rule, EPA focuses here on available technologies for entrainment. EPA assessed the social costs and economic impact associated with the impingement mortality compliance alternatives in the Final Rule and reasonably determined that the benefits justify the costs. *See* 79 Fed. Reg. 48,349. In other words, the Final Rule already considered the costs and benefits of complying with the impingement mortality standards at 40 C.F.R. § 125.94(c) on a national basis, including the potential compliance alternatives that Merrimack Station may select. No further consideration of site-specific costs and benefits for the impingement mortality BTA standards is required. NERA also evaluated the relative costs and benefits of an aquatic filter barrier system in 2012. Both PSNH and EPA have rejected this technology as infeasible for reducing entrainment at Merrimack Station due to concerns over the size of the barrier and the required maintenance. *See* AR-618 at 292-95. PSNH has not indicated that it has changed its position on the unavailability of this technology for entrainment and there is no new information to suggest that it would be feasible and effective for reducing entrainment at Merrimack Station.

Cost of Available Entrainment Technologies at Merrimack Station

NERA estimates that the total net present value social cost for closed-cycle cooling is $112.7 and $77.1 million (in $2017) utilizing discount rates of three and seven percent, respectively, based on information and estimates provided by Enercon. *See* AR-1565 at 18. NERA estimates that the total social cost for wedgewire screens is $10.71 and $8.67 million utilizing discount rates of three and seven percent, respectively. *Id*. The cost estimates include estimates of capital costs, construction costs, and energy penalty costs provided by Enercon in AR-1549. The capital cost estimate for closed-cycle cooling from the 2017 analysis is generally based on the same capital cost estimates initially provided by Enercon, which informed the costs estimates for the 2011 Draft Permit, updated to reflect Enercon's comments from 2012. In its 2012 comments, Enercon stated that the initial cost estimates had considerable uncertainty and an additional contingency was necessary to account for potential cost overruns. *See* AR-864 at 21-22.

In 2012, PSNH suggested that EPA had used "outdated" contingency multipliers for the 2011 Draft Permit.[57] Enercon proposed an additional multiplier of at least 30% added to the existing 25% contingency used for the 2007 estimates, resulting in a 55% contingency factor. *See* AR-864 at 22. Enercon indicates that its cost estimate is preliminary and some challenges would be expected in integrating a closed-cycle cooling system to the existing system. Preliminary cost estimates are more uncertain than detailed cost estimates and a higher contingency (*i.e.*, higher than 25%) could be applied to account for this uncertainty. Enercon appears to justify a 55% multiplier by referencing one 1976 Mitre study that "showed that average project costs exceed projections by a factor of 1.55." AR-864 at 22. Enercon suggests the multiplier of 1.55 is typical of cost overruns of large-scale projects at coal-fired power plants, yet this value appears to be the high point of a curve plotting the ratio of actual-to-estimated costs of coal projects in the early 1970's. The value of 1.55 is representative of projects in 1972-73, during a time when, as explained in the report, several unforeseen factors were in play and inflation was at a high point, which suggests that the 1.55 multiplier is biased high. EPRI's 2011 Report reviewed cost from a number of plants that underwent or evaluated retrofitting closed-cycle cooling and found that contingency was typically 30 to 35%. *See* AR-1740 at 3-11. Enercon's initial cost estimate, which EPA used in the 2011 Draft Permit, included both a 25% minimum contingency and a 12% contingency for "overhead and construction financing" resulting in total contingency of 37% which is slightly above the range recommended by EPRI. At the same time, the capital costs of closed-cycle cooling, which comprise the majority of the net present value estimate, are substantial regardless of which contingency factor is used, particularly relative to the cost of wedgewire screens. In addition, PSNH and Enercon raise concerns that the installation of the FGD system, which occurred after the 2007 Engineering Report, could result in additional complexities and challenges for retrofitting closed-cycle cooling that are unique to Merrimack Station and which were not accounted for in the initial costs estimates. For this reason, a larger contingency factor may possibly be warranted in this case. *See also* Response to Comment 5.3.1. EPA has considered the cost estimates from NERA's 2017 analysis, which reflect the 55% contingency factor, in determining the BTA for Merrimack Station.

[57] EPA notes that it did not independently develop the costs used to assess the technologies for the 2011 Draft Permit. The costs, including the contingency multiplier, were provided to EPA by PSNH. *See* AR-618 at 148.

In addition to capital costs, NERA's total net present value social cost estimates include the annual operation and maintenance costs, the cost of lost generation during the construction outage for each technology, and the costs associated with the energy penalty from both efficiency losses and parasitic losses associated with a given technology. NERA's estimates, presented below (millions of dollars in $2017), utilize discount rates of three and seven percent and are based on estimates provided by Enercon. *See* AR-1565 at 11-16.

	Loss (MWh)	Net Present Value millions of dollars ($2017)	
		3%	7%
Closed-cycle cooling			
Operation & Maintenance	---	$10.37	$4.81
Construction Outage	168,541	$2.25	$1.7
Annual Efficiency Power Loss	11,632	$14.7	$7.22
Annual Parasitic Losses	13,312	$16.57	$8.14
Wedgewire Screens			
Operation & Maintenance	---	$0.52	$0.28
Construction Outage	96,624	$1.5	$1.22
Annual Efficiency Power Loss	---	---	---
Annual Parasitic Losses	172	$0.21	$0.11

Enercon estimates that wedgewire screens result in two, six-week construction outages (one for each unit) during the months of September and October. Closed-cycle cooling results in one two-month construction outage during the months of April and May. See AR-1565 at 12. In its comments on the 2011 Draft Permit, CLF indicated that the cost estimates for lost profits associated with the construction outage is likely biased high because PSNH assumed both units would be operating at 100% capacity rather than reflect the Station's actual operating capacity. For its 2017 analysis, NERA estimated the loss (in MWh) during each construction outage based on the average monthly capacity factors based on historical plant operations during 2007 through 2016. This value is likely still biased high because the average monthly capacity factors used in the analysis are not reflective of the actual recent operation of the plant. For example, NERA's estimate indicates that the September/October outage would result in a loss of 168,541 MWh based on an average capacity factor (both units combined) of 25% in September and 20% in October. *See* AR-1565 at 13 (Table 8). However, the average capacity factor in the months of September and October from 2012 through 2019, which best reflects Merrimack Station's current operation as a peaking unit, was 3.5% and 1.3%, respectively. Similarly, the average capacity factor in the months of April and May from 2012 through 2019, which best reflects Merrimack Station's current operation as a peaking unit, was 6.5% and 0.8%, respectively as compared to NERA's analysis with an average capacity factor of 30% in April and 23% in May. In other words, based on actual current operations it is likely that Merrimack Station would operate very rarely in months when the construction outage is likely to occur, resulting in minimal lost profit. At the same time, while NERA's estimates for the construction outage are biased high, the lost profit due to the outage represents a relatively minor component of overall costs, particularly for closed-cycle cooling. Therefore, EPA uses NERA's 2017 cost estimates in its evaluation of costs for the final BTA determination.

In the 2007 Engineering Report, Enercon estimated that the loss in condenser efficiency from converting to closed-cycle cooling would result in an average power loss of 0.16 MW at Unit 1 and 2.82 MW at Unit 2. In addition, Enercon estimated that the conversion to closed-cycle cooling would result in parasitic losses (*i.e.*, additional electrical load due to operation of pumps and fans) of 1.56 MW at Unit 1 and 5.14 MW at Unit 2. *See* AR-6 at 43-45. While EPA used these estimates to evaluate the cost of the energy penalty, the 2011 Draft Determinations Document explains that they may be biased high because it assumes that the fans and pumps operate at full capacity 24 hours per day and 7 days per week. *See* AR-618 at 152. It is likely that the fans and pumps would not operate when the units are not generating electricity. EPA suggested that, based on the actual capacity factor from 2001-2009, the fans and pumps would likely operate up to 20% less than Enercon's estimate. *Id*. CLF agreed with EPA's assessment in its 2012 comments. AR-851 at 13.

To calculate the cost of the energy penalty in 2017, NERA adjusted Enercon's initial estimates (based on 100% operation) to reflect the average monthly capacity factor for each unit.[58] NERA estimates that Merrimack Station would experience an efficiency loss of 11,362 MWh and an annual parasitic loss of 13,312 MWh. *See* AR-1565 at 13-14. EPA could not replicate NERA's calculations, but the estimated efficiency loss in 2017 is about 55% lower than Enercon's calculation, which would reflect NERA's estimated combined capacity factor of 46% for both units. *Id*. However, NERA's estimated parasitic loss in 2017 is about 77% lower than Enercon's calculation (based on a loss of 6.8 MW per day). This value, which over the life of the technology represents a net present value of $14.7 million and $7.22 million utilizing discount rates of three and seven percent, respectively, would be an underestimate if NERA's estimated annual efficiency loss is too low. That is not likely to be a problem, however, because Merrimack Station is operating less frequently now than it was in 2007-2011 when NERA estimated the average monthly capacity factor. The average annual capacity factor reflective of the most recent operations (from 2012-2019) for both units combined is 22% (compared to NERA's 46%), which would suggest that NERA's estimates, which are based on the 10-year capacity factors from 2007 to 2016, are biased high as compared to the current operations. Still, NERA's analysis does account for the fact that Merrimack Station does not operate at full capacity year-round, which was the issue raised by EPA and CLF, and these numbers are uncertain and variable from year to year. Therefore, EPA it was reasonable to use NERA's 2017 cost estimates in its evaluation of costs for the final BTA determination.

Based on NERA's estimates, the total social cost of closed-cycle cooling (at $77 - $112 million dollars) is about ten times the cost of wedgewire screens (at about $8.7 to $10.7 million). EPA determined that the costs of both technologies provided by NERA may be biased high, in particular because the average capacity factors used for estimated lost generation and energy penalties do not reflect actual current operation of Merrimack Station as a peaking plant. At the same time, the majority of the cost estimates for both technologies are capital costs. In other words, even if the actual cost of the outages and energy penalties are somewhat lower, the overall

[58] NERA did provide a sensitivity analysis of the impact of the capacity factor on cost estimates for available technologies, but only assessed the significance of <u>increasing</u> the capacity factor to 50% and 100%. *See* AR-1565 at 30-31. NERA did not assess the significance of a lower capacity factor on the cost estimates.

cost of wedgewire screens would still be an order of magnitude less than the cost of closed-cycle cooling.

Benefits of Available Entrainment Technologies at Merrimack Station

In its 2012 comments, PSNH argues that a shortcoming of the analysis in the 2011 Draft Determinations Document is that EPA did not monetize expected benefits for each technology and, by failing to monetize benefits, EPA engaged in "nothing more than an affordability determination." *See* AR-846 at 89-93. In support of PSNH's comment, NERA's 2017 economic assessment presents monetized social benefits of closed-cycle cooling and wedgewire screens. NERA estimates the net present social benefit value of closed-cycle cooling at $66,000 and $33,000 utilizing discount rates of three and seven percent, respectively. NERA concludes that the cost-benefit ratio for closed-cycle cooling is 1,714 to 1 (at three percent discount rate) and 2,333 to 1 (at seven percent). NERA estimates the net present social benefit value of wedgewire screens at $56,000 and $29,000 utilizing discount rates of three and seven percent, respectively. NERA concludes that the cost-benefit ratio for wedgewire screens is 192 to 1 (at three percent discount rate) and 295 to 1 (at seven percent). NERA's monetized estimates are based on the value of "recreationally important" and "forage" species based on Normandeau's assessment of the biological benefits of reducing entrainment. *See* AR-1567. According to PSNH, "development of such benefits in monetary terms is the only way to make a true 'apples to apples' comparison between the costs and benefits associated with a considered project." *Id*. at 91.

EPA strongly disagrees that a site-specific entrainment determination requires a monetized benefits analysis. The Final Rule defines "social benefits" as:

> the increase in social welfare that results from taking an action. Social benefits include private benefits and those benefits not taken into consideration by private decision makers in the actions they choose to take, including effects occurring in the future. Benefits valuation involves measuring the physical and biological effects on the environment from the actions taken. Benefits are generally treated one or more of three ways: A narrative containing a qualitative discussion of environmental effects, a quantified analysis expressed in physical or biological units, and a monetized benefits analysis in which dollar values are applied to quantified physical or biological units. The dollar values in a social benefits analysis are based on the principle of willingness-to-pay (WTP), which captures monetary benefits by measuring what individuals are willing to forgo in order to enjoy a particular benefit. Willingness-to-pay for nonuse values can be measured using benefits transfer or a stated preference survey.

40 CFR § 125.92(x). This definition highlights the benefits to society as a whole from the reductions in entrainment that would result from the installation of a particular entrainment technology, rather than costs and benefits that would accrue to limited parties. *See* 79 Fed. Reg. at 48,370. The Final Rule recognizes that it may not be possible to accurately and fully monetize costs and benefits and that assessing costs and benefits on a qualitative and/or quantitative basis is preferable to ignoring those costs and benefits that cannot be accurately monetized. *See id.* at

48,371. EPA's 2010 Guidelines for Preparing Economic Analyses also recognize that "all benefits and costs of a regulation would be expressed in monetary terms, but this is almost never possible because of data gaps, unquantifiable uncertainties, and other challenges. It is important not to exclude an important benefit or cost category from BCA [benefit-cost analysis] even if it cannot be placed in dollar terms." AR-1698 at 11-3. Consistent with these Guidelines, the Final Rule explains "[m]erely because it is difficult to put a price tag on those benefits does not mean that they are not valuable and should not be included at least qualitatively in any assessment." 79 Fed. Reg. at 48,351. The Responses to Comments for the Final Rule states "EPA disagrees that comparing only monetized costs to monetized benefits is an appropriate test that trumps all other Clean Water Act factors for evaluating regulatory options; this casts a shadow of doubt onto any 'benefits that justify the costs,' 'maximize net benefits,' or 'benefits that are commensurate with costs' comparisons that are strictly numeric." AR-1697 at 92.

In summary, the Final Rule plainly does not require monetizing social benefits nor does it direct EPA to use a specific cost-benefit test or cost-benefit ratio in considering the social costs and benefits when establishing site-specific entrainment controls. *See* 40 CFR § 122.21(r)(11) ("Each category of benefits must be described narratively, and when possible, benefits should be quantified in physical or biological units and monetized using appropriate economic valuation methods.") *See also* 79 Fed. Reg. 48,351. That the Final Rule clearly contemplates that where benefits cannot be monetized, the quantified and qualitative social benefits should be considered also indicates that a qualitative analysis of benefits may be considered "of sufficient rigor" for making a BTA determination. 40 CFR § 125.98(f)(2)(v). In place of a monetized cost-benefit analysis, the Final Rule requires a reasoned determination that the benefits justify the costs. This approach allows for a full assessment in permit decisions of both qualitative and quantitative benefits and costs and strikes an appropriate balance between environmental improvements and costs, allowing the permitting authority to consider all the relevant factors on a site-specific basis and determine BTA on the basis of those factors. *See id*. at 48,352. EPA maintains that consideration of the quantitative benefits (in terms of the number of organisms saved) and qualitative benefits (in terms of the impacts of reducing entrainment on the waterbody and aquatic life and habitat) is appropriate and consistent with the Final Rule, EPA's economic guidelines, and past permitting decisions.

NERA's monetized benefits analysis, supported by Normandeau's biological benefits analysis, validates the concerns EPA raised in the Final Rule that the full ecological benefits may not be captured if benefits are expressed only in monetized terms. *See* 79 Fed. Reg. at 48,328. NERA's calculation of the total social benefits for each entrainment technology at Merrimack Station includes only the value of the annual equivalent recruitment losses for "recreationally important" and "forage" species. As NERA and Normandeau point out, there is no commercial fishery in the Hooksett Pool, thus there are no social benefits associated with commercial fish for technologies at Merrimack Station. The benefit transfer analysis calculates the value of recreational losses in terms of willingness-to-pay for catching additional fish based on EPA's benefits analysis for the Final Rule. *See* AR-1741. A review of economic data on the value of water in New Hampshire indicates that the economic impact of recreational fishing in New Hampshire is approximately $215 million per year, and that recreational fishers spend about $208.5 million on trip and equipment related expenditures. *See* AR-1714 at 10-13. NERA did not monetize market direct use benefits (due to the lack of a commercial fishery), market indirect use benefits (*e.g.*, increases in recreational tourism dollars), nonmarket indirect use benefits (*e.g.*, increase in value of recreational experiences), or non-use benefits (*e.g.*, the value an individual places on improved environmental quality without any past, present, or anticipated future use).

PSNH's benefits analysis, prepared by NERA, likely substantially underestimates the benefits of available entrainment technologies by including only the value from gains to the recreationally important fishery and ignoring other potentially important categories of benefits that cannot be as easily monetized or quantified. As an example, NERA concludes that non-use benefits are not likely to be significant and assigns this entire category of benefits no value. Non-use benefits accrue where individuals value improved environmental quality without any past, present, or anticipated future use of the resource in question. Individuals may gain value from knowing that a particular resource is protected (*i.e.*, existence value) or from knowing that the resource is available for future generations (*i.e.*, bequest value). Non-use benefits may also include population resilience and support, nutrient cycling, natural species assemblages, and ecosystem health and integrity. Nonuse values include improving the survival probability of a threatened or endangered species. Recent economic literature provides substantial support for the hypothesis that economic value of non-use benefits is greater than zero (*e.g.*, Turner et al. 2003, Zhao et al. 2013). See AR-1741 at 4-7 to 9. When a substantial fraction of the population holds even small per capita non-use values, these values can be very large in the aggregate. Both EPA's Guidelines for Preparing Economic Analyses (AR-1698) and the Office of Management and Budget's (OMB) Circular A-4 governing regulatory analysis (AR-1742) support the need to assess non-use values. Excluding non-use values from consideration is likely to understate substantially total social value.

NERA relies on a 2003 literature review, in which Freeman suggests that non-use values are likely to be significant when 1) the resource is unique; and 2) the loss would be irreversible or subject to a long recovery period. *See* AR-1565 at C-65. NERA argues that because the affected resources are not threatened and endangered species or federally-mandated species and can be characterized as "subpopulations of widely dispersed wildlife species," they are not sufficiently unique to generate substantial non-use values. *Id*. at C-X. However, Freeman's discussion of these criteria goes on to state that "at the present time there is no general method for determining whether a resource is sufficiently unique or a resource change is of sufficient duration to generate important nonuse values" Freeman, 2003. *See* AR-1697 at 364. In responding to comments on the Final Rule, EPA explains that "[t]here are no theoretical, necessary conditions for the existence of nonuse values. For example, resources do not have to be unique to be the source of nonuse willingness to pay (WTP). While factors such as uniqueness can affect the magnitude of willingness to pay, the significance of nonuse values depends on individual responses to given conditions." *Id*. at 392. In addition, EPA notes that during the development of the Stated Preference Survey for the Final Rule, "participants in focus groups and one-on-one cognitive interviews cited a variety of motivations for preventing fish losses, including the satisfaction of knowing that fish exist, the desire to bequeath healthy fish populations to future generations, and the desire to protect the functioning of aquatic ecosystems…EPA is aware of no research – empirical or otherwise – that demonstrates that individuals ascribe limited or no value to the aquatic resources affected by the 316(b) regulation." *Id*.

Available research demonstrates considerable public willingness to pay (i.e. non-use value) for similar types of resource improvements to those addressed by entrainment technologies at Merrimack Station. *See* AR-1697 at 366. *See also* AR-1743. Preliminary model results from the analysis of the stated preference survey data for the Final Rule found positive, significant implicit prices (WTP) for various attributes, including reductions in the number of fish saved and improvements in the conditions of aquatic ecosystems. As an example, the preliminary implicit prices for the Northeast survey region (which includes New Hampshire) are $1.12 per household per year for the fish saved attribute and $7.66 per household per year for the aquatic ecosystem conditions attribute. Over 40% of respondents indicated that protection of aquatic ecosystems was very important. *See* AR-1741. Johnston et al. (2011) also found positive WTP for various ecological improvements associated with migratory fish passage restoration in Rhode Island watersheds. Non-use values were rated as "important" or "very important" by 62 and 76 percent of survey respondents, which exceeded the ratings for commercial and recreational fish values. *See* AR-1809. Evidence from economic literature and analysis from the Final Rule indicates that NERA inappropriately rules out non-use values based on flawed criteria for "uniqueness." These studies suggest that household non-use WTP for improvements to aquatic resources similar to those at issue in the Final Permit could be quite substantial.

Finally, even the benefits that NERA did include in its monetized analysis may be underestimated. NERA estimated the value of forage fish as production foregone, that is, the indirect value of the fish estimated by converting to the pounds of commercial and recreational species that would have been gained if the forage fish were available for consumption. *See* AR-1567. While trophic transfer is one component of the value of forage fish, most of the species entrained at Merrimack Station are not consumed by recreational or commercial species. As a result, the value of forage fish is substantially underestimated by only monetizing value through trophic transfer methods, which ignores the non-use value of the remainder of forage fish. As forage fish make up the majority of fish entrained, the remainder of forage fish is a substantial portion of total entrainment for which no value is assigned. *See* AR-1697 at 366.

In the absence of monetizing or quantifying the nonmarket and non-use values, NERA offers no qualitative assessment of the benefits, contrary to the Final Rule, EPA guidance, and other permitting decisions. Instead, NERA concludes that the increase in fish population and catch from reducing entrainment is not likely to result in additional social benefits from any of these categories such that it would significantly impact the overall results of the analysis. *See* AR-1565 at 33-36. Comparing the approximate total costs of a technology based on a design and engineering study to only the subset of benefits that can be reasonably monetized, while ignoring a large proportion of the benefits and likely many that account for the bulk of the benefits of entrainment reductions is *not* an "apples to apples" comparison. EPA maintains that consideration of the benefits of entrainment technologies at Merrimack Station must include a qualitative discussion of environmental effects and a quantified analysis expressed in physical or biological units (in this case, number of organisms saved).

Comparison of costs and benefits of available technologies at Merrimack Station

According to PSNH, "in assessing costs as a mandatory BTA factor, EPA engaged in nothing more than an affordability determination and the agency repeatedly failed to adhere to its own standards, guidance, and prior precedent in rigorously assessing whether the benefits of CCC compared to relative costs constitutes BTA at Merrimack Station." PSNH's comments suggest that it believes the "standards, guidance, and prior precedent" for assessing costs and benefits under § 316(b) should be the "wholly disproportionate" or "significantly greater than" test. PSNH also concludes, based on NERA's analysis, that "EPA cannot reasonably classify wedgewire screens as BTA for entrainment at Merrimack Station" because wedgewire screens do not "satisfy EPA's cost-benefit standards." PSNH argues these cost-benefit ratios "grossly fail EPA's 'wholly disproportionate' and/or 'significantly greater' cost-benefit standards and far exceed the threshold ratios of approximately 8 to 1 and/or 10 to 1 the agency has advanced as the proper metric for rendering § 316(b) BTA determinations."

At the time of the 2011 Draft Permit, a cost-benefit analysis was not a "mandatory BTA factor" in making a determination under § 316(b) of the CWA. The 2011 Draft Determinations Document explained that while EPA was *authorized* to consider a comparison of the costs and benefits of technological options in determining the BTA under CWA § 316(b) based on best professional judgement, it was also clear that EPA's authority was discretionary. *See* AR-618 at 235 (citing *Entergy* at 1508). For the Final Permit, to be consistent with the 2014 CWA § 316(b) Final Rule, EPA is directed to consider both the social costs and social benefits of available technologies when establishing entrainment controls on a site-specific basis if the available information is of "sufficient rigor" to help support decision-making. *See* 40 CFR § 125.98(f)(2)(v). *See also* §§ 125.92(x) and (y) (defining "social benefits" and "social costs"). In other words, consideration of the relative costs and benefits of available technologies is now, as PSNH points out, a mandatory factor in determining the BTA for entrainment controls on a site-specific basis and EPA has considered this factor in determining the maximum reduction in entrainment warranted at Merrimack Station. At the same time, neither the Final Rule nor any of the supporting documentation require a specific cost-benefit standard such as "wholly disproportionate" or "significantly greater than" when considering the relative social costs and benefits of available entrainment technologies.

While PSNH concedes that "EPA enjoys some latitude on what constitutes a ratio of costs that are not 'significantly greater than' or 'wholly disproportionate' to the relative benefits of a given technology," it also argues that EPA's discretion in the assessment of costs and benefits is "not unfettered." In support of this argument, PSNH references the Brayton Point Station Response to Comments (NPDES Permit No. MA0003654), which in turn includes a discussion of a 1991 "guidance document" from EPA Region 4 (AR-671 at IV-52) that PSNH argues "plainly establishes a recommended ratio of around 10 to 1 as the threshold for determining whether costs are wholly disproportionate to benefits." In fact, EPA refuted this argument fully in the Brayton Point BTA determination. The Response to Comments explains:

> the sources cited by the permittee are not binding on the Agency's application of the wholly disproportionate cost-to-benefit test under CWA § 316(b)…EPA has discretion to reasonably determine when costs are wholly disproportionate to the benefits of complying with BTA-based permit limits in a particular case based on

> the facts of that case…A ratio of 10:1 might be appropriate in certain cases, but there is no legally binding requirement that EPA use such a ratio…The EPA document that the permittee refers to as a "guidance" document are only some notes prepared by an employee of EPA Region 4 in 1991.

Id. While these notes, titled "Some Specific Comments on CWA §316(b) Issues" suggest that a factor of 10 or more "may be a reasonable factor to be used," there was no intent to create a binding requirement for all cases. Moreover, a legally binding requirement cannot be created in a "guidance document" that has not undergone public notice and comment. There is simply no basis for PSNH's argument that the notes from a single EPA employee more than 25 years ago and prior to any of the subsequent national rulemakings implementing CWA §316(b) "plainly establishes" any threshold or ceiling of cost-benefit ratios.[59]

The quantifiable costs and relative benefits of EPA's final § 316(b) rule, which PSNH points out do not include the costs associated with technologies that may be necessary to address entrainment, have a ratio of 8.25 to 1 and/or 10.29 to 1, utilizing a 3 percent and 7 percent discount rate, respectively. PSNH argues that the cost benefit ratios that NERA calculated for entrainment technologies at Merrimack Station "grossly fail EPA's 'wholly disproportionate' and/or 'significantly greater' cost-benefit standards and far exceed the threshold ratios of approximately 8 to 1 and/or 10 to 1 the agency has advanced as the proper metric for rendering § 316(b) BTA determinations." However, the cost-benefit ratios for the Final Rule were not intended to establish a threshold or baseline for the site-specific BTA determination for entrainment requirements. In addition, EPA used neither the "wholly disproportionate" or "significantly greater than" standard for the Final Rule and yet concluded that it permissibly and appropriately considered costs and benefits.

EPA, in both the Fact Sheet and in this Response to Comments, has clearly characterized the entrainment (and impingement) at Merrimack Station's CWIS as an adverse environmental impact. The statute requires that the location, design, construction, and capacity of the facility's CWISs must reflect the BTA for minimizing adverse environmental impact. Merrimack Station's existing once-through cooling system is not currently equipped with any technology for reducing entrainment. EPA must establish site-specific entrainment controls that will result in the maximum reduction in entrainment warranted based on consideration of the relevant factors for this site and facility, including consideration of the social costs and benefits. 40 CFR § 125.98(f). Permitting authorities are to determine the BTA based on their consideration of the relevant factors and their judgment of how much of a reduction in entrainment is *warranted* in a particular case. The Final Rule also recognizes that the permitting authority "may reject an otherwise available technology as a BTA standard for entrainment if the social costs are not justified by the social benefits." *Id.,* § 125.98(f)(4). In addition, if all technologies have social costs not justified by social benefits, or have unacceptable adverse impacts that cannot be mitigated, then the Rule allows the permitting authority to determine that no additional controls are necessary. *Id.*

[59] In footnote 624, PSNH adds that a 10:1 ratio is consistent with the Department of Interior's determination and references other cost-benefit ratios that satisfy "analogous" standards. As the Response to Comments for Brayton Point Station (AR-671 at IV-52) explains, the DOI rulemaking and other cases present an entirely different set of circumstances and a different legal framework and are not binding upon EPA under CWA § 316(b).

EPA has explained in detail above that the consideration of costs and benefits should not be limited to only those costs and benefits that can be monetized but should also include the quantified and qualitative social benefits and costs. *Id*. § 125.98(f)(2)(v). NERA estimates that the total net present value social cost for closed-cycle cooling is $112.7 and $77.1 million (in $2017) utilizing discount rates of three and seven percent, respectively. *See* AR-1565 at 18. NERA estimates that the total social cost for wedgewire screens is $10.71 and $8.67 million utilizing discount rates of three and seven percent, respectively. *Id*. EPA has discussed above why the estimated costs of each technology may be biased high; however, EPA has determined that the cost estimates are reasonable to use in light of available information. EPA has also explained that it is likely that NERA's monetized estimates of the net present social benefits are substantially underestimated. Because the benefits valuation for each of the available technologies at Merrimack Station is incomplete and fails to capture what is likely to be the majority of the potential benefits (*e.g.*, non-market and non-use benefits), NERA's estimates for the cost-benefit ratios for closed-cycle cooling and wedgewire screens are insufficient.

Operation of Merrimack Station has declined in recent years such that the actual cooling water withdrawal is substantially less than the design flow at which EPA estimated entrainment impacts for the 2011 Draft Determinations Document. According to ISO New England, the resource mix of the region's installed generating capacity has shifted dramatically towards natural gas as a result of economic and environmental factors.[60] In 2019, coal made up about 0.5% of generation in New England.[61] The decline in coal-fired generation in New England, and at Merrimack Station, is not expected to reverse in the near future.[62] The change in the resource mix in recent years has caused Merrimack Station to transition to a peaking generator, meaning that it runs at very low capacity for much of the year except when demand for electricity is particularly high (typically during winter and summer). Given the long-term decline in coal-fired generation and resulting operation of Merrimack Station, EPA has evaluated the potential entrainment losses at both the design flow and actual intake flow (from 2007 to 2016 as estimated in the economic assessment and biological benefits analysis). *See* AR-1566; AR-1567. To be clear, however, even at actual intake flow (AIF) the CWISs clearly entrain a large number of early life stages and represent an adverse environmental impact.

If operating at design intake flow (*i.e.*, at the DIF), Normandeau estimates that Merrimack Station with its current open-cycle cooling system would entrain about 7.8 million fish eggs and larvae per year. *See* AR-1567 at 42. Based on the Facility's DIF, Normandeau estimates that using wedgewire screens would reduce entrainment to about 970,000 eggs and larvae per year, and that using closed-cycle cooling would reduce entrainment to about 389,000. *See id*. Thus, based on the DIF, wedgewire screens would prevent the entrainment of about 6.8 million eggs and larvae (an

[60] ISO New England, Resource Mix, "Mix of Supply Resources Has Changed Over Time" *available at* https://www.iso-ne.com/about/key-stats/resource-mix (accessed May 15, 2020). *See* AR-1744.
[61] *Id.*, "" available at https://www.iso-ne.com/about/key-stats/resource-mix (accessed Dec. 28, 2017) *See* AR-1744.
[62] *Id.* Of course, EPA cannot be certain how the energy markets will evolve. Only a relatively short time ago, the relative growth in natural gas-powered generation was not foreseen.

88% reduction) and closed-cycle cooling would prevent the entrainment of about 7.4 million eggs and larvae (a 95% reduction).

At the actual average monthly operating flows (*i.e.*, the AIF) from 2007 through 2016, Normandeau further estimates that Merrimack Station would entrain about 3.1 million fish eggs and larvae per year (with post-yolk sac larvae as the predominant life stage). *See id*. Comparing the entrainment estimates for the Facility at DIF to those based on the 10-year AIF (a 60% reduction as compared to DIF) provides a rough estimate that Merrimack Station's reduced operations would lessen entrainment of eggs and larvae by 4.7 million fish eggs and larvae per year. This is only a rough estimate, of course, because the AIF value is based on an average monthly AIF from 2007 through 2016 and the future month-to-month AIF could vary from that average value in months when entrainment is occurring.[63] In addition, based on a 10-year average AIF, Normandeau estimates that with wedgewire screens the Facility would entrain only about 416,000 eggs and larvae per year (an 87% reduction), and that with closed-cycle cooling it would entrain about 159,000 (a 95% reduction). In other words, based on AIF, Normandeau estimates that wedgewire screens would prevent the entrainment of another approximately 2.75 million eggs and larvae each year, and that closed-cycle cooling would prevent the entrainment of about 3 million eggs and larvae each year.

Comparing the three technologies (open-cycle cooling, wedgewire screens and closed-cycle cooling), the distinctions between them become clear. Open-cycle cooling has no mechanism or ability to prevent entrainment. Nevertheless, entrainment is likely substantially less now than it was at the time of the analysis for the 2011 Draft Permit because of the Facility's much reduced operations (according to Normandeau, the average, 10-year AIF from 2007 to 2016 during peak entrainment in May through July is 55% of DIF and, based on EPA's calculations, a capacity factor of 17% in May and June 2012 through 2018). That said, the Facility does tend to operate some during the summer months when densities of eggs and larvae are highest and with open-cycle cooling, entrainment would be maximized at those times. In addition, although the average AIF is lower under reduced operations, an open-cycle permit would not guarantee reduced operations in the future. Alternatively, entrainment would be greatly reduced by both wedgewire screens (approximately an 89% reduction) and closed-cycle cooling (approximately a 95% reduction). Stated differently, and using the estimates discussed above, closed-cycle cooling would reduce entrainment by about 257,000 (at AIF) to 581,000 (at DIF) more eggs and larvae than would fine-mesh wedgewire screens. Thus, both closed-cycle cooling and fine-mesh wedgewire screens would significantly reduce entrainment, though closed-cycle cooling would achieve a greater reduction. The difference in cost between the two technologies to save an additional 257,000-581,000 fish eggs and larvae, however, ranges from $68 to $102 million.

[63] EPA expects that this estimate of entrainment reduction just from reduced intake flow may be on the low side since the AIF values were based on years beginning in 2007, which was before Merrimack Station had shifted to operating as a peaking plant. Of course, the key question is what the expected intake flow reduction would be during the specific months when entrainment is actually a concern (*i.e.*, April – August). Recent experience suggests that the Facility would not be expected to operate at high capacity in April or May but might operate at times in the warmer months of June through August. However, the Final Permit's thermal discharge limits will cap summer operations (May 1 through September 30) to meet the standards of CWA § 316(a). *See*, *e.g*., Response to Comment II.1.1.

Weighing the social costs and benefits of the available technologies, EPA has determined that the benefits associated with preventing the entrainment of about 2.75 million (at AIF) to 6.8 million (at DIF) eggs and larvae warrant the cost of wedgewire screens. EPA finds on the facts of this specific case that retaining open-cycle cooling with no entrainment reduction technology would not satisfy the CWA § 316(b)'s BTA standard and the requirements of the 2014 Final Rule.[64] The significantly higher cost of closed-cycle cooling, which is estimated to cost 6 to 10 times more, is not warranted by the relatively small incremental benefits of wedgewire screens.

5.3 CCC Is Not the BTA for Merrimack Station According to Consideration of Other Mandatory Factors Set Out in the Final § 316(b) Rule

Comment III.5.3	**AR-1548, PSNH, pp. 162-163**
See also AR-846, PSNH, pp. 98-101, AR-864, Enercon, pp. 16-33	

The final § 316(b) rule requires or authorizes permit writers to consider an array of nonwater quality environmental effects in making an informed BTA determination for a facility, including but not limited to effects on energy reliability, limited land availability, remaining useful plant life, and increased water consumption. EPA mentioned some of these effects in the § 316(a) BAT determination-portion of its 2011 Fact Sheet for the Draft Permit and PSNH made the assumption in its 2012 comments that EPA intended for the same analysis and conclusions to apply to its § 316(b) BTA determination despite the fact that these criterion were not discussed separately or incorporated by reference in the § 316(b) section of the 2011 Fact Sheet.657 PSNH concluded in its 2012 comments to the Draft Permit that EPA incorrectly surmised that "none of these potential environmental impacts should prevent this option from being selected as the BAT for reducing the facility's thermal discharge to the Merrimack River."658 PSNH identified this conclusion as "clearly arbitrary and capricious and not supported by the uncontroverted facts and studies available to EPA" and provided a reasoned analysis of the pertinent non-water quality environmental effects that prohibit or substantially complicate the installation of CCC at Merrimack Station.659 Those comments remain valid today. Set out below is a discussion of these secondary environmental effects, updated to reflect issues that have arisen in the intervening 5+ years that could further complicate the installation of CCC at the facility.

657 Notably, the following secondary environmental effects delineated in the final § 316(b) rule were not mentioned or adequately considered in EPA's 2011 Fact Sheet and are also lacking from the agency's Statement: "land availability inasmuch as it relates to the feasibility of entrainment technology;" "[r]emaining useful plant life;" and "[q]uantified and qualitative social benefits . . . of available entrainment technologies . . . ." 40 C.F.R. § 125.98(f)(2)(iii)-(v).
658 *See* AR-846 at 99 (citing AR-618 at 156).
659 *See id.*

EPA Response:

[64] EPA recognizes that under the 2014 Final Rule, no entrainment reduction technology need be prescribed as the BTA if the permitting authority concludes that the benefits of none of the technologies warrant their costs. 40 C.F.R. § 125.98(f)(4). Under the facts of this case, however, EPA has concluded that the benefits of the Facility using fine-mesh wedgewire screens warrant the cost of the technology.

The Final Rule requires that the permitting authority establish site-specific entrainment controls that "reflect the maximum reduction in entrainment warranted after consideration of factors relevant for determining the best technology available for minimizing adverse environmental impact at each facility." 40 CFR § 125.98(f). When establishing site-specific entrainment requirements under the Final Rule, EPA must consider the number and type of organisms entrained, air emissions, land availability, remaining useful plant life, and social costs and benefits, though the Rule provides the permitting authority with the discretion to assign differing weight to each factor. *See* 40 CFR § 125.98(f)(2). The permitting authority may also consider additional factors, including entrainment impacts on the water body, thermal impacts, reliability, and water consumption. *See* 40 CFR § 125.98(f)(3). While in the case of a permit proceeding such as this one begun prior to October 14, 2014, EPA's "BTA determination may be based on some or all of the factors in paragraphs (f)(2) and (3)," 40 CFR § 125.98(g), in this case, EPA considers all of the relevant factors for each of the available entrainment technologies in making its BTA determination for Merrimack Station. In addition, EPA again notes that, under the Final Rule, the weight given to each factor is within EPA's discretion based on the site-specific circumstances for each facility. 40 CFR § 125.98(f)(2).

In the comment, and the several that immediately follow, PSNH criticizes EPA's analysis of certain factors relevant to determining the BTA for entrainment at Merrimack Station. The comment also asserts that EPA did "not mention[] or adequately consider[]" several of the mandatory factors. In this response and the Responses to Comments III.5.3.1 through 5.3.5 below, EPA responds to these criticisms and discusses EPA's consideration of the relevant factors at 40 CFR § 125.98(f) as they apply to wedgewire screens and closed-cycle cooling, for the purpose of reconsidering whether closed-cycle cooling, fine-mesh wedgewire screens, or neither (i.e., maintain the existing technology with no entrainment controls), are the BTA for Merrimack Station.[65] This analysis incorporates information and analysis from other Responses to Comments by reference, where noted, and compares the technologies to determine which produces the "maximum reduction in entrainment warranted."

Based on information available at the time of the 2011 Draft Permit, EPA concluded that wedgewire screens were not technically feasible at Merrimack Station due to the physical constraints of the river (for the proposed design) and uncertainty over the potential biological effectiveness of the technology. Since 2011, however, PSNH submitted comments and supporting information, including a new design and plan for seasonal use that overcomes the feasibility

[65] EPA also considered PSNH's proposal to shift the annual Unit 2 maintenance outage to coincide with the typical peak entrainment period in mid-May to mid-June. EPA initially rejected rescheduling the outage by itself as the BTA for entrainment because it does not cover large periods when fish eggs and larvae are present and would not address entrainment losses from Unit 1 at all. *See* AR-618 at 297. EPA reconsidered rescheduling the maintenance outage in combination with wedgewire screens and again rejected this technology as the BTA for entrainment after considering the relative costs and benefits, including that the timing of the outage is subject to change, the timing of the peak entrainment period is subject to change, and the duration of the outage (and thus entrainment reductions) will be somewhat less than the projected average (33 days) in most years. At the same time, EPA recognizes that the timing of the outage, which must be scheduled anyway, could provide some benefit for entrainment and the Final Permit includes a condition, as a best management practice, to schedule this outage from mid-May to mid-June to the extent practicable.

issues and a new assessment of the potential effectiveness of the technology overall, and specifically at Merrimack Station (AR-1550). Based on this information, EPA concludes that wedgewire screens are an available technology to minimize entrainment at Merrimack Station. *See* Responses to Comments III.4(i), 4.1, 4.2. EPA notes that neither PSNH (the former operator) nor GSP (the current Permittee) have indicated to EPA that Merrimack Station has any plans to cease operations. As such, EPA anticipates that Merrimack Station will continue to operate, meaning remaining useful plant life does not affect the availability of any entrainment technologies.

Other than retaining open-cycle cooling, each of the available technologies results in environmental benefits for the Merrimack River associated with reduced entrainment. EPA considered the number of organisms entrained in the 2011 Draft Determinations Document (at 244-55, 314-15) and again in this Response to Comments and determined that levels of entrainment are not *de minimis* and Merrimack Station's open-cycle cooling system has no existing controls to reduce entrainment. *See* Response to Comment III.3.6. Compared to the current baseline (based on the traveling screens), closed-cycle cooling is expected to reduce entrainment by about 95% by reducing the intake flow. *See* AR-618 at 322. Based on entrainment data collected during the 2017 pilot study, PSNH estimates that seasonal use of wedgewire screens will reduce entrainment by 89%. AR-1550. Based on the same 2017 dataset, EPA estimated that rescheduling the Unit 2 maintenance outage to occur from mid-May to mid-June (to coincide with periods of higher entrainment densities) would by itself reduce total entrainment at the facility by about 34%.[66] If Merrimack Station installs wedgewire screens and reschedules the Unit 2 maintenance outage, EPA estimates that the combination of technologies would reduce entrainment by about 93%. *See* Response to Comment III.4(i). Closed-cycle cooling remains the most effective technology for minimizing entrainment, but wedgewire screens are expected to very substantially reduce entrainment as compared to existing conditions. Thus, the entrainment impacts on the waterbody of both technologies are expected to be similar. Compared to the other two technologies, rescheduling the Unit 2 maintenance outage, by itself, is not as effective at reducing entrainment, but when combined with seasonal use of wedgewire screens can approach entrainment reductions achieved by closed-cycle cooling.[67] The

[66] In 2007, Enercon estimated that rescheduling the Unit 2 maintenance outage could reduce entrainment by about 27% (AR-6 at 93, 95) based on entrainment data collected in 2006-2007. EPA's estimates are based on entrainment data collected during the 2017 wedgewire screen pilot study.

[67] EPA recognizes that the reduction in entrainment achieved with wedgewire screens (estimated by Normandeau to be about 89%) includes a level of uncertainty that the flow reductions achieved with closed-cycle cooling do not. In particular, some portion of larvae that are not entrained may still encounter the screens and suffer mortality. However, empirical studies of wedgewire screens suggest that hydraulic bypass and, for larger organisms (e.g., greater than 10 mm), larval avoidance may be a major factor in the effectiveness of wedgewire screens. At Merrimack Station, the relatively low design velocity of the screens (0.4 fps), airburst cleaning system, and likelihood that there is sufficient sweeping flow during the primary entrainment period (May through July) indicates that an effective ratio of ambient to through screen velocity (and therefore, hydraulic bypass) will maintained. In addition, entrainment studies in 2006, 2007, and 2017 indicate that many commonly entrained species (e.g., white sucker) are larger and better able to avoid the relatively low velocity of the screens. Finally, the Final Permit's requirement to schedule the Unit 2 outage from mid-May to mid-June and limitations on capacity factor to meet temperature limits from May 1 through September 30, coupled with the relatively low capacity of the Facility in May and June since transitioning to operations more similar to that of a peaking plant together will limit the number of days that the

EPA considered land availability inasmuch as it relates to the feasibility of entrainment technologies. Unit 2 is required to undergo an annual maintenance outage regardless of whether the timing is planned to maximize the entrainment benefits. For this reason, there is no land availability issue associated with rescheduling the maintenance outage. The limited number of screens required with the new, half-screen design ensures that there is adequate available space to install the screens in the Merrimack River. *See* Response to Comment III.4.2. Enercon agrees that there are no land availability issues associated with the operation of wedgewire screens at Merrimack Station. *See* AR-1549 at 12-16; *see also* Comment III.5.2.1 n.635. PSNH, in its comments in 2012 and again in 2017 suggests that there may be issues of land availability associated with closed-cycle cooling due, in particular, to the installation of new equipment in the period between Enercon's 2007 Engineering Report and the 2011 Draft Permit. *See* Comment III.5.3.1. EPA did not conclude that land availability would eliminate closed-cycle cooling as a viable technology at Merrimack Station and has addressed these comments in more detail in Response to Comment III.5.3, below.

EPA considered the potential impact of changes in particulate emissions or other pollutants associated with each technology. As explained in Response to Comment III.5, Unit 2 is required to undergo an annual maintenance outage regardless of whether the timing is planned to maximize the entrainment benefits. Air emissions would be reduced during this outage because Unit 2 would be out of service. However, because the unit is already shutdown annually, the timing of the outage will have no impact on air emissions or icing/fogging concerns. Similarly, there are no air emissions issues anticipated from the operation of wedgewire screens. *See* AR-1549 at 12-16; *see also* Comment III.5.4 n.635. Parasitic losses associated with wedgewire screens are due only to the periodic operation of the airburst system and as a result, are low (172 MWh per year), which is not expected to result in a measurable increase in air emissions. PSNH, in its comments in 2012 and again in 2017 indicate that there may be impacts from increased air emissions and icing/fogging associated with closed-cycle cooling. *See* Comment III.5.3.4. EPA did not conclude that air emissions or icing/fogging would eliminate closed-cycle cooling as a viable technology at Merrimack Station and EPA has addressed these comments in more detail in Response to Comment III.5.3.4, below.

EPA considered the quantified and qualitative social benefits and costs of available entrainment technologies. *See* Response to Comment III.5.2. Both closed-cycle cooling and wedgewire screen technologies result in a significant reduction in entrainment, though closed-cycle cooling results in the greater reduction. However, the difference in cost between the two technologies to save an additional 257,000-581,000 fish eggs and larvae ranges from $68 to $102 million. Weighing the social costs and benefits of the available technologies, EPA has determined that the benefits associated with preventing the entrainment of about 2.75 million (at AIF) to 6.8 million (at DIF) eggs and larvae warrant the cost of wedgewire screens. EPA concluded that the significantly

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Facility is operating, and thus the cooling water withdrawals, during the peak entrainment period. *See* Response to Comment III.4.2. *See also* Response to Comment II.1.1. For these reasons, EPA concludes that the uncertainty is not so great as to preclude a reasoned decision that wedgewire screen technology is the BTA for minimizing entrainment at Merrimack Station in light of the factors at 40 C.F.R. § 125.98(f)(2) and (3), including the relative social benefits and costs of the available entrainment technologies.

higher cost of closed-cycle cooling, which is estimated to cost 6 to 10 times more that wedgewire screens, is not warranted by the incremental benefits as compared to wedgewire screens.

EPA also considered additional factors for each of the available technologies, including thermal discharge impacts, credit for reductions in flow associated with unit retirements, impacts on the reliability of energy delivery, impacts on water consumption, and availability of alternative sources of cooling water (e.g., gray water). *See* 40 CFR § 125.98(f)(3). Merrimack Station has not retired any units in the past 10 years, nor has the Permittee indicated any plans for retirement of either unit in the future; therefore, there is no reduction in flow associated with unit retirement. Similarly, past engineering assessments have not identified an alternative source of water, such as process water, gray water, wastewater, or reclaimed water, that could provide the quantity and quality of cooling water needed at Merrimack Station. *See* AR-1231 Attachment 1 at 16-20. In addition, all the available technologies, independently or in combination, will result in an overall reduction in entrainment as compared to the existing technology.

Rescheduling the Unit 2 outage would not affect water consumption, thermal impacts, or energy reliability. There is no consumptive use of water at Unit 2 during the outage and shifting the timing will not affect this factor. The outage eliminates the thermal discharge associated with Unit 2 for the duration; however, the outage must occur each year and the only change would be to shift slightly its timing to coincide better with the peak entrainment period, thus shifting any potential benefit of reducing the thermal discharge into mid-May and mid-June. EPA has addressed the thermal impacts from the cooling water discharge in Chapter II of this Response to Comments. (Obviously, EPA understands that closed-cycle cooling, unlike wedgewire screens, would reduce thermal discharges, but as discussed in the responses to comments in Chapter II, EPA has developed thermal discharge limits for the Final Permit that will satisfy CWA § 316(a) without mandating closed-cycle cooling.) In addition, the maintenance outage would not impact energy reliability because, as explained, the electricity generating system already accommodates an annual outage. Merrimack Station has operated relatively little during the months of May and June over the past eight years and shifting the outage is not likely to have a measurable impact on the overall regional electric system, since it already operates most years without any power from Merrimack Station. PSNH did not comment that shifting the outage would impact energy reliability. In addition, the requirement to shift the outage to begin in mid-May would be subject to approval from ISO-NE, which would ensure that rescheduling the outage will not impact energy reliability.

Similarly, seasonal operation of wedgewire screens is not associated with any impacts on water consumption, thermal impacts, or energy reliability. Enercon concluded that the non-water quality and other environmental impacts from wedgewire screens are miniscule. *See* AR-1549 at 12-16; *see also* Comment III.5.2.1 n.635. Unlike closed-cycle cooling, which introduces an entirely new system of cooling the condensers that relies on evaporative cooling, wedgewire screens are an alternative method of withdrawing cooling water from the waterbody in an open-cycle cooling system and, as such, do not result in a consumptive use of water or alter the thermal discharge in any way.[68] *See* AR-6 at 19. Enercon estimates that operation of the airburst system will result in a parasitic load of only about 172 MWh per year, which is miniscule compared to the output from Merrimack Station (rated at more than 10,000 MWh per day) and will not impact energy reliability. Enercon also estimates that installation of the screens will require a construction outage (in addition to the annual maintenance outage), but expects that the outage can occur during periods when Merrimack Station is not likely to be generating (e.g., in spring or fall) and, therefore, will not be associated with impacts on energy reliability. The energy penalty and construction outage are also considered components of the social cost of wedgewire screens. *See* Response to Comment III.5.2. Finally, EPA addresses the potential impacts of water consumption and energy reliability in Response to Comments III.5.3.2 and 5.3.3, below.

Based on consideration of the factors at 40 CFR § 125.98(f)(2) and (3), EPA concludes that seasonal operation of wedgewire screens is the BTA for entrainment at Merrimack Station. In the detailed comments below, PSNH suggests that closed-cycle cooling may not be available at Merrimack Station based on consideration of land availability, energy reliability, water consumption, particulate emissions, and fogging/icing. EPA evaluates these comments in more detail below and concludes that, based on the available information, they do not eliminate closed-cycle cooling from consideration. However, EPA considered the numbers of organisms entrained, the social costs, and the quantified and qualitative social benefits of each of the technologies and determined based on the facts of this permit, that the cost of seasonal operation of wedgewire screens are justified by the entrainment benefits, whereas the costs of closed-cycle cooling are not justified by the benefits. See Responses to Comments III.5.2.1, 5.2.2, and 5.2.3 for a more detailed discussion of EPA's consideration of costs and benefits.

Because the Draft Permit proposed closed-cycle cooling as the BAT for reducing Merrimack Station's thermal discharges and as the BTA for minimizing entrainment, the Draft Permit did not include Outfalls 001 and 002, which are the once-through cooling system discharges at the facility. AR-608 at 12. Similarly, the Draft Permit included Outfall 003D for the discharge of blowdown from a new cooling tower array that would have been used to facilitate closed-cycle cooling. *Id.* at 17. Because the EPA has decided to grant a CWA § 316(a) variance from technology-based BAT thermal limits (and water quality standards-based requirements), *see* Responses to Comments II.1.1 and II.3.4 (and associated sub-comments), and concludes that seasonal operation of wedgewire screen technology, not closed-cycle cooling, is the BTA for entrainment at Merrimack Station, the Final Permit has been changed from the Draft Permit to once again include Outfalls 001 and 002 and to remove Outfall 003D. Similarly, the description of the discharge from Outfall 003 has been adjusted to include in the Final Permit the discharges from Outfalls 001 and 002 (once-through cooling water) and to remove the discharge from Outfall 003D (cooling tower blowdown). Consequently, the Final Permit also includes limitations and monitoring requirements for effluent flow and total residual oxidants ("TRO") for the once-

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[68] In addition, the 2011 Draft Permit proposed use of closed-cycle cooling was required to meet technology-based temperature limits. For the Final Permit, EPA reviewed additional information, including the substantially reduced operations, and established numeric thermal limits based on a CWA § 316(a) variance from technology and water quality-based limits. *See*, *e.g.*, Response to Comment II.1.1, II Section 3, and II Section 4. The Final Permit's § 316(a)-variance based temperature limits will control the potential impacts from the thermal discharge associated with open-cycle operations, including use of the wedgewire screens.

through cooling water at Outfalls 001 and 002. The effluent flow limits are equal to the flow limits from the 1992 Permit for each unit consistent with antibacksliding regulations at 40 CFR § 122.44(*l*). The TRO limits and conditions are set at the applicable requirements for once-through cooling water established in the effluent limitation guidelines for the Steam Electric Power Generating Point Source category at 40 CFR § 423.13(b). The effluent flow and TRO limits at Outfalls 001 and 002 are unchanged from the 1992 NPDES Permit. As in the 1992 Permit, although 40 CFR § 423.13(b) specifies limits for total residual chlorine (TRC), TRO sampling both ensures that this limit is met and allows the Permittee to use not only chlorine but also bromine as a biocide. *See also* Response to Comment VI.1.1. Furthermore, pursuant to 40 CFR § 423.13, the TRO limit for Outfalls 001 and 002 is a "maximum concentration" or instantaneous maximum limit not to be exceeded at any time. The Final Permit, therefore, includes footnote 9, which makes clear that this TRO limit is instantaneous and is not a maximum daily limit. *See also* Clarification of "Instantaneous Maximum" as Applied to Steam Electric Facilities Effluent Limitations, EPA-OW-OWM-359 (July 27, 1992), *available at* https://www3.epa.gov/npdes/pubs/owm0320.pdf.

5.3.1 Limited Land Availability at the Plant Makes Installation of CCC Complex if not Impossible

Comment III.5.3.1	**AR-1548, PSNH, pp. 163-164**
See also AR-846, PSNH, pp. 99-100; AR-864, Enercon, p. 42; AR-851 p. 5; AR-841, UWAG, p. 60; AR-1549, Enercon, p. 81	

Other than reference the general discussion for a proposed CCC location at Merrimack Station PSNH provided to the agency in response to a 2007 § 308 information request, EPA said nothing in its 2011 Fact Sheet to the Draft Permit to address this non-water quality issue.[660] EPA has failed again in its Statement to discuss this non-water quality issue even though the new final § 316(b) rule requires the agency to consider this issue "as it relates to the feasibility of entrainment technology."[661]

EPA's evaluation of land availability to accommodate CCC is wholly inadequate and is compounded by the fact that PSNH's previous submittal is now obsolete due to the installation of an FGD scrubber system that has taken up a lot of previously available land and created "accessibility" issues for interfacing any additional technologies to the main part of the plant. A 2012 report from Enercon updated the information contained in PSNH's 2007 § 308 Response and raised a number of potential logistical issues that may inhibit CCC installation due to the FGD system, such as the need for a new pumping station and condenser cleaning system, existing piping interfaces, site layout constraints (*i.e.*, limited available space), operating parameters, and water treatment and quality issues.[662] In actuality, additional studies must be conducted before EPA can definitively state that CCC can actually be installed at Merrimack Station.

Accordingly, it is unclear at the present time whether Merrimack Station has the necessary space to physically install CCC at the plant and EPA's failure to adequately address this regulatory factor is and remains arbitrary and capricious.

660 AR-618 at 140-141 (citing AR-6 at 34-35).
661 40 C.F.R. § 125.98(f)(2)(iii).
662 AR-864 at 42. If forced to install CCC at Merrimack Station, PSNH would ultimately have to consider running the necessary piping along the shoreline and within a narrow strip of land buttressed by railroad tracks that contains highly erodible sands and is within a shoreline protection zone. Obtaining the necessary construction and/or operational permits may be impossible.

EPA Response:

PSNH comments that it is "unclear" whether there is sufficient land available at Merrimack Station to support closed-cycle cooling and that EPA has not adequately considered this regulatory factor. In the § 308 request for information referenced in the comment, EPA asked PSNH to evaluate major modifications that would need to be undertaken to retrofit closed-cycle cooling. *See* AR-237 at 3. In its 2007 Engineering Report, Enercon determined that there were no constraints on space that would limit Merrimack Station's ability to install wet cooling towers and associated infrastructure based on the evaluation and proposed design.[69] *See* AR-06 at 36, 38-39. The 2011 Draft Determinations Document did consider the issue of land availability in that EPA requested and was provided with information about the siting of cooling towers at Merrimack Station. EPA also notes that the Draft Permit was issued prior to the Final Rule, meaning that, at the time of issuance, there was no regulatory requirement for EPA to specifically consider land availability in establishing the BTA for entrainment. Land availability is one of the factors that must now be considered when establishing site-specific requirements for entrainment under the Final Rule. 40 CFR § 125.98(f)(2)(iii). For this reason, and based on the comments, EPA is revisiting its consideration of land availability for closed-cycle cooling.

In the TDD for the Final Rule (AR-1718 at 12-6 to 12-7), EPA discusses space constraints as they apply to availability of technologies for impingement and entrainment. On a national scale, EPA estimated that as many as 25 percent of facilities might have one or more constraints on land availability that would limit retrofit of cooling towers, particularly those located in urban locations or those located on relatively small acreage. *See also* Final Rule Response to Comment at 190-91. Similarly, EPRI (Technical Report 1023452) reported that at least 6% of sites (7 out of the 125 evaluated) were deemed "infeasible" for closed-cycle cooling on the basis that no space was available to locate a cooling tower. EPA notes that in both evaluations, the factor in determining that closed-cycle cooling was infeasible due to space constraints was lack of space to site a cooling tower and was not related to the logistical challenges associated with the piping and infrastructure. Merrimack Station is located on a large, industrial use parcel in Bow, New Hampshire. The area is largely forest and the nearest residential neighborhood is on the other side of the Merrimack River. As Enercon indicated in its initial analysis, there does not appear to be any obvious constraints on land availability for cooling towers as it was considered under the

[69] By comparison, PSNH concluded that dry cooling towers were infeasible at Merrimack Station, based in part on available space at the site, AR-06 at32-33, which EPA considered in its determination that dry cooling is not the BTA for Merrimack Station, Fact Sheet, Att. D at 304.

Final Rule. The additional complexities raised in the comment does, however, have the potential to increase the cost of closed-cycle cooling.

PSNH and Enercon, both in comments on the 2017 Statement as well as on the 2011 Draft Permit, point to challenges in siting closed-cycle cooling given the installation of the FGD system, which occurred between issuance of the Draft and Final Permits. According to PSNH, the FGD scrubber system has taken up previously available land and created "accessibility" issues for interfacing additional technologies that may impact both the cost and space available for installation of CCC. PSNH commented in 2011 that it was "unclear" whether Merrimack Station has the necessary space to physically install cooling towers. AR-846 at 99. Enercon raises logistical concerns that space previously assumed to be available for new piping additions may no longer be available. AR-1549 at 81. The 2007 Engineering Report (AR-06 at 38-39 and Attachment 2) indicated that cooling towers would be located south of the Station on the island created by the discharge canal, which provides adequate space, is relatively close to the Station to minimize piping work and requires minimal earthwork. Enercon also evaluated necessary electrical power supply modifications and noted that the new booster pumphouse would be located where the circulating water piping discharges to the cooling canal with associated piping running from the pumphouse to the towers, and new piping (supplying cooled water to the power plant using the existing circulating water pumps) running along the shoreline of the Merrimack River from the towers to the existing screen houses. At this time, Enercon noted "available space would be adequate for a linear hybrid tower" AR-06 at 36. PSNH has not provided any information to indicate that there is any constraint at Merrimack Station for locating the cooling towers themselves, which then leaves the question of constraints on associated infrastructure and piping. Enercon states "the circulating water return (cold-water) piping from the cooling tower basin would also cross the canal along the roadway built-up area, and the run northeast to supply the existing circulating water pump intakes at the Intake Pumping Station." *Id*.

While PSNH and Enercon both claim that site constraints exist as a result of the installation of the FGD system, neither has identified a specific conflict between the preliminary cooling tower designs and the existing FGD system to support a conclusion that closed-cycle cooling is unavailable due to land availability. Site plans and flow diagrams for the FGD system do not suggest any interference from the new booster pumping station, cooling towers, or substation, all of which are located on the island, along the road to the existing discharge, and along the river shoreline to the existing intake. *See* AR-463.

In 2011, PSNH commented that additional studies are necessary to definitively conclude if closed-cycle cooling can be installed at Merrimack Station. AR-846 at 100. If EPA determined that closed-cycle cooling is the BTA for entrainment in the Final Permit, additional studies and planning would be necessary to finalize the design and location of the towers. In particular, the presence of the FGD system may require adjustments to the installation and routing of piping for the cooling towers as several components of the FGD system are situated above and next to the screen house where the 2007 design had planned for the cold water return pipes for the closed-cycle system. *See* AR-1804. TetraTech reviewed satellite imagery, site photos, and plans of the FGD system to assess whether its presence may require modifications to, or affect the cost of, the conceptual plan for a closed-cycle cooling system at Merrimack Station. Both the FGD flue gas conduits and the limestone conveyer are located where the cold water return pipes for Units 1 and 2 were planned, but in both cases there appears to be sufficient clearance to allow installation of the piping. Installation may be more complicated due to congestion in the area but it does not suggest that closed-cycle cooling is unavailable. The complexity of the piping will likely increase the cost of the technology. *See id*. As EPA has already determined that the costs of closed-cycle cooling are not warranted as compared to the costs of wedgewire screens, any additional costs resulting from changes to the routing of piping would further support the determination that wedgewire screens are the BTA for entrainment at Merrimack Station.

Consistent with the 2014 Final Rule and in response to comments on the Draft Permit and the 2017 Statement, EPA reconsidered the feasibility of closed-cycle cooling as it relates to land availability at Merrimack Station. EPA concludes that there are no apparent land availability constraints to the installation of the towers or associated structures at the site. The construction of the FGD system may increase the complexity of installing the associated piping, but nothing in the review of available information suggests that the issues are insurmountable. Nor has PSNH (nor Enercon nor UWAG) identified any specific issues that would render the technology infeasible due to land availability. At the same time, the issues PSNH has raised, particularly the complexity of the piping with existing FGD infrastructure, would likely increase the cost of closed-cycle cooling, which EPA has already determined are not justified by the benefits of the technology in comparison to the costs and benefits of wedgewire screens.

5.3.2 EPA Incorrectly Dismisses as Insignificant the Expected Lost Generation that Will Occur if CCC is Installed at Merrimack Station

Comment III.5.3.2	**AR-1548, PSNH, pp. 164-165**
See also AR-846, PSNH, pp. 98, 188-199; AR-864, Enercon, pp. 28-30	

EPA noted in its 2011 Fact Sheet that PSNH estimated an approximately 10 megawatt (“MW”) reduction in the average, annual electricity output at Merrimack Station if forced to install CCC.[663] Specifically, 2.98 MW of that expected loss would be caused by condenser efficiency losses due to the increased temperature of cooling water provided to it. The remaining 6.7 MW is not lost, per se; instead, it would be needed to power the total booster pumps and tower fans necessary to run CCC at the plant.[664] Despite acknowledging this anticipated reality, EPA ignored the resulting consequence of these expected parasitic power generation losses eliminating enough electricity from the grid to power over 7,900 households.[665] Enercon put these numbers into proper perspective:

> If conversion to closed-cycle cooling became the standard for all power plants in the United States, the generating capacity of the Nation’s fleet would be substantially impacted. Assuming all open-cycle power plants in the United States were required to be converted to closed-cycle cooling, it is estimated that approximately 166 million MW-hr per year of generating capacity would be lost . . . This represents enough electricity to power

> approximately 15.5 million average American households . . . Approximately 40 power generating stations the size of Merrimack Station would have to be built to make up the lost generating capacity.[666]

The retirement of electric generating facilities in recent years only further exacerbates this issue, as removal of this substantial amount of electricity from the grid could dramatically impact the reliability of energy delivery.

In its 2017 report, Enercon suggests EPA initiate a rigorous analysis of how CCC would impact the generating capacity of Merrimack Station.[667] Were EPA to continue to erroneously advance CCC as the proper technology the facility, the agency must first initiate some form of modeling to consider not only the power consumption impacts to Merrimack Station but also the macro effects of setting such a standard within the industry prior to identifying the technology as BTA. The agency's failure to do so in its 2011 Draft Permit and again in its Statement is arbitrary and capricious.

663 AR-618 at 156-57 (citing to AR-6).
664 *See* AR-06 at 45; AR-864 at 28.
665 *See* AR-864 at 28-29.
666 *Id.* at 29 (internal citations omitted).
667 Enercon 2017 Comments at 17.

EPA Response:

The comment requests that EPA assess how retrofitting with closed-cycle cooling will impact the generating capacity of Merrimack Station, including modeling to consider power consumption impacts. The comment does not explain why Enercon's estimate of parasitic losses (annual average loss of 10 MW with up to 22 MW lost during summer peak) would be significant other than the statement that it would power 7,900 homes. EPA did consider the potential impact of lost generation of the reliability of the regional electric system and concluded that there are no issues that would make the technology unavailable. *See* AR-618 at 163-164. EPA and Enercon recognize that 7,900 homes would not be impacted by the retrofit to closed-cycle cooling, rather, the generation would be made up by additional generation by Merrimack Station or by other facilities in the region. In addition, PSNH requests the EPA "initiate some form of modeling" to consider the power consumption impacts from converting to closed-cycle cooling. Enercon provided an estimate of the lost generation at Merrimack Station and while a model might, as Enercon points out, provide a "more rigorous" estimate of the impact (AR-864 at 30), it is unlikely that a more precise estimate would be sufficiently different to warrant the cost of modeling given the relatively small annual loss (10 MW). In addition, if modeling were initiated, the necessary data and site-specific operating information would be more readily accessible to PSNH, not EPA. If PSNH felt that lost generation from converting to closed-cycle cooling was significant enough as to disqualify closed-cycle cooling as an available technology at Merrimack Station, it has had ample time to provide such an analysis.

PSNH's comments in 2011 and 2017, including the excerpt from Enercon's comments above, also focus on the impacts to the reliability of the electrical grid that would result from selecting closed-cycle cooling as the "standard within the industry." The 2014 Final Rule did not select closed-cycle cooling as "the standard for all power plants in the United States." (Nor, obviously, did the Draft Permit, which was applicable to a single facility). Enercon's analysis of the national impacts may be accurate but is unrealistic because it "[a]ssum[es] all open-cycle power plants in the United States [a]re required to be converted to closed-cycle cooling," which is not the case. In the 316(b) Final Rule, EPA determined that a "one-size-fits-all" approach is not feasible and adopted "an overarching regulatory framework under which the Director will establish BTA entrainment requirements on a site-specific basis following prescribed procedures and applying specified factors for decision-making." 79 Fed. Reg. 48,342.

In 2011, EPA considered the impacts of converting Merrimack Station to closed-cycle cooling on the reliability of the regional electric system. *See* AR-618 at 163-164. Based on the information provided by PSNH and Enercon, EPA concluded that even an estimated peak loss of 22 MW represents just 0.1% of the region's 2008 total electric generating capacity and the region can reliably absorb a 22 MW loss. *Id.* In addition, since the 2011 Draft Permit, Merrimack's role in the regional energy market has decreased, particularly the significance of the Station's operation to the overall reliability of electric power in the area. The region's reliance on coal-fired generation such as Merrimack Station continues to decrease as capacity from natural gas, wind, and photovoltaic resources increase. Economic dispatch of coal-fired resources tends to be during winter, when natural gas resources are most likely to experience constraints. *See* AR-1745. *See also* Responses to Comments II.1.1, II.3.2.3.

PSNH's comments (with supporting comments from Enercon) do not support a conclusion that the lost generation at Merrimack Station would be significant enough as to make this technology unavailable. At the same time, as explained elsewhere in this Response to Comments, in light of new information on the availability of wedgewire screens and after considering the relative costs and benefits of available technologies (including the cost of lost generation) consistent with 40 CFR § 125.98(f)(2), EPA ultimately concluded that wedgewire screens, not closed-cycle cooling, is the BTA for entrainment at Merrimack Station.

5.3.3 Increased Water Consumption Due to CCC at Merrimack Station Will Remove an Alarming Amount of Water from the Hooksett Pool Each Day

Comment III.5.3.3	**AR-1548, PSNH, pp. 165-167**
See also AR-1549, Enercon, pp. 12-13; AR-846, PSNH, pp. 100-101; AR-864, Enercon, pp. 16-19; AR-851, CLF, pp. 19-24	

EPA summarily dismissed this critical issue in its 2011 Fact Sheet. In reaching a conclusion that evaporation associated with CCC operations would not have adverse impacts in the Hooksett Pool, EPA argues without support that the substantial, daily water loss anticipated with CCC must be similar to the evaporation rate currently experienced with Merrimack Station's open-cycle system.[668] The agency cites only to Merrimack Station's thermal discharges to baldly assert that such discharges "probably increase[] evaporation rates from the Hooksett Pool itself."[669] These unsubstantiated statements by the agency are not true. In reality, it is generally recognized within the industry that CCC technologies "consume 70-90% of the water they withdraw as opposed to an open-cycle system[s] which discharge nearly 100% of the water they withdraw."[670]

Enercon estimated in its 2012 report that approximately 4.79 MGD would be lost due to evaporation from the Hooksett Pool if CCC is installed at Merrimack Station.[671] This equals the consumption of approximately 3,325 gallons of water per minute and approximately 2,640 Olympic-sized swimming pools per year.[672] The amount of water lost to evaporation due to PSNH's current thermal discharges and spray module system in its discharge canal pales in comparison. This is partially due to the fact that the power spray modules spray effluent into the air to cool the water through the process of convection—not evaporation—and because the modules are operated only under certain seasonal thermal conditions. Thus, in response to EPA's 2011 Fact Sheet, Enercon acknowledged that "[t]here is an incremental increase in the amount of evaporation that occurs within the Hooksett Pool as a result of elevated water temperatures" but noted that this evaporation is properly attributable to naturally occurring heat transfer due to higher ambient water temperatures within the waterbody.[673] Enercon concluded its critique of EPA's self-serving dismissal of this water consumption issue in the 2011 Fact Sheet by stating:

> [W]hile the exact amount of additional evaporation loss that occurs is difficult to determine, it is known that more water loss occurs in a closed-cycle system using cooling towers than one using a cooling pond . . . [and that] closed-cycle systems evaporate 2 to 3 times more water than open-cycle systems. This negates the possibility that the evaporation occurring in the river due to increased temperatures exceeds that of cooling towers.[674]

In its 2017 report, Enercon provides the following additional cautionary note to convince EPA this water consumption issue deserves a greater level of concern:

> A survey of State Water Managers across the United States designated New Hampshire as one of the more concerning states with respect to expected water shortages. The increased frequency of water shortages is only compounded by increased population growth and a need for more water and electricity. In these circumstances, it is possible that plants retrofitted with closed-cycle cooling may need to return to open-cycle cooling operation for water conservation purposes.[675]

In the end, it is clear EPA's consideration of this water consumption issue in its 2011 Fact Sheet was inadequate, arbitrary and capricious and must be revisited if the agency erroneously elects to require installation of CCC at Merrimack Station to satisfy § 316(b)'s BTA standard.

668 AR-618 at 163.
669 *Id.*
670 Enercon 2017 Comments at 12-13.
671 *See* AR-864 at 17.
672 *See id.*
673 *Id.*
674 *Id.* (internal citations omitted).
675 Enercon 2017 Comments at 13.

EPA Response:

Under the Final Rule at 40 CFR § 1245.98(f)(3)(v), one of the factors that may be considered in determining the site-specific entrainment requirements is the impact on water consumption; however, EPA's analysis suggests that water consumption is unlikely to be a significant factor influencing the choice of cooling system in most waterbodies. For the rulemaking, EPA concluded that, although evaporative losses from closed-cycle cooling are likely greater than that of once-through cooling for a given site, the difference is minimal in terms of gallons lost and in most cases are minor compared to river flow. *See* AR-1718 at 10-11 and AR-1697 at 163-64. In most cases, evaporative losses are minor compared to river flow, with the possible exception of areas with extreme limitations on water availability (e.g., the southwestern desert) or those prone to extreme drought conditions. *See* AR-1807. In the preamble to the Final Rule, EPA stated that its "analysis does not suggest that the difference [in evaporative losses between closed-cycle and open-cycle systems] is substantial enough to outweigh the significant reduction in adverse environmental impacts to aquatic organisms." 79 Fed. Reg. 48,333. For the Final Rule, EPA determined that "the relative difference in evaporation is not so great that it will play a major role in determining a cooling system type in most watersheds." 79 Fed. Reg. 48,333. In particular, the Response to Comment for the Final Rule states that "a source water that is supposedly too small to support a cooling tower (due to evaporative losses) is also too small a source water to provide adequate flow for a once-through cooling system." AR-1697 at 164. It is unclear why PSNH and Enercon now believe that evaporative losses from Hooksett Pool due to cooling towers would represent a significant loss from the Hooksett Pool, especially given that neither indicated that such losses would be significant in 2007 and have not provided any context or additional information in support of this argument. Available information indicates that the operation of a wet cooling system will result in the loss of a relatively small volume of cooling water to evaporation although EPA recognizes that, in nearly all cases, evaporative losses are greater with a wet closed-cycle cooling system than with once-through cooling.

According to PSNH, the amount of water lost to evaporation with the existing once-through system "pales in comparison" to the estimated 4.79 MGD that would be lost due to evaporation with closed-cycle cooling. The power spray module (PSM) system is a series of spray nozzles in the cooling canal that spray a portion of the cooling water discharge flow from the canal into the air. PSNH does not estimate the amount of water lost to evaporation with the existing system or provide any scientific basis for the assertion that the PSMs rely primarily on convection. In fact, the 2007 Engineering Report does not mention convection but does relate the principle of the PSMs to evaporative cooling towers, in that the performance of both is bound by an approach to wet bulb parameter. AR-6 at 20. Both PSMs and cooling towers mechanically induce an increase in the surface area of contact between heated cooling water and ambient air through formation of suspended water droplets and both use a combination of evaporation and convection. This mix is dependent on meteorological conditions, particularly relative humidity. Greater air flow through cooling towers maximizes surface area and duration and will evaporate more water than the PSMs. However, PSNH did not quantify the difference in evaporation between the PMSs and cooling towers at Merrimack Station to support its assertion that EPA's analysis was inadequate or that this issue of water usage from cooling towers is "critical" for this site.

In its comments, Enercon refers to literature suggesting that closed-cycle systems evaporate 2 to 3 times more water than open-cycle systems. In its 2007 Engineering Report, Enercon estimated the evaporative losses for cooling towers at 4.79 MGD but did not identify evaporation as a concern. See AR-6 at 54 and AR-102 at 15-16. The 2007 Engineering Report's entire analysis regarding the potential impacts of water consumption amounts to a single statement (repeated twice) that "cooling towers evaporate large quantities of water which are effectively lost from the source water body." AR-06 at 54, 116. If Enercon is correct that closed-cycle systems evaporate 2 to 3 times more water than open-cycle systems, the existing system would evaporate from 1.6 to 2.4 MGD, [70] or even slightly more.[71] PSNH has offered no basis to support its assertion that such additional losses (up to 3.2 MGD) from cooling towers would be "alarming" or have any measurable impact on the Hooksett Pool. Even using Enercon's highest estimate, the loss of an additional 3.2 MGD (4.95 cfs) represents 0.9% of the river's 7Q10 flow (578 cfs) and 0.11% of mean annual flow (4,551 cfs) as estimated at the time of the 2011 Draft Permit. *See* AR-618 at 8 AR-6 at 14. In the context of river flow, the evaporative losses expected from closed-cycle cooling are unlikely to be at levels that would impact the Hooksett Pool.

When once-through cooling is used to withdraw a significant portion of the source waterbody, the return of heated water may contribute to greater evaporation from the waterbody relative to the normal evaporation rate.

The magnitude of the additional loss due to evaporation is especially uncertain in light of the likely existing evaporative losses under the current system. Both the 2011 Draft Determinations Document (p. 162-163) and Enercon's comment recognize that there is some unquantified volume of water currently lost with the once-through system. Enercon qualifies this volume as "very small" though the 2011 Draft Determinations Document suggests that it may not be clear which system results in greater overall evaporative losses. A 2011 EPRI study of the environmental impacts of retrofitting power plants with closed-cycle cooling states "net consumptive loss in converting a once-through cooling system to CCC must also account for the loss due to excess evaporation from the warmer discharge plume from the once-through cooled system. AR-1808 at 3-15. Since this involves the entire cooling flow, and not just blowdown, this loss can be significant and can offset a significant portion of the loss that would occur with a CCC tower."

[70] 4.79 MGD ÷ 3 = 1.6 MGD
4.79 MGD ÷ 2 = 2.4 MGD

[71] Enercon's estimate appears to assume no evaporative losses when the PSMs are operating, although Enercon concedes elsewhere that "the PSMs do evaporate a small amount of water." AR-864 at 17.

In 2011, Enercon commented that several power plants in the Southeastern U.S. had to shut down or reduce operations in 2007 due to water shortages. According to drought data from August 2007, this time period was characterized by very hot and dry conditions over much of the southeastern U.S. (https://www.ncdc.noaa.gov/sotc/drought/200708). EPA recognizes that during periods of extreme drought, the consumption of water by power plants may have a greater impact on water resources, and in extreme cases, may require plants to curtail power generation or shut down. However, there is no evidence that plants in the northeastern U.S. have had to curtail power due to drought. In addition, the power plants referred to in the reference (AR-864 at 19) were once-through systems and had to shutdown because river levels became too low for the intakes to operate properly or because the temperature of the receiving water was too warm. See AR-1669. The report does not relate the curtailment of power production during drought to evaporative losses due to closed-cycle cooling towers.

According to PSNH, Enercon's comment about the expected "regional" water shortages anticipated by the State Water Manager for New Hampshire in the 2003 survey of State Water Managers is a "cautionary note" that about the potential importance of water consumption from cooling towers. In response, EPA reviewed the most recent survey data conducted in 2013. The State Water Manager for New Hampshire anticipated "local" water shortages in 2013, a reduction from the 2003 "regional" scale. Of the 43 states that responded to the survey in both 2003 and 2013, New Hampshire was among six states whose expectation of water shortages decreased between the two surveys. EPA also notes that Enercon's statement that only one state had a more negative outlook than New Hampshire was misleading because it ignored the many states that were equally concerned – in the 2003 survey, only one state had an expectation of water shortages on a statewide level (Colorado), while 17 states, including New Hampshire, had expectations of regional shortages. In the 2013 survey, 25 states had more negative outlooks on the likelihood of water shortages than New Hampshire, while 15 states, including New Hampshire, expected "local" water shortages. *See* May 2014 GAO Report to Congressional Requesters: Freshwater Supply Concerns Continue, and Uncertainties Complicate Planning (GAO-14-430).

EPA recognizes that while water resources are not considered scare in New Hampshire due, in part, to its temperate climate and generally abundant precipitation, the region does experience periodic drought conditions. However, EPA believes that the relatively low volume of water expected to be lost from the Merrimack River due to evaporation as a result of the use of closed-cycle cooling, as described in this comment and response, is unlikely to have a measurable, long-term impact on water resources such that the technology would be considered unavailable due to water consumption. Regardless of this factor, however, EPA already determined that the costs of closed-cycle cooling are not warranted as compared to the costs of wedgewire screens and that closed-cycle cooling is not the BTA for entrainment at Merrimack Station.

5.3.4 Increased Air Emissions as well as Fogging and Icing Associated With CCC Offset Any Purported Environmental Benefit of the Technology

Comment III.5.3.4	AR-1548, PSNH, pp. 167-170
See also AR-846, PSNH, pp. 98, 100; AR-864, Enercon, pp. 25-26, 32-34, 45; AR-1549, Enercon, pp. 14-16, 78-80	

40 C.F.R. § 125.98(f)(ii) requires EPA to consider the "[i]mpact of changes in particulate emissions or other pollutants associated with" CCC. EPA's assessment of this issue essentially consists of a conclusory assertion that significant air emissions are not anticipated but that air pollution control laws would adequately control such emissions were they to occur.[676] Through its extensive knowledge and experience with CCC technologies, Enercon knows air emissions would be increased at the facility both through increased stack emissions and new air emissions from the cooling towers.[677] Enercon explains:

> Although the content of the stack emissions would be unaffected, the quantity would increase if closed-cycle cooling were to be implemented due to increased parasitic losses resulting from the cooling tower's electricity demands, reduced efficiency of the turbine and condenser due to warmer condenser water, and increased coal consumption to make up for the newly incurred operational efficiency losses.
>
> There would also be an increase in air emissions resulting from the operation of new cooling towers. Cooling towers are known air emitters that are subject to regulatory air pollution controls. Although EPA dismisses particulate emissions as a serious concern because high quality drift eliminators were specified in the preliminary design, even state-of-the-art drift eliminators still allow some drift to occur. It is estimated that approximately 2,880 gallons of water a day would escape the tower via drift. As a result, it is possible that additional water treatment equipment would have to be installed for any cooling tower to be operated and/or permitted, which could lead to significantly increased costs.[678]

Enercon also notes that EPA inadequately assessed potential icing/fogging concerns associated with CCC in its 2011 Fact Sheet and that this issue is, in fact, "a safety concern that requires a rigorous analysis."[679] Formation of a cooling tower plume decreasing visibility around the facility, "black ice" forming on nearby roads and highways during Winter, damages to vegetation in the vicinity of Merrimack Station, "degradation of the Station heating, ventilating, and air conditioning (HVAC) systems, increased corrosion on Station equipment, and ice accumulation on electrical equipment which could lead to electrical arcing," are all mentioned as possible effects of CCC operations.[680] In fact, Enercon suggests EPA utilize or request a comprehensive modeling program (such as SCATI) to adequately assess these anticipated icing/fogging impacts.[681]

Enercon's discussions of the air emissions and icing/fogging issues reveals that EPA needs to reconsider the cumulative effects of CCC technologies. These anticipated issues clearly offset supposed benefits of the technology and could lead to increased water treatment costs. The agency's discussion of this issue in its 2011 Fact Sheet is paltry. A thorough and reasoned assessment of these issues is now mandatory pursuant to the final § 316(b) rule, meaning EPA must address them prior to attempting to classify CCC as BTA for Merrimack Station.

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676 *See* AR-618 at 156-59.
677 *See* Enercon 2017 Comments at 14-15.
678 *Id.* at 15-16 (citations omitted).
679 *See id.* at 16.
680 *See id.* (citations omitted). Notably, icing concerns are a non-water quality environmental impact that undercuts and/or works against EPA's 2011 decision that installation and year-round operation of CCC is required to satisfy BAT for thermal discharges from Merrimack Station. *See* 33 U.S.C. § 1314(b)(2)(B) (requiring EPA to consider, among other things, non-water quality environmental impacts (including energy requirements) in rendering a BAT determination for thermal discharges). Each of the non-water quality environmental impacts discussed in Part III.E.3. of these comments therefore applies equally to critique EPA's § 316(a) BAT determination for Merrimack Station. Enercon provides the following additional discussion regarding icing concerns associated with CCC technologies in climates similar to New Hampshire, especially for plants that undergo frequent start-ups and shutdowns:

Icing is a primary concern for cooling tower systems operating in freezing conditions, particularly those with frequent startups and shutdowns. Excessive icing can be mitigated through proper maintenance of the cooling tower system; however, final mitigative measures are often left to operator action. Of the mechanical draft designs, induced draft cooling towers are more capable of mitigating icing concerns than forced draft designs; this is largely because induced draft designs inherently pass heated air over the mechanical components, reducing their icing risk (Reference 12.15, Page 7). However, even induced draft cooling towers can build unacceptable levels of ice within the tower, beginning with air inlet louvers and heat transfer fill. This ice build-up can challenge the structural design of the cooling tower if appropriate and timely operator action is not taken to mitigate the icing effect. This presents a significant risk and challenge to the operators and additional costs to the plant (Reference 12.15).

Frequent plant startups and shutdowns during freezing conditions only further complicate and increase the icing risk. During shutdown periods, the cooling tower system would need to be winterized to address the risk of complete freezing of the water basin. Winterization could be accomplished through a number of options including full system draining, installation of a bypass system to ensure that basin water does not stagnate, or installation of a basin heating system. However, these options add additional engineering design costs, construction/maintenance costs, and/or required additional operator actions at the Station for a period when there is no requirement for entrainment control (Reference 12.16, Pages 6-7).

In addition to icing of the cooling tower itself, additional concerns exist for fogging and icing of the surrounding area due to the cooling tower plume. The persistency of cooling tower plumes is typically much greater in the winter due to the decreased air temperature and air moisture capacity. Plumes can present visibility issues downwind of the tower due to fogging and localized freezing/icing concerns as entrained water freezes out of the air onto roads, powerlines, and other equipment.

Lastly, there are other maintenance, reliability, and safety issues associated with frequent cooling tower startups and shutdowns, regardless of the concurrent weather. Transients are introduced during each startup and shutdown of the cooling tower equipment which may subject the equipment to excessive mechanical vibration which can degrade plant equipment and present additional maintenance and capital costs for the plant (Reference 12.17, Page ii). Under freezing conditions, ice that has formed on the cooling tower fan blades can be thrown through the air for several minutes upon startup, creating the potential for damage to the surrounding equipment. Additionally, deposits and bacterial growth that form during periods of inactivity must be monitored and remediated before startup. Left unattended, these deposits and bacterial growths can degrade the cooling tower efficiency, damage plant equipment, and in some cases, endanger the health and safety of the plant employees and public (Reference 12.17, Pages 3, 19, and 26; Reference 12.18, Page 6; Reference 12.19, Pages 2 and 10). Growth of Legionella bacteria is of particular concern with cooling tower operation as Legionella bacteria are ubiquitous in aqueous environments, including the recirculating water of cooling towers. If not properly maintained, all 50 species of Legionella can potentially become pathogenic (Reference 12.18, Page 2). Once again, these maintenance and operator requirements present additional risk, challenges, and costs to the Station which would be incurred throughout the life of the plant, including those periods when there is no requirement for entrainment control. Enercon 2017 Comments at 78-80.

681 *Id*. at 16.

EPA Response:

In the July 2007 CWA Section 308 Information Request (Section 5(h)), EPA requested that PSNH "describe in detail the non-water quality environmental impacts (including energy, air pollution, noise, public safety), if any, that you have determined will occur from the use of each technology." AR-237 at 4. In the 2007 Engineering Report responding to this request (AR-6), Enercon indicated that closed-cycle cooling could be retrofitted at Merrimack Station. With respect to air emissions, Enercon stated that "closed-loop operation of the Station would generate more stack emissions and material waste per net unit of electricity generated than the Station's current cooling water system," but Enercon neither quantified the increase nor concluded that the increase would be at a level that would potentially make closed-cycle cooling unavailable at Merrimack Station. AR-6 at 55. The Engineering Report also raised concerns that the plume could cause fogging and icing during winter months, which could impact local roads and highways. *See id*. at 51. But again, the Report does not quantify the impacts of potential vapor-related issues or suggest that they would threaten the availability of cooling towers at Merrimack Station. The closed-cycle cooling design proposed in the Engineering Report favored hybrid, or plume abated, towers which are substantially more costly than a non-plume abated tower but will significantly reduce the impacts of drift and vapor plume. *See id*. at 39; *see also* AR-1740 at 7-29.

The 2011 Draft Determinations Document (at 156-167) evaluated the potential impacts from both increased air emissions and icing/fogging from the vapor plume based on the information available at the time, including information provided by PSNH and Enercon, evaluation of Regional energy markets and air emissions policies, EPA staff consultation with engineers familiar with the operation of closed-cycle cooling at other facilities in cold climates, and modeling analysis of vapor plumes performed for other facilities. *See, e.g.*, Telephone Memorandum, Sharon Zaya, U.S. Envtl. Prot. Agency (Jan. 4, 2002) (regarding Call with Ken Daledda, Bergen Station, New Jersey) (AR-744); Memorandum from Mark Stein, U.S. Envtl. Prot. Agency, to Brayton Point NPDES Permit File (Dec. 12, 2001) ("Brief Notes on an Issue Discussed During Conference Call with John Gulvas of Consumers Energy and the Palisades Nuclear power station in Covert, Michigan") (AR-745); 39 Fed. Reg. at 36,192; EPA TDD 2001 – New Facilities at 3-33; Badger Power EIS, Exec. Sum. at xvii, xviii, 18–19, 72–75, 137–39 (AR-380); AES Londonderry Highlights at 6 (AR-743); Nuclear Regulatory Comm'n, Generic Environmental Impact Statement for License Renewal of Nuclear Plants (NUREG-1437 Vol. 1) §§ 4.3.4.2, 4.3.5.1.1, 4.3.5.1.3 (AR-721); Response to Comments Document, Public review of Brayton Point Station NPDES Permit No. MA 003654 (Oct. 2, 2003), App. M (evaluation of possible water vapor plumes from mechanical draft wet cooling towers (not hybrid towers) installed at a power plant) (AR-742). EPA concluded that 1) resulting increases in air emissions would be modest and controlled through federal and state air pollution control laws and 2) plume-related fogging or icing issues would be limited to local roadways, would not affect the closest major highways, and could be mitigated by traffic safety measures. AR-618 at 156-67.

In this comment, PSNH requests that EPA reconsider the cumulative effects of closed-cycle cooling, arguing in a conclusory fashion that the anticipated air-related issues "clearly offset supposed benefits of the technology and could lead to increased water treatment costs." In its 2012 comments, PSNH commented that EPA "failed to adequately consider and/or improperly dismissed as immaterial" secondary environmental effects including, but not limited to, increased air emissions, icing/fogging concerns, and any drift and vapor plume issues. AR-846 at 98. EPA notes that despite two public notice periods, PSNH has never indicated any specific inadequacy in EPA's evaluation of air-related impacts or demonstrated that consideration of these factors would lead to a conclusion that closed-cycle cooling is unavailable on a site-specific basis. PSNH and Enercon's comments are limited to statements that "the quantity [of stack emissions] would increase due to increased parasitic losses" and that there would be "an increase in air emissions resulting from the operation of new cooling towers." Neither PSNH nor Enercon quantify what the increase would be or provide any context for how the increase might impact air quality or site-specific issues in New Hampshire.

When establishing site-specific entrainment controls, one of the factors EPA must consider under the 2014 Final Rule is the "[i]mpact of changes in particulate emissions or other pollutants associated with entrainment technologies." 40 CFR § 125.98(f)(2)(ii). While EPA agrees that air emissions can result from increases in stack emissions due to increased fuel usage, emissions from the towers themselves, and plumes of water vapor, *see* 79 Fed. Reg. 48,341, an increase alone is not necessarily enough to make closed-cycle unavailable at a particular facility. The quantity and the impact of increases are what's relevant. EPA explained why it expected an increase attributable to converting Merrimack Station to closed-cycle cooling to be "very modest," including that Enercon had proposed highly efficient drift elimination equipment to minimize emissions from the cooling towers themselves and that the increase in generation needed (to make up for parasitic losses and reduced condenser efficiency) represented less than 0.1% of total electrical generation in the region. AR-618 at 157-59. PSNH's and Enercon's comments never truly grapple with this analysis.[72] Rather, they assert simply that air emissions would increase[73] but never quantify the increase or explain what impact it would have and why it should lead to the conclusion that closed-cycle cooling is unavailable at Merrimack Station.

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[72] The comments often consist of straw man arguments. For instance, Enercon criticizes EPA's analysis by commenting that drift eliminators "would still allow some drift to occur." AR-864 at 26. But EPA did not state that the equipment would completely eliminate drift, but rather explained its basis for concluding that "significant" air pollutant emissions from the cooling towers were not anticipated. Enercon also commented that "cap-and-trade does not constitute a valid justification for stating that long-term emissions [of particulate matter] from the cooling tower will be close to zero." AR-864 at 45. Yet, again, EPA discussed the anticipated effect of cap-and-trade programs on stack emissions of SO_2, NOx, and CO_2, not cooling tower emissions of particulate matter. AR-618 at 158-59.
[73] Furthermore, the basis for Enercon's prediction is incomplete. Enercon comments that other sources would have to compensate for the loss of generation at Merrimack Station, which "could increase air emissions occurring in the region." AR-864 at 25. EPA recognized this possibility, but noted as additional support for its conclusion that any increase in emissions would likely be very modest, that most of the output to replace lost generation would likely come from natural gas-fueled combined cycle units, which "tend to have relatively low emission rates of air

EPA agrees that air emissions could increase as a result of closed-cycle cooling retrofit at Merrimack Station but maintains that the impact of a potential modest increase should not disqualify the technology. *See* AR-618 at 159. In the preamble to the 316(b) Final Rule, EPA explained that it expects the most significant impacts at existing facilities would be $PM_{2.5}$ emissions, which are associated directly with an increase in human health effects. 79 Fed. Reg. 48,341. EPA explained that increased stack emissions from additional fuel usage, however, are more likely to be primary factors because effects of the particulates from cooling tower emissions would be limited (by plume abatement and drift elimination technologies) and confined wholly to the facility property. *See id*. The Technical Development Document (TDD) for the Final Rule (Appendix A) (AR-1718) identified that increased air emissions in areas that are already in non-attainment for an individual pollutant could be an issue. New Hampshire is not in non-attainment, however, for any of the associated pollutants, including particulate matter.[74] The TDD also recognizes that plume abatement might be necessary at certain locations, including where local objections to a visible plume exists, or where the plume may create safely issues on nearby roadways. EPA assumed up to 25% of facilities would be expected to retrofit wet cooling towers with higher cost plume abatement towers. *See* AR-1718 at 10-7. As explained above, Enercon's proposed design at Merrimack Station includes plume-abated towers.

According to Enercon's assessment, impacts from the vapor plume would primarily be icing and fogging during winter conditions, vegetation damage caused by the mineral content of the entrained moisture, and potential degradation of heating, ventilating, and air conditioning (HVAC) systems at the Station. *See* AR-6 at 51. Enercon anticipated that a plume-abated tower would be used, which typically reduces the plume by 95 to 99 percent under optimum conditions. *See* AR-1775. Enercon expects that a visible plume would be limited to the winter months when the ambient air temperature is below 27°F and could either manifest as a vertical plume visible in the sky or as ground-level fog. AR-6 at 51. Enercon indicated that driving on nearby roads and highways could be impacted, "with the possibility of 'black ice' formation during winter months and visibility severely compromised." *Id*. Analysis provided to EPA by TetraTech suggests that drift would result in at most 6 to 12 pounds of solid particulates per day over a relatively large area down wind of the cooling towers. *See* AR-1804.

In its 2012 and 2017 comments, Enercon suggests EPA utilize or request a comprehensive modeling program (such as SACTI[75]) to adequately assess icing/fogging impacts. In its assessment of the cooling tower plume in the 2007 Engineering Document, Enercon stated "the behavior of the plume can be modeled using the SACTI code under environmental conditions

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pollutants." AR-618 at 158; *see also* Response to Comment III.5.3 and II.3.2.4 (noting since the 2011 Draft Permit was issued that New England's reliance on coal-generation has continued to decreased and that capacity from lower- (or no-) emission sources, such as natural gas, wind, and photovoltaic resources, has increased). PSNH's/Enercon's comments never dispute this aspect of EPA's analysis.

[74] When the TDD was issued, portions of New Hampshire were designated non-attainment for the 1997 ozone National Ambient Air Quality Standard ("NAAQS") and the 2010 SO_2 NAAQS. EPA later approved New Hampshire's requests to redesignate these areas to attainment for both NAAQS. *See* 40 C.F.R. §§ 52.1520(e), 52.1534(i), 81.330; 84 Fed. Reg. 49,467 (Sept. 20, 2019); 78 Fed. Reg. 6741 (Jan. 31, 2013).

[75] Seasonal Annual Cooling Tower Impacts. *See* AR-864 at iii.

typical of Bow, NH. However, reasonable predictions of plume travel can be made based on the local prevailing wind directions and frequency of occurrence (i.e., site wind rose)." AR-6 at 51. In the 2011 Draft Determinations Document, EPA stated "[m]odels exist for attempting to predict the likelihood that such fogging or icing problems might occur based on tower characteristics and local weather data, but PSNH has not, to EPA's knowledge, conducting such a modeling analysis." AR-618 at 165. Quantifying the potential impacts of the vapor plume with a SACTI (or similar) model requires site-specific engineering and cooling tower design data that are more accessible to the permittee than to EPA. *See*, *e.g*., AR-1805. As such, EPA has not modeled the vapor plume from Merrimack Station. EPA has, however, reviewed an analysis provided by TetraTech, at EPA's request, of another, similar model that was prepared for a different facility as a qualitative review of the potential impacts of the plume at Merrimack Station. A CALPUFF model generated for Manchester Street Station in Rhode Island (CH2M Hill 2009)[76] predicted fogging and icing would occur for a total of 24 hours per year dispersed over 6 days in winter, with each event expected to cause icing. *See* AR-1804. The model predicted a maximum distance of a fogging event of 2,640 ft with a duration of 1 hour with events during 19 of the 24 hours at distances less than 1,100 ft. The duration, distance, and direction of fogging events may be different at Merrimack Station, but the analysis provides some indication that effects of fogging are likely to be geographically limited and occur over a relatively limited portion of the year. *See id*.

At Merrimack Station, the closest major roads to the west (NH Route 3A and Interstate 93) are at least one mile from the proposed cooling tower location, and the closest major road to the east (NH Route 3) is roughly three-quarters of a mile away across the river. The nearest houses are located more than about 2,000 ft to the east across the Merrimack River. River Road, located about 500 feet from the proposed location of the cooling towers along the western edge of the Station's property, may experience infrequent icing or fogging issues for limited periods during winter if the wind direction is from the east. Ice accumulation on electrical equipment at the switchyard, located about 1,000 ft northwest of the proposed tower location may be affected during a very limited period of time during winter and only when the wind is from the southeast. As Enercon states in its Engineering Report and in its comment, the prevailing wind direction is north or south. Land to the north and south of Merrimack Station is forested with areas cleared for agriculture and industrial activities, which are not likely to be significantly impacted by occasional fogging or icing for a relatively short duration over limited periods of the year. Based on the available information, including a review of other modeling data and information from other electrical generating facilities in the northern and eastern United States, EPA expects that the impacts of fogging and icing would be relatively minor and would not alter the conclusion that cooling towers are an available technology at Merrimack Station. *See* AR-618 at 165-67. If

[76] EPA recognizes that models are site-specific and the results are not transferrable between facilities; however, in the absence of modeling data for Merrimack Station, which PSNH failed to provide in support of its comments, EPA believes that the CALPUFF model allows at least a qualitative understanding of the potential for impacts from fogging and icing at Merrimack Station. Manchester Street Station is a 264 MW Station which is roughly 60% of the generating capacity at Merrimack Units 1 and 2. Impacts at Merrimack Station could be similar but proportionally greater in magnitude given the difference in capacity. At the same time, between the two stations, Manchester Street, situated in a humid, maritime location on the Providence River near Mount Hope Bay, is more likely to experience conditions conducive to generation of fog.

PSNH believed that these impacts were likely to be more than minor, it had the opportunity to provide a more rigorous analysis either during development of the Draft Permit or during either the public comment period in 2011 or 2017.

EPA maintains that, while there is potential for traffic safety problems on local roadways as a result of fogging and icing, the available information indicates that any impacts are likely to be of a relatively short duration and geographically limited. These impacts can be mitigated with best management practices for safe travel on local roadways, *see, e.g.*, AR-618 at 167, and do not appear to rise to levels that would justify disqualifying closed-cycle cooling as an available technology at Merrimack Station. PSNH failed to provide any additional information demonstrating that the plume abatement technology would not effectively minimize impacts from the vapor plume, including fogging and icing, or that the increased air emissions present exceptional circumstances that would make these impacts proportionally greater at Merrimack Station in comparison to other power plants.[77] For these reasons, EPA does not consider that impacts from increased air emissions would impact the availability of closed-cycle cooling on a site-specific basis. Moreover, as explained elsewhere in this Response to Comments, EPA has selected wedgewire screens, not closed-cycle cooling, as the BTA for entrainment at Merrimack Station upon consideration of the relative costs and benefits of this technology as compared to closed-cycle cooling. Thus, PSNH's and Enercon's comments about air emissions and fogging/icing related to closed-cycle cooling do not impact EPA's BTA determination.

5.3.5 Non-Water Quality Environmental Impacts and Other Factors EPA Deemed Appropriate

Comment III.5.3.5	**AR-851, CLF, pp. 13-15**
See also AR-852, Henderson, pp. 17-24	

As required by the CWA, EPA considered non-water quality environmental impacts in assessing BAT for Merrimack Station.[62] EPA examined air pollutant emissions (including those resulting from additional energy requirements associated with conversion to CCC), sound emissions, and visual/aesthetic effects. In all three cases, EPA concluded that the non-water quality impacts would not disqualify CCC from being the BAT for Merrimack Station. In light of EPA's broad discretion and PSNH's lack of evidence to the contrary, EPA's decisions with respect to non-water quality environmental impacts were reasonable.

The CWA also directs EPA to take into account "such other factors as [the agency] deems appropriate. 33 U.S.C. § 1314(b)(2)(B). In this case, EPA considered three factors that were specifically identified by PSNH as concerns: (1) water loss from the Merrimack River due to the

[77] Similarly, in a footnote to the comment PSNH repeats Enercon's comments about additional issues related to icing and other "maintenance, reliability, and safety issues." The comments do not assert that such issues are likely to impact Merrimack Station disproportionately in comparison to other power plants. In fact, the comment inherently recognizes that such issues could exist at other power plants employing closed-cycle cooling "in climates similar to New Hampshire." Moreover, the comment suggests methods for overcoming these issues that mostly impact the cost of closed-cycle cooling, which, as noted, EPA has determined is not the BTA at Merrimack Station.

use of CCC technology; (2) the possible effect of requiring the installation of CCC on the reliability of the regional electric system; and (3) potential adverse effects due to fogging or icing. EPA also considered the beneficial effect requiring CCC would have in terms of reduced impingement and entrainment.

Any argument that water loss from evaporation due to the use of CCC should be grounds not to require that technology is meritless, especially in light of the overall environmental benefits provided by CCC. [63] EPA recognized that changing to CCC may not result in any appreciable increase in evaporative water loss over current once-through cooling technology due to the evaporation that occurs once Merrimack Station's heated effluent is discharged into the cooling canal and the River.[64] PSNH has not accounted for all of the evaporative water loss that occurs due to its current operations, and therefore can make no informed conclusions as to whether evaporative loss will increase under a CCC regime.

As the Henderson Report demonstrates, on a 77 degree summer day evaporative loss in the cooling canal alone can be as high as 67,000 gallons per day.[65] This is likely an underestimate of the actual evaporative loss because it does not take into account the evaporation that occurs as a result of the operation of the power spray modules. Further, water loss from evaporation occurs as the thermal plume discharges into the main stem of the river where there is a greater surface area to facilitate evaporation.[66] Finally, the percentage of River water loss due to evaporation from CCC is small: 1.3% during extreme low flow conditions based on EPA's calculations.[67] That percentage is likely biased high, since EPA accepts PSNH's estimate of water loss of 4.79 million gallons per day and uses the most extreme low flow conditions.[68]

When the average water loss from the Electric Power Research Institute's ("EPRI") 2002 Water and Sustainability Report is used (4 million gallons per day), the percentage of water loss declines to 1.05% using the same extreme low flow.[69] When a more typical low flow rate is used (1000 ft^3/s), the percentage of water loss attributed evaporation from the use of CCC drops further to 0.619%, as compared to 0.387% evaporative water loss caused by current once-through cooling operations.[70] Nevertheless, EPA again in this instance accepted PSNH's estimates, yet correctly concluded that "it is unclear which cooling system would ultimately result in greater overall evaporative losses" and the possible loss of River water due to evaporation should not disqualify CCC as BAT for Merrimack Station, "given the very substantial reductions in thermal discharge available."[71]

EPA also more than adequately addressed PSNH's two other concerns, reliability of the regional electric system and potential fogging and icing. EPA examined the two possible ways the CCC requirement could affect the regional electric supply - the incremental additional electrical demand needed to power the CCC configuration and possible outages needed to implement the conversion to CCC- and found both would have little effect, if any, on the regional electrical supply.[72] The estimated incremental peak demand for electricity to power the CCC configuration is 22 MW, which can be easily absorbed in the projected excess capacity in the region over the next six years of 3700 MW.[73] As discussed above, PSNH projects that only three weeks of additional outage at Merrimack Station (in addition to scheduled maintenance outages) would be required to convert to CCC. As demonstrated by the fact that PSNH's extensive 2009 outage to repair Merrimack Unit 2's new HP/IP turbine after catastrophic failure had no adverse effect on regional electrical supply, none would reasonably be anticipated as a result of this more limited outage duration.

Although PSNH raised fogging and icing of nearby roadways as a concern, the Company failed to provide EPA with any modeling data for such weather-related effects, nor did PSNH give EPA estimates of the likely timing, frequency, location, or geographic extent of such roadway effects.[74] Even if PSNH had provided data to support its speculative concern, EPA notes that this issue would be easily managed through weather monitoring and notification to the Bow Highway Department in the event that fogging and icing appears possible so icing controls could be initiated.[75] Accordingly, EPA correctly concluded that none of PSNH's concerns, either independently or in combination, are enough to disqualify CCC as BAT for Merrimack Station, especially in light of the expected 95% reduction in entrainment and impingement and 99.5% reduction in temperature of the thermal discharge.

[62] See 33 U.S.C. § 1314(b)(2)(B); see also Attachment D at 152.
[63] See Henderson Report at 24-25.
[64] Attachment D at 163.
[65] See Henderson Report at 22.
[66] See Attachment D at 39 ("the [thermal] plume typically flows across the river under low-flow conditions, reaching the east bank between S-1 and S-3, and disperses throughout the river width as it approaches S-4 ... the plume often extends downstream to a point immediately upstream of Hooksett Dam.").
[67] Attachment D at 163.
[68] *Id*.
[69] See Henderson Report at 24.
[70] *Id.*
[71] *See* Attachment D at 162.
[72] *Id.* at 164.
[73] *Id.*
[74] *Id.* at 165.
[75] *Id.* at 167.

EPA Response

CLF submitted comments on the 2011 Draft Permit supporting the Permit's determination of closed-cycle cooling as both the BTA for impingement and entrainment and the best available technology (BAT) to control thermal discharges to the Merrimack River. Several of these comments, reproduced above, focused on EPA's evaluation of the non-water quality factors associated with closed-cycle cooling, which was presented as part of the BAT analysis (AR-618 at 156-167). As such, CLF's comment addresses closed-cycle cooling as it pertains to permit requirements for both thermal and CWISs. EPA is addressing these comments under § 316(b) because the issues raised in the comments are directly relevant to the Final Rule's requirements for establishing site-specific entrainment controls at 40 CFR § 125.98(f)(2) and (3) (i.e., consideration of relevant factors). CLF comments that in the 2011 Draft Permit, EPA correctly concluded that non-water quality impacts (including air pollutant emissions, sound emissions, visual/aesthetic effects, water loss, reliability of the regional electric system, and fogging/icing), either independently or in combination, are not enough to disqualify closed-cycle cooling as BAT for Merrimack Station. EPA agrees and has addressed additional comments on these issues raised by PSNH and others in the response to comments above. See Response to Comment III.5.3. At the same time, while none of the issues raised in CLF's comments rise to levels that would render closed-cycle cooling unavailable at Merrimack Station, after consideration of the relative costs and benefits of closed-cycle cooling in comparison to wedgewire screens, EPA determined that the costs of closed-cycle cooling are not warranted by the expedited benefits. The Final Permit includes conditions and requirements to install wedgewire screens as the BTA for entrainment at Merrimack Station.

CLF comments that "water loss from evaporation due to the use of closed-cycle cooling should be grounds not to require that technology is meritless." EPA addressed comments about water consumption in Response to Comment III.5.3.3, above. As explained in that response, the relatively low volume of water expected to be lost from the Merrimack River due to evaporation as a result of the use of closed-cycle cooling is unlikely to have a measurable, long-term impact on water resources such that the technology would be considered unavailable due to water consumption.

6.0 Proposed Compliance Schedules for Installing Closed-cycle Cooing or Wedgewire Screens Are Not Reasonable

Comment III.6(i)	**AR-1548, PSNH, pp. 170-171**

The compliance schedules set out in EPA's Statement for the design, permitting, construction, and tie-in of CCC[682] and wedgewire screens[683] at Merrimack Station are fatally flawed. Schedules such as these are not appropriate at this stage in the permit renewal process. Instead, it is prudent to establish compliance schedules such as these after EPA has rendered its final permit for the facility, the parties have had the ability to negotiate potential resolutions, and administrative and legal appeals (if any) have been fully exhausted. Only then can the permit writer and permittee fully appreciate the scope of the project that will be required and the factual circumstances and constraints at the facility that may complicate the schedule for the construction and tie-in of all retrofitted technologies. Events in the recent past demonstrate that the layout of an electric generating facility can drastically change in a short period of time. Accordingly, a construction compliance schedule developed at this juncture will likely be rendered obsolete by the time it is time to actually take steps to commence construction at the facility.

Nevertheless, PSNH has provided comments on the key aspects of the proposed compliance schedules EPA has set out in its Statement. Should EPA erroneously reject PSNH's recommendation that such schedules are more appropriately established much later in the permit renewal process, PSNH encourages EPA to revise its schedules based on the comments below.

682 *See* AR-1534 at 27-28.

683 *See id.* at 30-32.

EPA Response:

PSNH comments that compliance schedules "are not appropriate at this stage in the permit renewal process" and maintains that the compliance schedules proposed in EPA's 2017 Statement are "fatally flawed." EPA responds to PSNH's more detailed comments about the proposed compliance schedules in Responses to Comments III.6.1 and 6.2 below. Here, EPA focuses on PSNH's broader comment that a compliance schedule is not appropriate until EPA has issued the Final Permit, "the parties have had the ability to negotiate potential resolutions, and administrative and legal appeals (if any) have been fully exhausted." According to the comment, only after such a process can EPA and the permittee "appreciate the scope of the project . . . and the factual circumstances and constraints" that may complicate the schedule.

The comment does not explain this claim in any meaningful way. First, the comment does not dispute EPA's authority to include compliance schedules in NPDES permits. EPA has long understood that when new permit limits or conditions require new equipment that will reasonably take some time to install, a compliance schedule of some kind will typically be appropriate to provide a clear, enforceable timeline for achieving permit compliance. Under 40 CFR § 122.47(a), EPA has the discretion to include compliance schedules in NPDES permits when appropriate. While a schedule for attaining future compliance with technology-based effluent limits whose statutory compliance deadline has already passed cannot be included in an NPDES permit (e.g., a schedule for installing equipment to come into compliance with a permit's thermal discharge requirements), this prohibition does not apply to permit conditions developed pursuant to § 316(b). 40 CFR §§ 125.94(b), 125.98(c); 79 Fed. Reg. at 48,359; *see also* AR-1534 at 23-24 (explaining why a compliance schedule for § 316(b) requirements was not included in the 2011 Draft Permit but why EPA proposed compliance schedules for closed-cycle cooling and wedgewire screens in 2017). Moreover, any schedule established must provide for compliance with § 316(b) requirements "as soon as practicable." 40 CFR §§ 125.94(b), 125.98(c).

Second, the comment does not explain how "factual circumstances and constraints" that may complicate the schedule would change or should be expected to be brought out during an appeal process in particular, especially if they have not already been raised during the public comment periods for this permit. The comment essentially asserts that, as a general matter, EPA should refrain from developing any schedule of compliance until the appeal process has played out completely because of a chance that a permit may change as a result of that process. By that reasoning, however, EPA should never include a compliance schedule in a permit, a notion that, again, is simply not reflected in the NPDES regulations generally, *see* 40 CFR § 122.47, or in the regulations regarding permit requirements under § 316(b) specifically, *see id.* §§ 125.94(b), 125.98(c).

EPA recognizes that it will take facilities time to upgrade existing technologies and install new technologies and takes this into account when establishing a deadline for compliance. In addition, EPA considers the extent to which technologies proposed to meet the CWIS requirements for entrainment will also be used to meet the requirements for impingement mortality. To the extent the commenter is concerned that "factual circumstances and constraints" or scheduling conflicts may arise during data collection and construction that complicate the schedule, such uncertainties are factored into the compliance schedule to some extent by incorporating interim reporting requirements designed to provide regular updates on the progress of construction without dictating precise steps that will be best left to the discretion of the Permittee and by taking into account the comments submitted during the public comment periods, the schedule proposed by PSNH for wedgewire screens in its 2009 Supplemental Alternative Technology Evaluation (AR-4, Att. B), the schedule proposed in the 2017 Statement (AR-1534 at 31-32), and the schedules for wedgewire screens Region 1 has included in permits for other facilities, including Granite Shore Power's Schiller Station. Furthermore, the compliance date is tied not to the effective date of the permit but rather to the date that the permittee obtains all other necessary permits and approvals. Moreover, a compliance schedule may be modified, if warranted. For these reasons, EPA disagrees that a compliance schedule set forth in the Final Permit will be "rendered obsolete by the time it is time to actually take steps to commence construction at the facility," and the Permittee has not offered any specific evidence that it expects drastic changes at the Facility during the time period between the Final Permit and compliance. Enercon recognizes in its 2017 comments that compliance schedules may be included in the permit but cautions that the schedule should be realistic and reasonable. EPA does not disagree and has included such a compliance schedule for the CWIS requirements.

Furthermore, including the compliance schedule in the permit has the added benefit of providing an opportunity for the public to review and comment on the schedule. Including the compliance schedule in this permit rather than in a separate administrative order is reasonable and makes sense from the standpoint of administrative efficiency. The public has had an opportunity to comment on the permit, inclusive of the compliance schedules proposed in 2017. Considering this and the level of public interest in this permit and the other reasons given above, it is appropriate to include a compliance schedule in the permit for the § 316(b) requirements. *See* Responses to Comments III.6.1 and 6.2. EPA has finalized the compliance schedule to meet the BTA for entrainment and impingement mortality in consideration of the comments received on the 2017 Statement as addressed below.

6.1 The CCC Compliance Schedule Should be Eliminated or, at a Minimum, Substantially Overhauled

Comment III.6.1	**AR-1548, PSNH, pp. 171-174**
See also AR-1549, Enercon, pp. 71-73	

CCC is not needed at Merrimack Station for the reasons articulated in these comments.
A schedule for the system's installation at the facility, like the one EPA sets out in the Statement, is therefore not necessary. In addition, it is short-sighted, premature, and highly speculative for EPA to concoct a compliance schedule for a needless, extraordinarily costly technology without the detailed input of engineers familiar with the site and plant operations. Given the certainty of a multi-year appeal process of a final permit requiring conversion to CCC, coupled with the likelihood that additional changes could occur at the facility during this timeframe, a proper

compliance schedule cannot reasonably be established until after the appeals process is fully resolved—and only then with insight from an engineering firm familiar with all aspects of Merrimack Station's site and operations. Nevertheless, PSNH sets out below as examples some of the more significant problems with the schedule currently proposed by EPA in its Statement, in the event the agency erroneously requires installation of this cost prohibitive technology and includes a detailed compliance schedule in the Final Permit.

Part 1.c. of the proposed compliance schedule must be revised. The six months EPA allocates for the permittee to solidify a final design required to convert Merrimack Station's Unit 1 and 2 from open-cycle cooling to CCC is woefully inadequate.[684] Since the conceptual design for CCC was provided to EPA in 2007, a new FGD system has been constructed.[685] The FGD system is occupying the space intended for routing new piping in the 2007 design. Therefore, the conceptual design, including cost and scheduling, must be reexamined. In order to redraft the design, PSNH needs at least sixteen months, which was the amount of time set out in the construction schedule provided to Region 1 in Enercon's 2007 report.[686]
Furthermore, will EPA first require the permittee to submit a preliminary design for the CCC technology for EPA approval? Such a requirement is included in the proposed compliance schedule for the installation of wedgewire screens.[687] If so, the timeframe within which the permittee is required to complete a final design and engineering for CCC cannot be tied to the effective date of the permit and, instead, must be tied to the date EPA approves the preliminary CCC design.

EPA has also failed to establish any period of time for PSNH to execute construction contracts necessary to commence the next phase of the project. If EPA intends to approve the permittee's final design and engineering submittal, a minimum of 12 months from the date of the agency's approval should be delineated in the schedule to allow the permittee to prepare requests for proposals, accept and review them, and negotiate a contract. More time could possibly be needed given the size, scope, and limited land constraint issues at Merrimack Station. If EPA does not intend to approve the permittee's final design and engineering submittal, a minimum of 12 months from the date the permittee issues this submittal should be provided in the schedule.

The Part 1.d. deadline is also problematic.[688] If EPA intends to approve the preliminary CCC design, this Part 1.d. deadline also must be tied to that agency action. And, irrespective of this approval issue, the proposed nine months from the effective date of the Final Permit to complete submission of all necessary federal, state, and local permit applications are arbitrary and capricious, given it is a mere three months after the final design and engineering for the CCC technology will be completed. This necessarily means the permittee will be required to complete the overwhelming bulk of the work to complete all necessary federal, state, and local permit applications within a span of three months. More time is needed and PSNH suggests a minimum of eight months from the date a final CCC design is completed to finish this task.

Parts 1.f. through 1.j. of EPA's proposed compliance schedule exceed the scope of the agency's authority under the CWA insofar as the provision permits EPA to insert itself into the managerial and/or operational functions of the permittee.[689] At most, the agency can set a deadline by which the permittee may have the CCC technology in operation, but it is properly left to the permittee's discretion as to how it elects to meet that deadline. Interim requirements—such as when the permittee must commence construction—are unrealistic since construction is inherently fluid and subject to delay. For example, is the permittee required to commence construction in the middle of winter with snow on the ground if its nine-month deadline is approaching?[690] All of these proposed deadlines should be deleted.

Other issues likely exist in this proposed schedule. Unfortunately, these are the only ones PSNH is capable of identifying at this stage in the process.

PSNH maintains that requiring CCC at Merrimack Station to satisfy CWA §§ 316(a) or (b) would be arbitrary and capricious. If EPA ignores the comprehensive and well-reasoned facts and analyses submitted by PSNH and its consultants and ultimately requires CCC technologies at Merrimack Station, a reasonable compliance schedule can only, in actuality, be set following the exhaustion of all administrative and legal appeals and only then in conjunction with an engineering firm familiar with all aspects of Merrimack Station's site and operations.

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684 *Id.* at 27.
685 *See* AR-6.
686 *See* AR-6 at Attachment 7.
687 AR-1534 at 31-32.
688 *Id.* at 27.
689 *Id.* at 27-28.
690 The proposed requirement in Part 1.g. to plan an outage with ISO-New England by a certain date in the year prior to the anticipated tie-in date for CCC for each unit is particularly overreaching. *Id.* at 28. Merrimack Station has been online since 1960 and plant operators are well-versed in handling operations and knowing what needs to be accomplished in order to construct new technology at its facility. Therefore, requirements of this kind are unnecessary and should not be delineated in the Final Permit, as the permittee can ultimately handle such matters without EPA expending its time and resources to micromanage the construction. These tasks are vital to the completion of the overall project, and therefore, they will be completed without arbitrary deadlines.

EPA Response:

In its comment, PSNH raises a number of concerns with the compliance schedule EPA proposed for installation of closed-cycle cooling at Merrimack Station in its 2017 Statement, which was based, in part, on schedules previously proposed by PSNH for retrofitting Merrimack and Schiller Stations. *See* AR-1534 at 24-28. As discussed elsewhere in this Response to Comment, EPA has determined that the costs of closed-cycle cooling are not warranted as compared to the costs of wedgewire screens and that closed-cycle cooling is not the BTA for entrainment at Merrimack Station. As a result, the Final Permit does not include a compliance schedule for installing closed-cycle cooling at Merrimack Station.

6.2 The Wedgewire Screen Compliance Schedule Is Unworkable

Comment III.6.2	**AR-1548, PSNH, p. 174**
See also AR-1549, Enercon, pp. 44-47, 71-73	

The schedule for the design, permitting, construction, and tie-in of wedgewire screens at Merrimack Station must also be revised.[691] The proposed schedule set out in EPA's Statement includes the following key deadlines:

> Preliminary and final design: Provide a preliminary design of the wedgewire screens to be installed to EPA within six (6) months of the effective date of the permit and submit a final design to the agency within two (2) months after receipt of correspondence from EPA approving the preliminary design.
>
> Permits and approvals: Commence the process of obtaining necessary permits and approvals within four (4) months of submitting a final design to EPA.
>
> Construction contract: Execute an engineering, procurement, and construction agreement with a contractor within four (4) months of submitting the final design.
>
> Commissioning of wedgewire screens: Complete site mobilization and modifications, installation, tie-in, testing and commissioning of the wedgewire screens and all other technologies for the CWIS of Units 1 and 2 no later than sixteen (16) months of obtaining all necessary permits and approvals.[692]

PSNH takes issue with these proposed deadlines. EPA's attempt to require the permittee to enter into any construction contract exceeds the scope of the agency's authority under the CWA and is illegal *per se*. At most, EPA may set a deadline by which the permittee must have the CWIS technology in operation. How a permittee elects to ensure it will meet that deadline is left entirely to its discretion and the agency's attempt to insert itself in the managerial and/or operational functions of the permittee is inappropriate. Furthermore, this deadline is more appropriately tied to the date on which the permittee obtains the necessary permits and approvals it needs to commence construction, rather than to the submission of the final design.
Other deadlines EPA has proposed are patently unreasonable or are tied to or triggered by events or occurrences that should be adjusted. Prudent construction schedules mandate that certain deadlines are tied to the date of final permit issuance, while others must be tied to EPA's approval of a final design for the wedgewire screens or the date all necessary permits and approvals have been obtained. The following is a schedule and timeline that is sensible and would be reasonable if the permittee is ultimately forced to install the entrainment technology at Merrimack Station:

EVENT	**TIME** (including a description of the event to which the time is tied)
Effective Date of the Permit	0 mo[693]
Other Data Collection and Preliminary Design	9 mo from the date of Final Permit

Submission: Time to collect additional data EPA has delineated in the Statement, including but not limited to topographic and bathymetric surveys, geotechnical exploration, and other design and marine construction variables,[694] and time to submit a preliminary design of the wedgewire screens to EPA	issuance
Final Design Submission: Time to generate and provide a final design for the wedgewire screens at Merrimack Station based on all data collected.	3 mo from the date the permittee receives correspondence from EPA approving the preliminary design[695]
Permits and approvals: Complete submission of all necessary permit applications and notices required to install the wedgewire screens at Merrimack Station.	6 mo after EPA approves final design
Commissioning of wedgewire screens: Complete site mobilization and modifications, installation, tie-in, testing and commissioning of the wedgewire screens and all other technologies for the CWIS of Units 1 and 2.	18 mo after obtaining all necessary permits and approvals, in order for the permittee to first install the screens for Unit 1, test, monitor, and develop lessons learned, and then install the screens for Unit 2[696]

These are the only dates EPA can definitively establish in the Final Permit for Merrimack Station.

The schedule PSNH has set out above is well-reasoned and includes the minimum amount of time the permittee would need to properly design, install, and optimize the new technology at Merrimack Station. Thus, if EPA requires the permittee to install wedgewire screens at Merrimack Station, the agency must substantially revise its proposed compliance schedule and craft one that is reasonable and will offer a sufficient amount of time to comply with the permit requirement.

691 *See id.* at 30-32.
692 *See id.* at 31-32.
693 The commencement of this schedule may not be triggered by EPA's issuance of the Final Permit if the permit is appealed by one or more parties. Instead, this schedule would become operable once the Final Permit became effective, meaning all administrative and/or judicial proceedings that resulted in a stay of the relevant conditions of the permit have been fully exhausted.
694 *See id.* at 31.
695 More time could actually be required if different and/or multiple engineering and/or construction firms are involved in different phases of the construction project.
696 In fact, more than 18 months may be needed to complete the installation and tie-in of the wedgewire screens, depending upon when the Final Permit becomes effective, because the optimal time for Enercon to commence the construction phase of the project is September due to a historically low capacity factor for Merrimack

Station, coupled with slower river velocities and a lack of heavy debris in the waterbody during this time frame. *See* Enercon Technology Cost Inputs Memo at 6.

EPA Response:

EPA has reviewed the determination for the BTA in the Draft Permit in light of the comments received and maintains that controls to reduce entrainment are warranted at Merrimack Station. EPA concludes that the BTA for entrainment at Merrimack Station is fine-mesh wedgewire screens. *See* Responses to Comments III.4.2 and III.5.3, above. As the comment recognizes, meeting the requirements of the Final Permit for Merrimack Station will require certain improvements to the Facility's CWISs and time will be needed to plan and install the equipment needed to achieve compliance.

EPA's 2017 Statement proposed a compliance schedule by which the Permittee would achieve compliance with entrainment requirements under CWA § 316(b) via the use of wedgewire screens. *See* AR-1534 at 29-32. PSNH provided comments on this schedule and proposed a modified schedule that provides 8 months more than EPA proposed. Both schedules are substantially more accelerated than the final compliance schedule to install wedgewire screens at GSP Schiller Station because the pilot phase for Merrimack Station has already been completed. Compared to EPA's proposed schedule, PSNH's schedule includes an additional 4 months for the design phase (3 months for preliminary design and an additional 1 month for the final design), 2 additional months for submitting complete applications and notices to obtain necessary permits and approvals, and 2 additional months for construction. PSNH's schedule also proposes to stagger the installation of screens at Units 1 and 2 within the 18-month construction period. Enercon states that staggering implementation between the Units will enable the Permittee to incorporate lessons learned during installation and early operation of the screens for Unit 1 to improve installation of the screens for Unit 2.

The 2014 Final Rule requires compliance with the CWIS requirements under CWA § 316(b) as soon as practicable based on a schedule of requirements established by the permitting authority. 40 CFR § 125.94(b)(2) and § 125.98(c). In December 2016, PSNH submitted a Technical Memo prepared by Enercon that included additional information about wedgewire half-screens, including a preliminary design, and described future efforts to complete the design and testing. See AR-1352 (Attachment 1). *See also* AR-1361. A pilot study of wedgewire screens at Merrimack Station was completed during summer 2017. *See* AR-1550. Based, in part, on this pilot study, Enercon's 2017 comments include an update to the conceptual half-screen design, a preliminary cost estimation, and a procurement and construction schedule. *See* AR-1549. Enercon's construction schedule is consistent with the proposed 18-month timeline in the comment and includes a staggered installation for Units 1 and 2. EPA agrees that the additional 2 months for construction and the staggered installation is reasonable and has included 18 months for construction in the final compliance schedule. PSNH also proposes that certain milestones (e.g., preliminary and final design) be tied to EPA approval, which will extend the proposed schedule beyond 36 months. The final compliance schedule includes a milestone for EPA approval of the preliminary design within 60-days of submission, which is consistent with the final compliance schedule for wedgewire screens at GSP Schiller Station. The final compliance schedule also provides 3 months for the final design submission and 6 months for completing submission of all necessary permit applications and notices, as requested in the comment. However, the comment proposes 9 months for submission of a preliminary design. PSNH offers no explanation for the additional 3 months for the preliminary design, particularly as the record demonstrates that a substantial amount of site-specific work has already been completed to evaluate this technology and develop conceptual designs. The final compliance schedule for GSP Schiller Station included 18 months for pilot study and 3 months for submission of a preliminary design. EPA recognizes that there is additional work necessary to finalize the conceptual designs that have already been submitted, but the comment fails to explain why 6 months for the preliminary design is insufficient given the amount of work that has already been completed on the conceptual designs and pilot study.[78] For these reasons, the final compliance schedule requires submission of a preliminary design within 6 months. The compliance schedule in the Final Permit, which slightly extends the timelines for final design, permitting, and construction and allocates 60-days for EPA approval of the design extends the compliance deadline from 28 months (plus EPA approval time) as proposed in the 2017 Statement to 35 months.

Beyond issues related to the specific timelines proposed by PSNH as addressed above, EPA disagrees with several aspects of the permittee's comment. According to the comment:

> [a]t most, EPA may set a deadline by which the permittee must have the CWIS technology in operation. How a permittee elects to ensure it will meet that deadline is left entirely to its discretion and the agency's attempt to insert itself in the managerial and/or operational functions of the permittee is inappropriate.

The comment provides no authority or explanation for this statement. The Clean Water Act defines "schedule of compliance" to mean "*a schedule of remedial measures* including an enforceable *sequence of actions or operations leading to compliance* with an effluent limitation, other limitation, prohibition, or standard," 33 U.S.C. § 1362(17) (emphases added), and EPA regulations similarly define the term as "*a schedule of remedial measures* included in a 'permit,' including an enforceable *sequence of interim requirements* (for example, actions, operations, or milestone events) *leading to compliance* with the CWA and regulations," 40 CFR § 122.2 (emphases added). Furthermore, a NPDES "permit may, when appropriate, specify a schedule of compliance leading to compliance with CWA and regulations." *Id*. § 122.47(a). The existence of § 122.47(a) and the statutory and regulatory definitions contradict the notion that the only "deadline" that EPA is authorized to set is the date for final compliance. If that were true, there would be no need to define a "schedule for compliance" and 40 CFR § 122.47(a) would simply

[78] Enercon (AR-1549 at 72-3) comments that the compliance schedule should be revised because the preliminary wedgewire designs were revised to a design based on a half-screen technology. The conceptual designs and pilot study have all been submitted after PSNH revised the design for wedgewire half-screens and it is unclear why the compliance schedule, which was based on information and submissions after the change to half-screens, should be revisited. In addition, Enercon comments that the recently announced change in Station ownership (at the time of the comments) should be considered. Since the 2017 comments were submitted, the transfer of ownership of Merrimack Station to GSP has been completed and it is not clear why it should be an issue for the purposes of a compliance schedule more than two years after the transfer.

not exist in its current form. Instead, 40 CFR § 122.47(a) would likely only provide that EPA may set the time for final compliance.[79]

The comment asserts that the dates proposed by PSNH "are the only dates EPA can definitively establish in the Final Permit for Merrimack Station." As explained above, 40 CFR § 122.47 stipulates that EPA may specify a schedule leading to compliance with the CWA and its implementing regulations, and neither restricts the steps that may be in the schedule nor limits the schedule to only a final deadline for compliance. The regulation also provides that EPA may set "interim" requirements and dates (*i.e.*, more than just the final requirement and date). *Id.* § 122.47(a)(3) (where "a permit establishes a schedule of compliance which exceeds 1 year from the date of permit issuance, the schedule shall set forth interim requirements and the dates for their achievement"). Similarly, EPA noted in the preamble to the 2014 § 316(b) regulations that, "[b]ecause an entrainment requirement could require controls that take many years to design, finance and construct, the [permitting authority] may establish interim milestones related to meeting the final requirements to ensure that the facility is making progress." 79 Fed. Reg. at 48,327. These provisions regarding interim requirements and dates are a particularly clear indication that the schedule may, and in some cases must, include steps towards compliance with the permit requirement and not just a "deadline by which the company must have the CWIS technology in operation." The regulation requires EPA in certain instances to set not just interim requirements and dates, but also "dates for the submission of reports of progress *toward completion of the interim requirements*." *Id.* § 122.47(a)(3)(ii) (emphasis added). Finally, the regulation provides several examples of interim requirements that may be in a schedule of compliance, which "include: (a) Submit a complete Step 1 construction grant (for POTWs); (b) let a contract for construction of required facilities; (c) commence construction of required facilities; and (d) complete construction of required facilities." *Id.* § 122.47(a)(3) note. In short, the regulations contradict the comment that EPA may not establish a schedule including anything other than a deadline for the operation of the technology and that the schedule may not include a requirement to enter into a construction contract.

In the proposed compliance schedule, the final compliance date (commissioning of fine-mesh wedgewire screens) is 16 months from the previous date (obtaining all necessary permits and approvals).[80] In addition, once the Permittee submits the necessary permit applications and

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[79] Numerous specifics of these provisions also support EPA's reading. For instance, the word "sequence" in each definition reinforces that a schedule of compliance will include more than just the final date for compliance, because a "sequence" includes more than just one item, by definition. Further, the words "measures," "actions," "operations," and "events" in the definitions are plural, where under the commenter's theory, they would be singular or would not exist in the regulation at all. Furthermore, each of these provisions indicates that the sequence of requirements in a schedule will <u>lead</u> to compliance with the CWA and implementing regulations, whereas, under the theory presented in the comment, they would simply set a date for final compliance, not a path or series of milestones <u>leading</u> to compliance.

[80] In its comment, PSNH suggests that the deadline by which the permittee must have the CWIS technology in operation "is more appropriately tied to the date on which the permittee obtains the necessary permits and approvals it needs to commence construction, rather than to the submission of the final design." The schedule proposed in EPA's 2017 Statement always tied the final compliance deadline to obtaining all necessary permits and approvals. *See* AR-1534 at 32. The compliance schedule in the Final Permit also ties this final milestone to obtaining all necessary permits and approvals.

notices, the period of time until the necessary permits are obtained is outside of the control of the Permittee. Under 40 CFR § 122.47(a)(3)(i) and (ii), if the time between interim compliance dates exceeds one year and the time necessary for completion of interim requirements is not readily divisible into stages for completion, the permit shall specify interim dates for the submission of reports of progress toward completion of the interim requirements and indicate a projected completion date. As a result, interim steps must be included in the compliance schedule during the construction milestone because more than one-year elapses between requirements. Accordingly, the final compliance schedule includes submission of a status reports for each six-month period after the Permittee completes submission of all permit applications and notices and during every six-month period until all necessary permits are obtained. The Final Permit also requires a status update within 12 months after obtaining all permits and approvals, indicating progress toward, and a final date for, commissioning the screens.

The compliance schedule in the Final Permit has extended the final compliance deadline from 28 months (plus EPA review time) to 35 months (including EPA review time). As stated above, this relatively small extension in time is reasonable in order to ensure that the wedgewire screen design will reduce entrainment to the smallest amount reasonably possible for this site.

7.0 Additional Comments Submitted by Conservation Law Foundation, EarthJustice, Environmental Integrity Project, and Sierra Club (CLF et al.)

7.1 New Regulations for Minimizing Adverse Environmental Impact at Cooling Water Intake Structures – Clean Water Action Section 316(b)

Comment III.7.1	AR-1573, CLF et al., pp. 13-14

Cooling water intake structures ("CWIS") can cause or contribute to a variety of adverse environmental effects including "entrainment" (drawing small organisms into the mechanism, killing or injuring them) and "impingement" (trapping larger organisms against intake points). Cooling water intake structures must comply with technology-based requirements under CWA §316(b).

Section 316(b) provides for a technology standard that requires "the location, design, construction, and capacity of cooling water intake structures reflect the best technology available [("BTA")] for minimizing adverse environmental impacts." 33 U.S.C. § 1326(b). For existing sources, section 316(b)'s limitations are technology-based performance requirements analogous to those derived for point sources under Section 301. Although section 316(b) came into effect in 1972, since 1976, when EPA proposed its first 316(b) regulation, the provision has been the subject of extensive litigation.

At the time EPA issued its Draft Permit in 2011, there were no effective § 316(b) national categorical standards to apply to the CWISs at Merrimack. Attachment D at 221. As a result, EPA's BTA determination for Merrimack was governed by 40 C.F.R. § 125.90(b) which provides that "[e]xisting facilities that are not subject [to other requirements] must meet requirements under section 316(b) of the CWA determined by the Director on a case-by-case best professional judgment (BPJ) basis." See also 40 C.F.R. § 122.44(b)(3). While neither the CWA nor EPA regulations dictate a specific methodology for developing permit limits based on a BPJ determination of BTA, EPA is guided by its own precedent and by the federal courts' interpretation of the § 316(b). Attachment D at 225-26.

EPA previously determined in its Draft Permit that the BTA for Merrimack's CWISs, using its best professional judgment, was closed-cycle cooling on a seasonal basis. Attachment D at 309. After EPA issued the 2011 Draft Permit, in 2014 EPA promulgated new regulations under CWA § 316(b) that apply to existing facilities with CWISs such as Merrimack. See 79 Fed. Reg. 48300 (Aug. 15, 2014) (codified at 40 C.F.R. § 12221(r) and part 125, Subpart J). Although the rules are being challenged in court, the regulations are now in effect. See 40 C.F.R. §§ 122.43(b)(1), 125.91(a) and 125.94(a)(1).

EPA Response

In the comment, CLF, Earthjustice, Environmental Integrity Project, and Sierra Club (hereinafter, "CLF") provide their summary of § 316(b) of the CWA and the basis of the determination of the BTA under § 316(b) in the Draft Permit for Merrimack Station. EPA generally agrees with CLF's view of the statute and the basis of seasonal closed-cycle cooling as the entrainment BTA for Merrimack Station in the Draft Permit as presented in the comment. CLF also comments that the 2014 regulations were, at the time of the 2017 Statement, facing multiple challenges brought by industry and environmental petitioners in Federal court. EPA notes that since this comment was submitted, the Second Circuit denied those challenges and upheld the 2014 Final Rule. S*ee Cooling Water Intake Structure Coal. v. EPA*, 905 F.3d 49 (2d. Cir. 2018). EPA responds to CLF's substantive comments on the Draft Permit and subsequent Statement below.

7.2 EPA's New Regulations Should Not Affect the Proposed, BPJ-based 316(b) Determination that EPA Reached in 2011

Comment III.7.2	**AR-1573, CLF et al., pp. 15-16**
See also AR-851, CLF, pp. 11-18, 23-27	

The new CWA § 316(b) regulations do not affect EPA's BTA determination at Merrimack. Of course, EPA must make a BTA determination in renewing this permit. The new regulations provide that, "[i]n the case of any permit issued after July 14, 2018, at a minimum, the permit must include conditions to implement and ensure compliance with the impingement mortality standard at § 125.94(c) and the entrainment standard at § 125.94(d), including any measures to protect Federally-listed threatened and endangered species and designated critical habitat required by the Director." 40 C.F.R. § 125.98(b)(2).

However, the new regulations do not require EPA to reopen its BTA determination, nor do they provide incentive or justification for doing so. To the contrary, the regulations invite Region 1 to finalize the determination made in 2011:

> In the case of permit proceedings begun prior to October 14, 2014 whenever the Director has determined that the information already submitted by the owner or operator of the facility is sufficient, the Director may proceed with a determination of BTA standards for impingement mortality and entrainment without requiring the owner or operator of the facility to submit the information required in 40 CFR 122.21(r). The Director's BTA determination may be based on some or all of the factors in paragraphs (f)(2) and (3) of this section and the BTA standards for impingement mortality at § 125.95(c). In making the decision on whether to require additional information from the applicant, and what BTA requirements to include in the applicant's permit for impingement mortality and site-specific entrainment, the Director should consider whether any of the information at 40 CFR 122.21(r) is necessary.

40 C.F.R. § 125.98(g).

For Merrimack, EPA should clearly determine that the information already submitted is sufficient. The 2011 proposed BTA determination was clearly documented and based on a thorough and methodical analysis. EPA determined in 2011 that the information submitted was sufficient, and that is still true today.

Further, the new § 316(b) regulations do not significantly affect EPA's decision-making process. EPA did not set a standard for entrainment in the rule; instead, it effectively codified the case-specific best professional judgment decision-making process already used by EPA in New Hampshire. EPA's rule leaves entrainment BTA decisions to permit writers to be made on a site-specific basis (see 40 C.F.R. § 125.94(d)), using the same factors that have historically been used by EPA in making BTA determinations. See 40 C.F.R. § 125.98(f)(2)-(3)). And in lieu of setting a firm impingement standard, EPA has created a discretionary set of seven options for permit writers to choose from. In essence, the first six options reduce to achieving a through-screen velocity of less than 0.5 feet per second, installing modified traveling screens with a fish return system, use of an existing offshore velocity cap, or otherwise achieving a 76% reduction in impingement mortality. The impingement standard is completely discretionary, however, because the seventh "option" is to use "any combination of measures approved by the Director as BTA on the basis that it is demonstrated to 'minimize impingement mortality of all non-fragile species.'" See 40 C.F.R. § 125.94(c)(6).

It should be noted that EPA is currently in violation of its Clean Water Act obligations to issue NPDES permits for terms that do not exceed five years and to reissue and fully review those permits every five years. See 33 U.S.C. § 1342. The new rule does not change these obligations and does not require any significant reconsideration on the part of EPA. Now that the rule is final, EPA must complete the BTA determination process and issue Eversource's overdue permit as quickly as possible.

EPA Response:

CLF comments that the new CWA § 316(b) regulations (2014 Final Rule) do not require EPA to reopen its BTA determination. EPA agrees that the 2014 Final Rule authorizes the permitting authority to proceed with ongoing permit proceedings begun prior to October 14, 2014 (as is the case for Merrimack Station) without the additional information required at 40 CFR § 122.21(r). *See* 40 CFR § 125.98(g). EPA also agrees that the information already submitted during development of the Draft Permit and upon which the draft BTA determination was made, as well as information submitted subsequent to the 2011 Draft Permit (up to and including information submitted during the public comment for the 2017 Statement) is sufficient to support a BTA determination for the Final Permit. *See* AR-1534 at 16 ("EPA concludes that it can address the appropriate factors under the statute and regulations without additional information submissions under 40 CFR § 122.21(r)") and Response to Comment III.2.3.

CLF comments that the 2014 Final Rule does not affect EPA's decision-making process or the 2011 BTA determination. According to CLF, the 2014 Final Rule establishes that entrainment BTA decisions are made on a site-specific basis using the same factors that have historically been used by EPA in making BTA determinations. The 2011 BTA analysis considered several factors, many of which were similar to those put forth in 40 CFR § 125.98(f)(2) and (3) for establishing site-specific entrainment controls. *See* AR-618 at 228-238. As CLF points out, the Final Rule does not require that BTA determinations which were ongoing at the time of the promulgation of the Final Rule be based on the factors at 40 CFR § 125.98(f)(2) and (3), only that the permitting authority *may* consider these factors. EPA agrees with CLF that the justification for the BTA determination from 2011 is not invalidated by the promulgation of new regulations. At the same time, EPA is not prevented from revisiting its 2011 BTA analysis in light of the new regulations and information subsequent to the initial notice period, and in response to comments received during the multiple notice periods for this permit. As an example, PSNH submitted additional information during the initial and subsequent public notice periods for this permit that is substantially similar to the information required in 40 CFR § 122.21(r). *See*, *e.g.*, AR-1550, AR-1567. EPA would expect to review its preliminary BTA determination based on information and comments submitted during the public notice period prior to issuing any Final Permit. In this case, review is particularly warranted given the number of comments and studies received regarding the draft BTA determination and in light of the new regulations. *See* AR-1534 at 17; Responses to Comments III.2.0 (and associated sub-comments).

According to CLF, rather than establishing a single impingement standard, the 2014 Final Rule creates a "discretionary set of seven options for permit writers to choose from." EPA notes that under the Rule, the permittee would typically elect which of the seven compliance alternatives it will use to meet the impingement mortality BTA requirements. *See* 40 CFR §§ 125.94(c), 122.21(r)(6) (Chosen Method of Compliance with the Impingement Mortality Standard). The existing technology at Merrimack Station does not satisfy any of these impingement BTA compliance alternatives and the Permittee must select, and comply with, one of the BTA alternatives for impingement mortality in 40 CFR § 125.94(c)(1) through (7) as soon as practicable. In addition, the Final Rule encourages permitting authorities to consider the extent to which technologies operated for purposes of minimizing entrainment may also be used to satisfy § 125.94(c). EPA has determined that the BTA for entrainment at Merrimack Station is seasonal operation of wedgewire screens—a technology that would satisfy the impingement BTA alternatives of maximum through-screen velocity of 0.5 fps, at least for the periods it operates. *See* Response to Comment III.4.2 and III.5.3. EPA believes that this technology, when combined with PSNH's proposed fish-friendly return, an optimized rotation frequency, and perhaps even flow reductions, may allow the facility to comply with the "systems of technologies" standard at § 125.94(c)(6). Or, the Permittee may choose to comply with another impingement BTA alternative, the most likely of which would be modified traveling screens, which will also require installation of a new fish return. The facility could also choose to comply with § 125.94(c) by operating the wedgewire screens year-round. The Final Permit sets Merrimack Station on a path to comply with § 125.94(c) as soon as practicable by immediately requiring a new fish return and, once constructed, an impingement technology performance optimization study to evaluate the effectiveness of the system of technologies (i.e., seasonal wedgewire screens, new fish return, optimal rotation frequency). Should the permittee later choose to comply with the impingement BTA standard using modified traveling screens or an alternative method, EPA could modify the permit. *See also* Response to Comment III.3.1.

Finally, CLF notes that EPA is currently in violation of its Clean Water Act obligations to issue NPDES permits for terms that do not exceed five years and to reissue and fully review those permits every five years, and comments that the 2014 Final Rule does not change its obligation and does not require any significant reconsideration on the part of EPA. As the commenter is no doubt aware, EPA regulations allow for the continuation of NPDES permits beyond the 5-year term under conditions that exist here. 40 CFR § 122.6; *see also* 5 U.S.C. § 558(c). Nonetheless, EPA is acutely aware that the Merrimack Station permit has been administratively continued for a lengthy period of time and is eager to issue a new Final Permit as soon as possible. At the same time, EPA is committed to providing a fair, legally sound process for the development of this Final Permit, and to developing scientifically and legally sound permit conditions that will ensure the protection of the Merrimack River well into the future, including those consistent with the 2014 Final Rule. AR-1534 at 10. Thus, EPA has reviewed its BTA determination for this Final Permit both in response to the voluminous comments received on its preliminary determination and to ensure that the Final Permit is consistent with the effective regulations governing determination of the BTA at CWISs under the 2014 Final Rule.

7.3 The availability of wedgewire-half screens is not demonstrated in-situ and, in any case, remains inferior to the closed-cycle cooling option that EPA already selected and that is required in light of EPA's Denial of a 316(a) Thermal Variance

Comment III.7.3	**AR-1573, CLF et al., pp. 16-18**

EPA should not reopen the 2011 BTA determination because the permittee is now proposing to study a new compliance option, wedgewire-half screens. This determination is long overdue and cannot be further delayed for more studies because, as noted above, EPA is already in violation of its duty to timely renew this permit. Further, as EPA noted in the Statement of Substantial New Questions for Public Comment, even under EPA's new interpretation of the law, the new regulations "require compliance as soon as practicable" with Section 316(b). SSNQPC at 23. Slowing down the BTA determination process to await new information when EPA has already reached a decision is not consistent with EPA's legal duties.

Further, under the best conditions cylindrical wedgewire-half screens will not be nearly as effective in reducing impingement and entrainment as the cooling towers that EPA has already proposed as BTA. And the 2011 determination to require seasonal use of cooling towers harmonizes with the requirement to install cooling towers to comply with Section 316(a) of the Act.

There is also considerable uncertainty about whether wedgewire-half screens will function in the Hooksett Pool. The permittee has not yet conducted studies to estimate the impingement and entrainment levels to be expected under actual conditions in the Hooksett Pool at the appropriate depth and location. The permittee has not conducted a detailed flow study in the vicinity of the intake. And most importantly, the permittee has not considered the biofouling potential of the Asian Clam to affect operation of narrow slot width wedgewire-half screens. The USGS has noted that "[t]he most prominent effect of the introduction of the Asian clam into the United States," like that of zebra mussels, "has been biofouling, especially of complex power plant and industrial water systems." USGS, "Corbicula Fluminea Fact Sheet," http://nas.er.usgs.gov/queries/factsheet.aspx?speciesid=92 (last visited December 15, 2017). Perhaps the largest uncertainty, however, relates to ambient velocities in the Hooksett Pool and whether they will create adequate sweeping flows for these screens to function under all conditions – particularly under summer low flow conditions.

For wedgewire screen technology to be effective in reducing entrainment, screen systems must be designed with: (1) sufficiently small screen slot size to physically block passage of the smallest lifestage to be protected; (2) low through-slot velocity; and (3) relatively high-velocity ambient current cross-flow to carry organisms and debris around and away from the screen. Only where all of these conditions are present are wedgewire screens effective at reducing entrainment. EPA has acknowledged that for wedgewire screens to perform effectively and avoid fouling, "locations also need to have an adequate source water sweeping velocity." 76 Fed. Reg. 22174, 22000 (April 20, 2011).

Insufficient velocity will greatly increase the impingement and entrainment rate. Larvae are fragile organisms and can be easily damaged by impacts with wedgewire-half screens, particularly on a repeated basis. Wedgewire-half screens are designed to be oriented parallel to that flow to decreased impingement and reduce fouling. But this actually increases screen-to-organism contact times because organisms must travel the full length of the screen before returning to the water body. See EPA, Technical Development Document for the Proposed Section 316(b) Phase II Existing Facilities Rule 2-19 (2011) at 6-40. In low current (ambient flow) conditions, larvae will not be moved away from or along the screen by water movement, so they will likely suffer multiple screen encounters as they are repeatedly moved by the current towards the screen, until they are exhausted and pass through or are impinged upon the screen.

Because the Merrimack is dammed both above and below the station, water velocity in the Hooksett Pool is dependent on release rates of the upstream and downstream dams. But these dams are managed for multiple purposes, and releases are not optimized to provide the desired velocities near Merrimack Generation station. The ambient flow in the river is not guaranteed to meet Merrimack's needs for adequate sweeping velocities.

At best, wedgewire screens remain unproven; they may not be at all feasible in the Hooksett Pool. And even if feasible, their operational effectiveness is entirely dependent on river conditions that Merrimack Generating Station cannot control. There may be needs of other users, for power, storage, water level maintenance, or other purposes that render wedgewire screens highly ineffective.

Overall, the performance of a wedgewire-half screen system that has not yet been designed, of an unknown slot-width size, in environmental conditions that have not been fully assessed, cannot be considered equivalent to closed-cycle cooling. In contrast, cooling towers are available, proven, and considerably more effective than wedgewire-half screens at minimizing both entrainment and impingement, as well as thermal discharges. They are the best technology available.

EPA Response

First, CLF comments that "EPA should not reopen the 2011 BTA determination" to study a new compliance option (wedgewire-half screens), because a final BTA determination is long overdue and cannot be further delayed for more studies. EPA agrees that delaying a BTA determination for further study is not necessary. In its 2017 Statement, EPA explained that the existing record (including comments submitted on the 2011 Draft Permit and 2014 Revised Draft Permit) is sufficient to address the relevant factors under the 2014 Final Rule without additional information submissions under 40 CFR § 122.21(r). *See* AR-1537 at 16. The 2017 Statement summarized comments and new information about wedgewire screens received subsequent to issuance of the 2011 Draft Permit indicating that this technology may be an available and effective technology to reduce entrainment at Merrimack Station. *Id*. at 17-20. The 2017 Statement requested public comment on these issues. *Id*. at 21. EPA has reviewed its preliminary conclusions about wedgewire screens in the 2011 Draft Determinations Document in light of comments and new information received since the 2011 Draft Permit issuance, including through the 2017 public notice period, and has determined that wedgewire screens are an available technology for entrainment (and when operating, impingement) at Merrimack Station. *See* Response to Comment III.4.2. EPA is not reopening a BTA determination to study a new compliance option but making a final BTA determination consistent with 40 CFR § 125.94(a)(1) based on its review of all of the comments pertaining to the CWIS requirements submitted in 2012, 2014, and 2017, including comments on the availability and effectiveness of wedgewire screens.

CLF comments that cylindrical wedgewire-half screens "will not be nearly as effective" as cooling towers and "cannot be considered equivalent to closed-cycle cooling." For the 2011 Draft Permit, EPA concluded that seasonal use of closed-cycle cooling would result in a 95% reduction in entrainment at Merrimack Station. *See* AR-618 at 338. EPA recognizes that closed-cycle cooling is the best performing technology in the industry and will achieve the greatest reduction in entrainment as evidenced by EPA's selection of closed-cycle cooling in the 2014 Final Rule as the BTA for impingement mortality and entrainment at *new* units based on the high levels of flow reduction obtained. 40 CFR § 125.94(e)(1); *see* 79 Fed. Reg. at 48,338. The Final Rule did not settle on closed-cycle cooling as a mandated, industry-wide BTA for entrainment reduction for existing facilities like Merrimack Station, however, opting instead to continue the approach of making entrainment reduction BTA determinations on a site-specific basis after consideration of a diverse suite of factors. *See* 40 CFR § 125.98(f). As the preamble to the Final Rule states, "[t]he entrainment provisions reflect EPA's assessment that there is no single technology basis that is BTA for entrainment at existing facilities, but instead a number of factors that are best accounted for on a site-specific basis." 79 Fed. Reg. at 48,303.

EPA does not take the position that wedgewire screens will be as effective as closed-cycle cooling. EPA recognized in its 2017 Statement that even if wedgewire screens are available and effective at Merrimack Station, "closed-cycle cooling will still be expected to reduce entrainment to a greater degree than wedgewire screens." AR-1534 at 19. At the same time, the expected reduction in entrainment at Merrimack Station under the Final Permit is not that much lower. *See* Response to Comment III.5.2.3 (estimating that wedgewire screens would prevent the entrainment of about 2.75 million to 6.8 million eggs and larvae, at AIF and DIF, respectively, whereas closed-cycle cooling would prevent the entrainment of about 3 million to 7.4 million eggs and larvae, at AIF and DIF, respectively).[81] Moreover, the technology that results in the greatest reduction in entrainment is not necessarily the BTA for a facility after a site-specific consideration of the relevant factors. *See* 40 CFR § 125.98(f)(1) (authorizing EPA to "reject[] any entrainment control technologies or measures that perform better than the selected technologies or measures"), (2) (requiring EPA to consider several factors in addition to numbers of organisms entrained) (3) (authorizing EPA to consider even more factors), (4) (authorizing EPA to "reject an otherwise available technology as a BTA standard for entrainment if the social costs are not justified by the social benefits"). In *Entergy Corp. v. Riverkeeper, Inc.*, the Supreme Court rejected a similar argument, observing that "'minimize' is a term that admits of degree and is not necessarily used to refer exclusively to the 'greatest possible reduction.'" 556 U.S. 208, 219 (2009); *see also Hudson Riverkeeper Fund v. Orange & Rockland Utils.*, 835 F. Supp. 160, 165 (S.D.N.Y. 1993) (noting that, in a site-specific, case-by-case analysis of § 316(b) requirements, "best available doesn't mean perfect"). Instead, the Court found that EPA has the discretion to determine "the extent of reduction that is *warranted under the circumstances*," a "determination that could plausibly involve a consideration of the benefits derived from reductions and the costs of achieving them." *Id.* (emphasis added). EPA explained in the 2017 Statement that it was reconsidering whether the cost of closed-cycle cooling is warranted in light of the potentially better-than-previously-estimated performance of wedgewire screens and the possible resolution of logistical and engineering issues originally discussed in the 2011 Draft Determinations Document. *See* AR-1534 at 20. The difference in cost between the two technologies is substantial

[81]Put another way, closed-cycle cooling would reduce annual entrainment by about 257,000 (at AIF) to 581,000 (at DIF) more eggs and larvae than would fine-mesh wedgewire screens. Normandeau estimated that wedgewire screens at Merrimack Station will reduce entrainment by about 89%, as compared to the existing system, which includes no entrainment reduction technology. The Final Permit's thermal limits, which effectively cap the facility's operation as a peaking plant, and provisions regarding scheduling the Unit 2 annual maintenance outage during peak entrainment provide further entrainment reduction.

and ranges from $68 to $102 million. Weighing the social costs and benefits of the available technologies, EPA has determined that the significantly higher cost of closed-cycle cooling (estimated to be 6 to 10 times more than wedgewire screens) is not warranted by the comparatively small incremental benefits. *See* Response to Comment III.5.2.3. Additionally, the Final Permit sets a maximum through-screen velocity at the wedgewire screens (which, again, would be operated seasonally) of 0.5 fps, which EPA has found protects the vast majority of impingeable aquatic organisms and should achieve a greater reduction in impingement mortality than the technology on which the Final Rule's impingement mortality standards are based (i.e., modified traveling screens). 79 Fed. Reg.at 48,345. The Final Permit also requires installation and operation of a new fish return. This is not to say that EPA expects wedgewire screens to achieve an impingement mortality reduction as high as closed-cycle cooling would, but the reduction will nonetheless be significant. EPA's determination of the BTA at Merrimack Station is reasonable in light of the information in the record and is consistent with the Final Rule.

CLF also suggests that EPA finalize the 2011 BTA determination because a requirement to operate closed-cycle cooling as the BTA "harmonizes with the [2011 Draft Permit] requirement to install cooling towers to comply with Section 316(a) of the Act." The technology-based thermal requirements in the 2011 Draft Permit were based on closed-cycle cooling as the best available technology (BAT) to reduce thermal load to the river. *See* AR-618 at 210-17. In addition, the preliminary determination that seasonal closed-cycle cooling is the BTA for Merrimack Station under CWA § 316(b) was not based on the technology-based thermal limits, although EPA considered that the Facility would have to install closed-cycle cooling to meet the thermal limits in determining the BTA for the Draft Permit. *See* AR-618 at 347-49. There is no regulatory requirement to "harmonize" effluent limitations to meet thermal limits with permit conditions governing the intake of cooling water, nor is there any regulatory bar from doing so. Under the Final Rule, site-specific entrainment controls must reflect the maximum reduction in entrainment warranted after consideration of factors relevant for determining the best technology for minimizing adverse environmental impact at each facility. 40 CFR § 125.98(f). The permitting authority may consider thermal discharge impacts as one of the relevant factors in making its decision, but ultimately the determination of the BTA must reflect the maximum reduction warranted. In a case where a facility must install closed-cycle cooling to meet thermal requirements, a technology that does not perform to the level of closed-cycle cooling could be the BTA if its performance reflects the maximum reduction in entrainment warranted to minimize adverse environmental impact. At the same time, a facility required to install closed-cycle cooling to meet thermal limits would likely comply with requirements under § 316(b) because flow reductions achieved through operation of closed-cycle cooling would exceed the reduction in entrainment from any other technology. *See also* AR-1534 (observing that, "if closed-cycle cooling is used year-round to limit thermal discharges," EPA could still conclude that wedgewire screens were the BTA, although "the installation of wedgewire screens would be unnecessary" in such a case).

For Merrimack Station, EPA conducted an independent analysis of the impacts of the CWIS, the technological and economic feasibility of available CWIS technologies, and the relative costs and benefits of available technologies. *See* AR-618 at 347. For the Final Permit, EPA reconsidered its determination in response to comments received and to be consistent with the requirements of the

2014 Final Rule. EPA concluded that wedgewire screens are the BTA for entrainment. *See* Response to Comments III.4.2, 5.2, 5.3. If the Final Permit required closed-cycle cooling to meet the thermal limits, this technology would exceed the entrainment reductions achieved by wedgewire screens and would comply with the BTA. However, EPA also revisited the thermal limits of the 2011 Draft Permit and the Final Permit includes temperature limits that do not require closed-cycle cooling, but which EPA believes will be protective of the balanced, indigenous population in compliance with a thermal variance from technology- and water quality-based temperature limits under CWA § 316(a). *See* Response to Comments II.1.1, II.3.4 (and associated sub-comments).

Responding to EPA's request for public comments about the potential availability and performance of wedgewire screens at Merrimack Station, CLF expresses that there remains considerable uncertainty about the functionality of the technology for this Facility. CLF comments that additional study is required to evaluate the performance of the screens in Hookset Pool and questions the suitability of the river for proper functioning of the screens, particularly as related to ambient velocity. CLF also comments that biofouling of the screens may be an issue and that the potential for the Asian clam to foul the screens has not been addressed. For these reasons, CLF maintains that wedgewire screens remain unproven and comments that the technology may not be feasible and, even if feasible, their operational effectiveness not guaranteed.

The 2017 Statement explained that comments received on the Draft Permit question EPA's determination that the physical limitations of Hooksett Pool would prevent the use of wedgewire screens. *See* AR-1534 at 18-19. In particular, the 2017 Statement acknowledged that the proposed half-screen design and seasonal deployment could potentially address concerns about adequate depth and the number of screens, and that data submitted in 2012 suggest that adequate sweeping flows are likely to exist during the time period when the majority of eggs and larvae will be present. *See id.*; *see also* AR-846; AR-864; AR-872; AR-1231, Exhibit 4 and Attachment 1 to Exhibit 4; AR-1352, Attachment 1; and AR-1361. In Response to Comment III.4.2, EPA presents its analysis of the body of information and comments and its conclusion that the half-screen design (first proposed in 2014) is an available technology to address entrainment. CLF does not identify any specific inadequacy in any of the comments and supporting material referenced in the 2017 Statement, which were publicly available as part of the Administrative Record at the time. The record supports the conclusion that the proposed designs are suitable for the location. *See* Response to Comment III.4.2. Since the 2017 Statement, PSNH refined the proposed design (see AR-1549) and completed a site-specific pilot of the screens to evaluate performance under actual conditions in the Hooksett Pool at the appropriate depth and location and confirmed that the screens effectively reduce entrainment at Merrimack Station. *See* AR-1549 at 21-47, 1550; *see also* Response to Comment III.4.2. The compliance schedule in the Final Permit requires that the preliminary design be submitted within 6 months of the effective date of the permit and finalized within 2 months from obtaining EPA approval, which is possible only due to the extensive engineering and biological analyses that have already been completed. *See* Response to Comment III.6.2. Finally, the proposed design considered the potential for colonization by fouling organisms and has proposed both a copper-nickel alloy coating to reduce bio-fouling and prevent corrosion (the "Z-alloy" has been shown to effectively prevent growth of colonizing organisms like zebra mussels) and an airburst system that uses compressed air to periodically clean the screens. *See* AR-1549 at 28, 44-44. In addition, the larger slot size balances the effectiveness of the screens to reduce entrainment with the potential for biofouling and debris accumulation to interfere with operation. *See* AR-1549 at 26-28.

CLF states that three parameters of wedgewire screens are critical to ensuring entrainment reductions: (1) sufficiently small screen slot size to physically block passage of the smallest life stage to be protected; (2) low through-slot velocity; and (3) relatively high-velocity ambient current cross-flow to carry organisms and debris around and away from the screen. The proposed designs and pilot study are based on a slot size of 3 mm. While the 2014 Final Rule describes fine mesh screens as having a mesh size of 2 mm or smaller, it does not require any specific slot size for establishing entrainment controls. *See* 79 Fed. Reg. 48,349. In the 2017 Statement, EPA noted that it was considering "fine-mesh" wedgewire screens, which it said the agency has generally considered to be "slot sizes less than or equal to 2.0 mm," although it has also said they could range up to 3mm. AR-1534 at 30 n.5. EPA also said in the 2017 Statement that, if it determined that wedgewire screens are the BTA for entrainment at Merrimack Station, it would define the appropriate slot size based on public comments on the 2017 Statement and on the results of the 2017 site-specific pilot study. *Id.* Thus, EPA gave notice that it was considering slot sizes from 0.5mm to 3mm and would make a decision on slot size based on public comments received. CLF, however, chose not to offer any specific comments on this issue, except to suggest in general terms that wedgewire screen technology is only effective in reducing entrainment if the slot size is based on physical exclusion "of the smallest lifestage to be protected." In the past, it was thought that a slot size no larger than the smallest life stage was necessary for wedgewire screens because the primary mechanism for preventing entrainment was physical exclusion. However, recent research highlighted and summarized in the 2017 Statement (and contemporaneously made available in the record) suggests that wedgewire screens reduce entrainment through physical exclusion, hydraulic bypass, and larval avoidance, and that reductions can be achieved even at slot sizes as large as 2 to 3 mm. *See* AR-1534 at 18-19. CLF may disagree with this research, but it must provide more than conclusory statements to explain and justify its disagreement. *See* 40 CFR § 124.13 (requiring commenters to "raise all reasonably ascertainable issues and submit all reasonably available arguments supporting their position") (emphasis added). In its 2017 study, Normandeau observed an 89% reduction in entrainment of eggs and larvae with 3-mm slot wedgewire screens compared to control densities. AR-1550 at 18, 29; *see also* AR-1549 at 7. At Merrimack Station, entrainment is dominated by post-yolk sac larvae, which have been shown to effectively avoid wedgewire screens, and eggs account for a relatively low percentage of the organisms entrained; more than half of the larvae collected during the 2006-2007 study were larger than 10 mm. *See* AR-618 at 247; AR-1402; AR-2 (Table 3-3). In the 2017 pilot study, Normandeau observed a 96% reduction in entrainment of post-yolk sac larvae and relatively high exclusion (87%) of length classes that were physically small enough to pass through the 3 mm slot size. *See* AR-1550 at 18, 30, 47-48. Research on the effectiveness of wedgewire screens to effectively reduce entrainment of post-yolk sac larvae, supplemented by the results of the 2017 site-specific pilot study, indicate that this technology is well suited for Merrimack Station, even with slot sizes as large as 3 mm. On the issue of sweeping flow and fouling, certain technologies and techniques can be used to lessen its impact, including air burst systems, fouling-resistant screen alloys and coatings, and manual cleaning, all of which PSNH and Enercon proposed for

Merrimack Station. Indeed, the very page of the preamble to the 316(b) proposed rule that CLF cites in the comment states that "Wedgewire screens may also employ cleaning and de-icing systems such as air-burst sparging to aid in maintaining open intake structures and low intake velocities." 76 Fed. Reg. 21,172 at 22,000 (Apr. 20, 2011). According to Enercon, the 2017 pilot study confirmed that the Z-alloy coating mitigated the effects of biofouling on the wedgewire screen and that when a blockage occurred, backflushing the screen successfully removed large debris. *See* AR-1549 at 28-29, 56-59. Furthermore, Enercon also commented that "blockage of the screens . . . due to either biofouling or largescale debris is expected to be successfully mitigated by the Z-Alloy screen and inclusion of the [air burst system]." Enercon 2017 Comments at 59; *see also* Response to Comment III.4.2, III.4.3

EPA agrees that a minimum ambient velocity relative to the design through-slot velocity ensures that entrainment reductions are achieved through hydraulic bypass and avoidance. *See* AR-1534 at 19. CLF comments that the ambient river flow is not guaranteed to meet Merrimack's needs for adequate sweeping velocities and that insufficient velocity increases the impingement and entrainment rate. Data collected during the 2017 Pilot-Scale Study support a conclusion, however, that sweeping flows are consistently greater than 0.5 fps from April through July (as compared to the proposed design through-slot velocity of 0.4 fps), which will achieve a through-slot to ambient velocity ratio greater than 1:1 for the period when more than 95% of entrainment occurs. *See* AR-846 at 103-106; AR-864 at 9-11; AR-1231 Exhibit 4 at 11-12; AR-1550 at 14; *see also* Response to Comment III.4.2. Maintaining a slot velocity of 0.4 fps, which preserves the appropriate ratio of slot to sweeping velocity for reducing entrainment, will also reduce impingement mortality when the screens are operating consistent with the maximum design through-slot velocity of 0.5 fps under the Final 316(b) Rule. 40 CFR § 125.94(c)(2); *see* Response to Comment III.3.1; *see also* AR-1549 at 63-64.

Larvae that experience multiple screen encounters may suffer mortality if they cannot swim away. However, CLF has not offered evidence that the Merrimack River has insufficient velocity that will result in repeated screen encounters. The Technical Development Document for the Final Rule (at 6-42) indicates that wedgewire screens have a "relatively small flow field in the waterbody" and that this flow field results in a small system profile that minimizes the potential for contact of early life stages against the screens. A 2011 study of wedgewire screens demonstrated that the probability of an organism encountering the screen decreases as the radial distance from the screen axis as it approaches the screen increases. *See* AR-1402. Only those organisms that pass relatively close to the screens will encounter the screens, and those that do need only swim a short distance to be outside of the zone of hydraulic influence (e.g., in one model a release point less than 3 inches from the screen had a 10% probability of encountering the screens at all). The proposed installation for Merrimack Station, with few screens located in a relatively small area, suggests that the probability of encountering the screens may be low (as compared to earlier designs which had more than 70 screens that stuck out into the river). Further, white sucker, which is the dominant species entrained at Merrimack Station comprising more than 40% of total entrainment in 2006 and 2007 (*see* AR-618 at 245), is also larger with greater swimming ability, which makes it more likely to actively avoid the screens. The pilot study confirms that white sucker entrainment density in the wedgewire test samples was reduced by 98% overall as compared to the control. *See* AR-1550 at 41-42.

Finally, CLF comments that because the Merrimack River is dammed both above and below the station, water velocity is dependent on release rates and will not be optimized to provide the desired velocities near Merrimack Station. As a result, CLF comments that the ambient flow in the river is not guaranteed to meet Merrimack's needs for adequate sweeping velocities. In the 2007 renewal of its FERC license (Project No. 1893)[82], each of the three dams: Garvins Falls, Hooksett, and Amoskeag, is required to operate as a run-of-river project with tailrace and bypass minimum flows. *See* AR-1671. A run-of-river hydropower project is defined by limited storage capacity where water is released at roughly the same rate as the natural flow of the river. If the river is below the minimum tailrace flow, the FERC license requires release of 90% of inflow. *See id*.

CLF has not explained why it believes that the operation of the dams will impact river velocity at the wedgewire screens. Operating the dams consistent with the FERC license (i.e., as run-of-river projects) is unlikely to affect the sweeping velocity at the wedgewire screens because the release rates at the dams are roughly the same as the natural flow of the river. Any impacts to river velocities would likely be a result of low river flows, which are most common in August and September. PSNH proposed ceasing operation of the screens in July in part because of issues with low river flows and because densities of eggs and larvae decrease in August. PSNH speculates that the likelihood of exposure to potentially damaging debris will be higher during low flow periods, it offers no evidence, and actually advances a contrary view in a later comment. *See* Comment III.6.2 n.696; *see also* Comment III.9.5. Moreover, other comments and information in the record, including site-specific data, further undermine the comment. Therefore, EPA finds that comment unpersuasive. *See also* Response to Comment III.5.2. However, the periods when low river flow is most likely to impact the efficacy of the screens is also when densities of eggs and larvae are lowest. As such, any impacts on the performance of the screens due to low river flows are likely to be caused by the natural river flow, unaffected by operation of the dams and will not significantly decrease the effectiveness or availability of the technology because low flows occur when entrainment is also minimal. The Final Permit requires operation of the screens through August 15, which strikes a balance between reasonably assuring that the technology is operated to achieve the maximum entrainment reduction warranted and that river conditions are suitable for operation of the technology. *See* Response to Comment III.4.2 and II.4.3.

In summary, in its 2017 Statement, EPA summarized the new information about the availability and effectiveness of wedgewire screens at Merrimack Station. *See* AR-1534 at 17-21. Contrary to the suggestion in the comment that "a wedgewire-half screen system . . . has not yet been designed," PSNH and its consultants proposed a relatively detailed design for seasonal use of wedgewire screens at Merrimack Station that accounts for the physical conditions of Hooksett Pool (AR-1231 Attachment 4) and completed a pilot test (proposed in May 2017, AR-1361) that demonstrates that the screens will reduce entrainment by as much as 89% as compared to the current baseline. CLF has not provided any new evidence that the screens are unproven or that the

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[82] PSNH operated the three hydroelectric projects at the time of the comments but has since sold its hydroelectric stations (including these projects) to HSE Hydro NH AC, LLC in the same auction in which Merrimack Station was sold. *See* AR-1625, AR-1774.

conditions of the river preclude their use as the BTA for entrainment. EPA agrees that wedgewire screens may not achieve entrainment reductions equivalent to closed-cycle cooling but nothing in the CWA or implementing regulations requires the BTA at an existing facility to be the best performing technology. The Final Rule requires that EPA establish entrainment controls that reflect the maximum reduction warranted after consideration of factors relevant for determining the best technology available for minimizing adverse environmental impact at each facility. 40 CFR § 125.98(f). After considering the relevant factors for Merrimack Station, EPA concluded that the BTA for entrainment is wedgewire screens and the Final Permit establishes conditions and requirements for implementing this technology. *See* Responses to Comments III.4.2, 5.2, and 5.3 and Final Permit Part I.E.1.

7.4 Environmental Organizations agree with EPA that a reasonable schedule for retrofitting Merrimack's cooling system must achieve full compliance with Sections 316(a) and 316(b) as soon as reasonably practicable and no deviation from that standard should be considered.

Comment III.7.4	AR-1573, CLF et al., pp. 18-19

Environmental Organizations agree with EPA's view that federal regulations require compliance with the BTA determination "as soon as practicable." See 40 C.F.R. §§ 125.94(b)(1), (2); 125.98(c).

With respect to the provision in the new regulations that requires EPA to consider "measures to maintain adequate energy reliability and necessary grid reserve capacity during any facility outage," consideration of such measures should neither delay EPA's finalization of the 2011 BTA determination, nor extend the schedule for compliance because of Merrimack's current generating profile. For several years, Merrimack has operated as a peaking facility. This has two implications, both of which EPA has already correctly identified. *See* SSNQPC at 26.
First, construction of a cooling tower should not affect Merrimack's operations. There would be some disruption to Merrimack when the new cooling system is tied in to the existing system, but that process, which should only take a few weeks at most, can be scheduled at any time during the approximately 9 months of the year that Merrimack doesn't run. *See id*. Second, since Merrimack is no longer a baseload facility it has no significant effect on local grid reliability. If Merrimack were needed to ensure adequate capacity, the Regional Transmission Operator (RTO) would address that during upcoming capacity planning and capacity auctions, and EPA could consider that new information when it arises as a basis for permit modification. *See id*.

As noted above, EPA is currently in violation of its Clean Water Act obligations to issue NPDES permits for terms that do not exceed five years and to reissue and fully review those permits every five years. *See* 33 U.S.C. § 1342. The new rule does not change these obligations and does not require any significant reconsideration on the part of EPA. Now that the rule is final, EPA should finalize the 2011 BTA determination – seasonal use of cooling towers – and require compliance as soon as practicable, on the 35-month schedule that EPA proposes, or on a more accelerated schedule if practicable.

EPA Response

CLF's comments that, as EPA discussed in the 2017 Statement (at 23), compliance with entrainment and impingement requirements must be as soon as practicable under 40 CFR §§ 125.94(c) and (d). *See also* 40 CFR §§ 125.94(b)(1)-(2), 125.98(c). CLF also supports EPA's analysis reflected in the 2017 Statement of the potential impacts of installing closed-cycle cooling at Merrimack Station, namely that 1) only a relatively brief outage may be required when "tying in" the new cooling system to the existing operation and 2) adding closed-cycle cooling at would not realistically threaten the reliability of the region's energy supply or grid reserve capacity. AR-1534 at 26. EPA has not altered these conclusions since the 2017 Statement. *See* Responses to Comments 6.C.2 and 7. Nor has EPA altered its conclusions that "wedgewire screens . . . would have an insignificant effect, if any, on the regional energy supply [and] should not require any significant plant outages." AR-1534 at 29.

CLF also comments that EPA should implement the BTA determination from the Draft Permit, seasonal use of cooling towers, in the Final Permit and require compliance as soon as practicable. During development of the Final Permit and in consideration of the many comments and supporting documents received since issuance of the Draft Permit, EPA has reconsidered the BTA determination from the 2011 Draft Permit. *See* AR-1534 at 12-36. Based on this information, EPA has determined that wedgewire screens, not seasonal use of closed-cycle cooling, is the BTA for entrainment at Merrimack Station and explains the basis for this determination throughout the Response to Comments. See Response to Comments III.4 (and associated sub-comments), 5.2, 5.3. In response to this comment, EPA notes that the determination that closed-cycle cooling is not the BTA for Merrimack Station was not based on either potential impacts to local energy reliability or issues related to a compliance schedule.

With respect to the comment that EPA is in violation of its obligations to issue NPDES permit that does not exceed five years and to reissue such a permit every five years, see Response to Comment III.7.2.

7.5 EPA Must Not Consider the Merrimack Auction.

Comment III.7.5	**AR-1573, CLF et al., pp. 27-28**

EPA cannot take into account the completed auction and imminent sale of Merrimack Station in setting NPDES permit limits for Merrimack Station, for multiple key reasons.

First and foremost, as discussed above, none of the considerations that EPA, as permitting authority, must undertake in setting substantive NPDES permit conditions and limits include any reference to the particular owner of a facility. Whichever corporate entity owns Merrimack Station does not play into, for example, EPA's obligations to use its best professional judgment to set technology-based effluent limitations, or to assess water quality-based effluent limitation needs; nor does the ownership of the facility impact EPA's obligation to undertake assessments of best available technology (or best technology available) for control standards at the facility. Ultimately, the substance of the NPDES permit hinges on the pollution profile and impacts of the plant itself, not whoever owns it.

Second, the auction process has been completed and the New Hampshire Public Utilities Commission has entered an order approving the sale of Merrimack Station and Eversource's other fossil-fired generating plants to Granite Shore Power LLC, with the sale's finalization anticipated to occur early in 2018.[22] As such, there is little to no remaining uncertainty as to the owner of Merrimack.

Finally, even if such indications were relevant, the new owner of Merrimack Station has provided no indication that it intends to accept federally-enforceable operation restrictions that would have any meaning for the pollution impacts EPA must address in this NPDES permit. If, for example, Granite Shore Power LLC wished to retire Merrimack, or to eliminate the intake of water for cooling purposes and the discharge of heated water, those decisions may ultimately need to be reflected in a modification to Merrimack's NPDES permit. However, absent such decisions, the change in ownership at Merrimack can have no substantive impact on the permit that EPA finalizes.[23]

[22] *See* New Hampshire PUC Order No. 26,078 (Nov. 28, 2017), Docket DE 17-124, *available at* https://www.puc.nh.gov/Regulatory/Docketbk/2017/17-124/ORDERS/17-124_2017-11-28_ORDER_26078.PDF.
[23]Nor should EPA further delay issuance of this NPDES permit based on the possibility that Granite Shore Power LLC might at some future date decide that it wishes to operate Merrimack in a way fundamentally different than does Eversource. This permit is already decades overdue, and additional delay only serves to extend and exacerbate the environmental harm that Merrimack causes.

EPA Response

In its 2017 Statement, EPA requested comment on how the Agency should account for the potential sale of Merrimack Station in its development of Final Permit conditions under § 316(b), AR-1534 at 35-36, and Final Permit limits more generally, *id.* at 69. At the time, Merrimack Station was owned and operated by Eversource (also referred to as PSNH) and was in the midst of an auction process mandated by New Hampshire law. *See* N.H. Rev. Stat. Ann. § 369-B:3-a (2015). Merrimack Station was purchased by Granite Shores Power LLC ("GSP"); the sale closed on January 10, 2018. Under the terms of the purchase and sale agreement between PSNH and GSP, GSP Merrimack LLC ("GSP Merrimack"), now owns and operates Merrimack Station and is responsible for compliance with the Facility's NPDES permit. In essence, GSP Merrimack has stepped into the shoes of PSNH with regard to both ongoing NPDES permit compliance and participation in the current NPDES permit development proceeding for Merrimack Station. The existing NPDES permit was modified effective January 10, 2018, to reflect the transfer to GSP Merrimack. 40 CFR §§ 122.61(a), 122.63(d). *See* AR-1642, AR-1650, AR-1701.

In the 2017 Statement, EPA explained its view that the auction and sale should not affect the Final Permit conditions, but nonetheless requested public comment on the subject. AR-1534 at 35-36, 69. EPA has not changed its view now that GSP Merrimack is the owner and operator of

Merrimack Station. Thus, EPA agrees that the sale of the Facility is not a factor in determining the Final Permit conditions.

7.6 The Most Effective Way to Reduce Cooling Water Intake Structure Impact is to Require Closed-Cycle Cooling

Comment III.7.6	**AR-851, CLF, pp. 23-27**
See also AR-852, Henderson, pp. 2-7, 17, 24-5; AR-991, CLF et al., pp. 1-2	

We agree with EPA's determination that the most effective way to reduce cooling water intake structure ("CWIS") impact is to require CCC.[120] EPA has selected as BTA "Option 5," which requires CCC operated on a seasonal basis (Units 1 and 2, April 1 through August 31), and a Type 2 fish return system, which consists of low and high pressure wash, continuous screen operation, and a new fish return system.[121] Option 5 is estimated to reduce annual impingement rates by sixty-five percent, and would save 3.6 million fish eggs and larva.[122] CLF supports EPA's CWIS BTA because we understand that, despite the manner in which the BTA is defined (seasonal CCC operation), EPA has "recognized that the permit's thermal discharge conditions are based on using closed-cycle cooling on a year-round basis." Because the thermal discharge limit effectively requires year-round CCC, that limit will, as EPA states, "provid[e] even greater reductions in impingement mortality" than would be realized with the screening system improvements originally included in Option 5.

EPA concluded that Normandeau's analysis likely underestimated the actual annual entrainment and commensurate adult equivalent loss.[129] For example, EPA noted that Normandeau recorded zero entrainment at Unit 1 in May 2006, when 175 feet downstream at Unit 2, sampling on the same date recorded an estimated entrainment of 742,481 larvae and sampling in May 2007 at Unit 1 recorded an estimated entrainment of 556,360 larvae.[130] Rather than question an obviously erroneous data point, Normandeau used it in its analysis resulting in a 50% lower average annual entrainment rate for Unit 1 in May. When Normandeau's analysis is corrected, the estimated entrainment rate at Merrimack Station rises to 3.8 million fish larvae.[131]

Not surprisingly, when PSNH's consultant looked for entrainment survivors, they found none. Normandeau conducted entrainment survival tests between May 25 and June 18, 2007, when larval abundances in Hooksett Pool were expected to be highest. However, Normandeau reported that no larvae were collected at either Unit 1 or 2 and no eggs or larvae were observed in the samples collected in the control tank either.[132] Amazingly, PSNH's consultant blamed "overall low densities of larvae in the Hooksett Pool"[133] rather than the well-known fact that mortality from entrainment under normal conditions is substantial.[134] EPA correctly and easily concluded that, absent affirmative site-specific evidence to the contrary, 100 percent of fish eggs and larvae entrained at Merrimack Station are killed.[135]

The adult equivalent loss due to entrainment at Merrimack Station must be viewed in relation to the already depleted fish populations. Thus, as EPA correctly noted, "the loss of 195 adult equivalents [of yellow perch] takes on greater significance" given the overall decline in yellow perch abundance that has occurred since the 1960s.[136] In addition to the direct mortality (or adult equivalent loss) of fish species caused by entrainment, there are indirect effects as well. EPA correctly noted the "ripple effects" that entrainment loss of large numbers of fish eggs and larvae may have, including loss of forage for other species and increased competition among species for other sources of food. It is no wonder given these documented direct and indirect effects that EPA concluded, "entrainment at Merrimack Station represents a significant adverse environmental impact."[137]

Likewise with regard to impingement at Merrimack Station, EPA correctly concluded that "[t]he loss of thousands of juvenile fish per year [due to impingement] from an ecosystem already stressed by the plant's thermal effects and entrainment constitutes an adverse environmental impact."[138] Impingement occurs when larger fish and other aquatic life become trapped on screening devices or other barriers installed at the entrance of the intake structure. Impingement is caused by the force of water passing through the intake structure and can result in starvation and exhaustion (when organisms are trapped against an intake screen), asphyxiation (when organisms are forced against a intake barrier by velocity forces that prevent proper gill movement or when organisms are removed from the water for prolonged periods of time), descaling (when organisms are removed from an intake screen by a wash system), and other physical harms.[139] As the Henderson Report notes, "[a]quatic life is poorly adapted to withstand impingement, and contact with the metal screens frequently results in injury or death."[140] Under normal conditions, a substantial number of the aquatic organisms impinged are killed or subjected to significant harm.[141] Because PSNH has not employed a fish return system to deliver impinged fish back to the river, impingement at Merrimack Station has resulted in 100% mortality.

PSNH's consultant also collected fisheries data between June 2005 and June 2007 to estimate the number of fish subjected to impingement as a result of Merrimack Station's water withdrawals.[142] When adjusted for collection efficiencies, Normandeau estimated the total impingement from July 2005 through June 2006 to be 6,736 fish, and from July 2006 through June 2007 to be 1,271 fish, for a total of 8,007 fish impinged over two years.[143] Again, EPA appropriately put these numbers into context explaining that fish abundance is at a four-decade low in Hooksett Pool and that "while impingement losses result in fewer adult equivalents than losses from entrainment, the numbers are not insignificant based on all the available information on the status of the fish community in Hooksett Pool."[144] Moreover, although PSNH has been required by its current permit to monitor for impingement during low-flow conditions, it is likely that significant impingement events have gone undetected. The sampling data collected by Normandeau demonstrated that the greatest impingement occurred during the month of June (4,300 fish in 2006, or 72% of all fish impinged in 2006), when PSNH is not required to monitor for impingement.[145]

[120] *See* Attachment D at 312, 346.

[121] *Id.* at 346 (noting Draft Permit does not require installation of the new traveling screens that were originally part of the Option 5 package).

[122] *See id.* at 322, Table 12-1.
[123] *See* 66 Fed. Reg. 65,256 at 65,263; *see also* 65 Fed. Reg. 49,060 at 49,072.
[124] *See generally* AR 2, Normandeau Associates, Entrainment and Impingement Studies Performed at Merrimack Generating Station from June 2005 through June 2007 (2007) ("Normandeau E & I Studies").
[125] *Id.* at 52 (Table 3-6).
[126] *Id.*
[127] *See* AR 6, PSNH, Response to United States EPA CWA § 308 Letter, Attachment 6, Table 2-1 (December 10, 2007).
[128] *Id*.
[129] Normandeau initially underestimated the average annual entrainment at Merrimack Station by using actual flow withdrawal data rather than design intake flows. See Attachment D at 252 ("While [actual flow data] may be a fair representation of entrainment rates for the river flow rates and plant operations during the monitoring period, it does not necessarily reflect entrainment rates under other flow conditions and plant operation scenarios."). When entrainment rates were adjusted based on design flow data, those rates rose considerably.
[130] Attachment D at 252.
[131] *Id*.
[132] See AR 2, Normandeau E & I Studies, at 43.
[133] *Id*.
[134] *See* 65 F.R. at 49,072.
[135] *See* Henderson Report at 7 (concurring with EPA's assumption of 100 percent mortality of organisms entrained at Merrimack Station).
[136]Attachment D at 251.
[137] *Id*. at 254; see also Henderson Report at 5-7 (concurring with EPA's conclusion that entrainment at Merrimack Station represents a significant adverse environmental impact).
[138] Attachment D at 261; see also Henderson Report at 3 ("The impingement losses observed due to Merrimack's
current intake structures are significant and have affected the abundance of the local fish populations, both resident and migratory.").
[139] 66 Fed. Reg. at 65,263.
[140] Henderson Report at 3.
[141] *Id*.
[142] See AR 2, Normandeau E & I Studies, at 54-82.
[143] *Id*. at 74 (Table 4-5).
[144] Attachment D at 260.
[145] *Id*. at 261.

EPA Response

In its comment, CLF generally summarizes the entrainment and impingement impacts presented in the 2011 Draft Determinations Document and supports EPA's preliminary determination that the most effective way to reduce cooling water intake structure ("CWIS") impact is to require closed-cycle cooling. For the 2011 Draft Permit EPA determined that the entrainment and impingement impacts, as described in the comment, are adverse environmental impacts and that the Permittee must operate its CWIS with technology that reflects the BTA to minimize those impacts. *See* AR-618 at 242-62. This determination has not changed. *See* Responses to Comments III.3.1, III.3.4, III.3.5, and III.3.6. CLF also supports using closed-cycle cooling on a year-round basis because it will provide greater reductions in impingement mortality and the thermal discharge limit effectively requires year-round closed-cycle cooling. As explained fully in Section II of the Response to Comments, the Final Permit does not require closed-cycle cooling to meet the thermal limits. *See*, *e.g*., Response to Comment II.1.1. Closed-cycle cooling is also not required to meet the impingement mortality BTA standards under the 2014 Final Rule. *See* Response to Comment III.3.1.

For the Final Permit, the determination of the BTA for Merrimack Station is subject to new, national standards for establishing requirements for CWISs at existing facilities. *See* Response to Comment III.2 (and associated sub-comments). The Final Rule requires the owner or operation of an existing facility to comply with one of the BTA standards for impingement mortality listed at 125.94(c)(2) through (7), except as provided in paragraphs (c)(11) or (12). 40 CFR § 125.94(c). In addition, the Final Rule requires the permitting authority to establish BTA standards for entrainment on a site-specific basis. These standards must reflect the maximum reduction in entrainment warranted after consideration of factors as specified in 40 CFR § 125.98(f). 40 CFR § 124.94(d). EPA has determined that the BTA for entrainment at Merrimack Station is seasonal operation of wedgewire screens. *See* Responses to Comments III.4.2, III.5.2. and III.5.3. This technology would also satisfy the impingement BTA alternatives of maximum through-screen velocity of 0.5 fps, at least for the periods it operates. *See* Response to Comment III.3.1. EPA believes that this technology, when combined with PSNH's proposed fish-friendly return, an optimized rotation frequency, and potentially flow reductions as a result of reduced operations and/or to meet the thermal limits, may allow the facility to comply with the "systems of technologies" standard at § 125.94(c)(6). Or, the Permittee may choose to comply with another impingement BTA alternative, the most likely of which would be modified traveling screens, which will also require installation of a new fish return. The Final Permit sets Merrimack Station on a path to comply with § 125.94(c) and (d) as soon as practicable.

8.0 Additional Comments Submitted by Normandeau Associates

The EPA's "Statement of Substantial New Questions and Possible New Conditions" posed a number of questions about the potential use of wedgewire screens at Merrimack Station, including questions about mortality to aquatic life with the use of this new technology.

8.1 The extent to which wedgewire screens with different screen slot sizes can prevent mortality to aquatic life from entrainment and/or impingement and satisfy the BTA requirements of CWA § 316(b)

Comment III.8.1	AR-1552, Normandeau, pp. 26-27

The entrainment reduction performance of the 3-mm narrow slot wedgewire screens designed by ENERCON for full scale installation at Merrimack Station Units 1 and 2 and tested by Normandeau for 17 consecutive weeks during the predominant entrainment season from 22 May through 3 September 2017 provided an overall entrainment reduction compared to the paired Unit 1 cooling water intake structure control of 89% for all ichthyoplankton taxa and life stages combined (Normandeau 2017b). The entrainment reduction for fish larvae only (i.e., eggs excluded) was 90% (Normandeau 2017b). With regard to impingement mortality reduction benefits of the 3-mm narrow slot wedgewire screens proposed for installation and operation at Merrimack Station Units 1 and 2, the screens are designed with a through screen velocity of 0.4 feet per second or less (ENERCON 2017) and therefore are compliant with the §125.94(c)(2) criterion as the best technology available (BTA) standards for impingement mortality specified by CWA §316(b) when in use.

EPA Response

In its comment, Normandeau summarizes the results of its 2017 pilot study of a 3-mm wedgewire screen at Merrimack Station, as presented in the 2017 Final Report (AR-1550) submitted as an exhibit with PSNH's comments on EPA's 2017 Statement. EPA has determined that the BTA for entrainment at Merrimack Station is seasonal operation of wedgewire screens. See Responses to Comments III.4 (and associated sub-comments), 5.2. and 5.3. This technology would also satisfy the impingement BTA alternatives of maximum through-screen velocity of 0.5 fps, at least for the periods it operates. *See* Response to Comment III.4.1 and 4.2. EPA believes that this technology, when combined with PSNH's proposed fish-friendly return, an optimized rotation frequency, and perhaps even flow reductions, may allow the facility to comply with the "systems of technologies" standard at § 125.94(c)(6). Or, the Permittee may choose to comply with another impingement BTA alternative, the most likely of which would be modified traveling screens, which will also require installation of a new fish return. The Final Permit sets Merrimack Station on a path to comply with § 125.94(c) and (d) as soon as practicable.

8.2 Which months (e.g., April 1 through August 31, April 1 through July 31), if any, should wedgewire screens be implemented as the BTA for controlling entrainment

Comment III.8.2	**AR-1552, Normandeau, p. 27**

The table below shows percentage and cumulative percentage of total annual entrainment density observed by week and month based on the weekly entrainment densities observed in the sampling study performed at Merrimack Station Unit 1 and Unit 2 from May 2006 through June 2007 (Normandeau 2007):

Week of Year		Month	Percent Of 2006-2007 Annual Entrainment Density Units 1 And 2 Combined	
#	begin		Weekly %	Cumulative %
14	2Apr	Apr	0.4%	0.4%
15	9Apr		0.4%	0.8%
16	16Apr		0.4%	1.2%
17	23Apr		0.4%	1.6%
18	30Apr	May	0.4%	2.0%
19	7May		5.3%	7.3%
20	14May		10.1%	17.4%
21	21May		4.1%	21.5%

22	28May		8.1%	29.6%
23	4Jun	Jun	26.0%	55.6%
24	11Jun		6.1%	61.7%
25	18Jun		6.3%	68.1%
26	25Jun		13.4%	81.5%
27	2Jul	Jul	4.5%	86.0%
28	9Jul		3.5%	89.4%
29	16Jul		2.4%	91.9%
30	23Jul		4.5%	96.3%
31	30Jul	Aug	2.0%	98.4%
32	6Aug		0.8%	99.2%
33	13Aug		0.4%	99.6%
34	20Aug		0.0%	99.6%
35	27Aug		0.4%	100.0%
36	3Sep	Sep	0.0%	100.0%
37	10Sep		0.0%	100.0%

These data reveal that 96.3% of the annual total entrainment density observed at Merrimack Station Units 1 and 2 combined from studies performed weekly during 2006 and 2007 occurred from 2 April through 29 July, and 100% of the entrainment was observed during the period 1 April through 31 August. This seasonal pattern of weekly entrainment densities was confirmed during the May to September 2017 3-mm wedgewire screen evaluation study at Merrimack Station Unit 1 (Normandeau 2017).

EPA Response

Normandeau provides entrainment data from 2006 and 2007 to support its comment that the majority of entrainment occurs between April 1 and July 31. EPA agrees that the data suggest a strong seasonal component for the presence of eggs and larvae in Hooksett Pool, which indicates that a high percentage of annual entrainment (as high as 96%) occurred between April 1 and July 31. Similarly, in 2017, more than 99% of entrainment at both the Unit 1 intake and the test wedgewire screen occurred between May 22 (the first date of the study) and July 31. *See* AR-1550 at 41-2. Taken together, the two entrainment studies suggest that the presence of eggs and larvae in Hooksett Pool decreases substantially at the beginning of August and drops to essentially zero by mid-August. The data also suggest that deploying the wedgewire screens from April 1 through July 31 will likely ensure that the entrainment technology is operational during the period when greater than 95% of annual entrainment occurs. At the same time, relatively low densities of eggs and larvae may still be present in early August. For example, in 2016, nearly 5% of entrainment at Unit 1 occurred during August. *See* AR-1567 at 33. Depending on annual variation, this transitional period could potentially experience greater densities in some years (*e.g.*, years when spawning is delayed). EPA has proposed that, at a minimum, the wedgewire screens shall be operational beginning on April 1 through August 15. *See also* Response to Comments III.4.3 and III.9.5.

8.3 For impingement, whether Merrimack Station's impingement mortality should be considered to be de minimis all year, during certain months, or not at all?

Comment III.8.3	AR-1552, Normandeau, p. 27
See also AR-1549, Enercon, pp. 20, 63	

Normandeau performed an analysis of the Merrimack Station Unit 1 and Unit 2 weekly impingement rates from the 2005 through 2007 impingement abundance study (Normandeau 2007), scaled these weekly rates up to the 2011 through 2013 weekly actual intake flows (AIF), and then summed the weekly rates over 52 consecutive weeks to represent the annual impingement rates for 2011 through 2013. These 2011 through 2013 annual impingement rates for Merrimack Station were then compared to annual impingement rates obtained from a data base supplied by EPRI (2011) consisting of results supplied in response to a detailed questionnaire from 166 power generating facilities from throughout the United States with similar once-through cooling systems (Normandeau Attachment 1 to ENERCON October 2014). Based on this comparison of annual impingement rates, Normandeau concluded that annual impingement rate at Merrimack Station (Units 1 and 2 combined) of 0.27% of the national average is *de minimis*.

EPA Response

Contrary to the comment, EPA does not consider that impingement at Merrimack Station is de minimis at any time of year. *See* Response to Comment III.3.4, in which EPA responds to a PSNH comment that relies in part on Normandeau's above reasoning. A separate response to Enercon's 2017 comment regarding *de minimis* impingement is likewise unnecessary because Enercon relies solely on Normandeau for the comment and presents no additional bases. AR-1549 at 20, 63.

8.4 If wedgewire screens are used, should PSNH be authorized to "bypass" the screens under certain conditions and, if so, should additional protective measures for impingement be required during those periods?

Comment III.8.4	AR-1552, Normandeau, p. 28

The response to this question depends on what time of the year bypass would occur, the duration of the bypass flows, and is largely based on engineering and plant operation considerations identifying the need for bypassing the full scale wedgewire screen arrays. Therefore, ENERCON and Merrimack Station should address this question. However, because the annual impingement rate at Merrimack Station (Units 1 and 2 combined) of 0.27% of the national average is considered *de minimis*, additional seasonal or monthly constraints on CWIS flows that bypass the installed and operated full-scale wedgewire screen array at Merrimack Station Units 1 and 2 are unnecessary.

EPA Response

EPA has addressed similar comments about a bypass in Response to Comment III.4.3. Part I.E.4 of the Final Permit authorizes the Permittee to operate an emergency intake when operation of the wedgewire screens would result in unavoidable loss of human life, personal injury, or severe property damage. Further, it requires the permittee to notify EPA (within twenty-four hours of initiating any use of the emergency intake system) of the reason that the wedgewire screens were taken off-line and identify all actions taken or to be taken to address the cause, and minimize the use, of the emergency intake. EPA does not agree that impingement at Merrimack Station should be considered *de minimis*. *See also* Response to Comment III.3.4. The Permittee must operate a technology to minimize impingement under the 2014 Final Rule. Because the use of wedgewire screens is expected to be seasonal, the Final Permit requires the Permittee to operate the existing traveling screens with a new fish return system when the through-screen velocity is greater than 0.5 fps. As the traveling screens will be used during certain periods of the year, the Final Permit reasonably requires that the Permittee rotate the traveling screens during periods when the emergency intake is used.

8.5 There is no evidence that entrainment varies with river flow.

Comment III.8.5	AR-872, Normandeau, pp. 125-128

[Responding to AR-618, p. 243 Section 11.2.1] There is no evidence that entrainment varies with river flow. Entrainment will vary directly with the volume of water withdrawn by the Station and the density of ichthyoplankton in the river, neither of which are influenced by river flow.

[Responding to AR-618, p. 245 Section 11.2.1a] USEPA provides no evidence for the assertion that eggs and larvae are equally distributed throughout the river. In fact, the peer-reviewed scientific literature indicates that ichthyoplankton have a very patchy spatial and temporal distribution. USEPA provides no basis for its assumption that the percent of water withdrawn for cooling can provide an estimate of the percentage of the ichthyoplankton lost to entrainment. The percentage of the water withdrawn is a factor in determining entrainment, but density of ichthyoplankton in Hooksett Pool over space and time are also important factors. Existing entrainment and withdrawal data do not support the Agency's assumption that entrainment is proportional to percent water withdrawal because the months with the greatest percentage withdrawal are also the months with the lowest ichthyoplankton densities. Figure 4-1 presents a plot of percent withdrawal on the x axis versus total entrainment on the y axis (Table 3-7; Normandeau 2007b). There is no apparent positive relationship between percent withdrawal and total monthly entrainment. In fact, a non-parametric Spearman Rank Correlation analysis indicates that there is a negative relationship (-0.41) between percent withdrawal and total monthly entrainment. The raw data are presented in Table 4-1. The months with the greatest percent withdrawal, August and September 2006, also have the lowest entrainment because ichthyoplankton are not common in Hooksett Pool during those months. The highest entrainment occurred in June of 2006 and 2007 when percent withdrawal was relatively low (June 2006), or above average (June 2007) but entrainment was highest due to the high density of ichthyoplankton in Hooksett Pool. The conclusion to be drawn from this analysis of empirical data is that percent water withdrawal alone is not a major factor in determining entrainment at Merrimack Station. Density of ichthyoplankton in Hooksett Pool is also an important factor and the greatest percent withdrawals occur in the months when ichthyoplankton density is low. It can be seen that during May, low ichthyoplankton densities are the norm, and that the entrainment estimate for May at Unit 2 is driven by the relatively large amount of ichthyoplankton collected on the night of 31 May (Table 4-2). The data from the night of 31 May might be considered the outlier rather than the 0 counts at Unit 1, but Normandeau included all data in the analysis because there are no methodological reasons to exclude them. Empirical data should not be excluded because it appears to be "different," but may only be excluded if there is some methodological reason that would justify the exclusion, such as abnormal field sample collection or mishap during laboratory analysis. These incidents did not occur. Therefore, USEPA's rationale for excluding the data for Unit 1 from May, and substituting the Unit 2 data for the Unit 1 data is not valid. Normandeau's data estimated 3.2 million larvae per year were entrained, and USEPA improperly changed this number to 3.8 million larvae entrained.

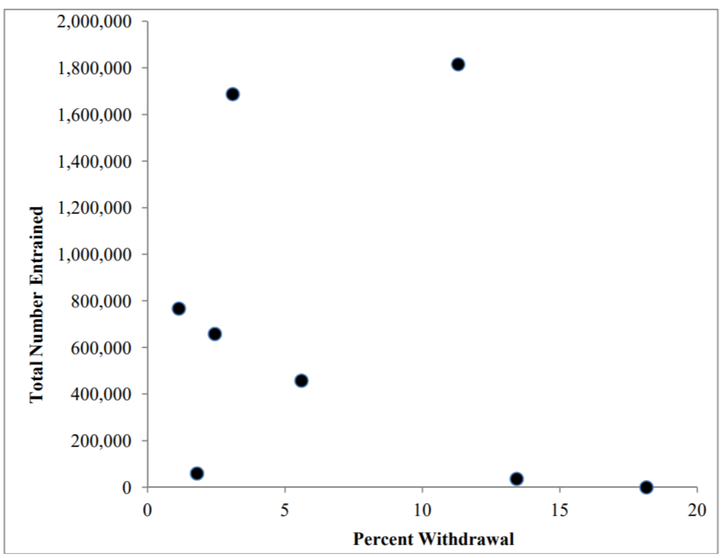

Figure 4-1. Percent withdrawal versus total number entrained during Merrimack River entrainment studies (2006-2007) (Normandeau 2007b).

Table 4-1. Monthly river flow, plant withdrawal and larval entrainment at Merrimack Station, 2006-2007 (Normandeau 2007b).

Year	Month	River Flow (million gallons)	Plant Flow (million gallons)	Percent Withdrawal	Entrainment
2006	May	331,811	3,778	1.14	767,330
	June	236,747	7,344	3.1	1,687,784
	July	141,833	7.944	5.6	457,974
	August	59,157	7,944	13.43	36,445
	September	28,681	5,206	18.15	0
2007	April	290,628	5,245	1.8	59,724
	May	177,852	4,361	2.45	658,544
	June	65,656	7,418	11.3	1,815,937

Table 6-2. Number of larvae collected at Units 1 and 2 of Merrimack Station on 25 and 31 May, 2006 (Normandeau 2007b).

Date	Unit	Diel Period	Amount of Ichthyoplankton collected in sample
31-May	1	Day (10:35-14:37)	0
31 May- 1 June	1	Night (21:15-01:49)	0
25-May	2	Day (12:53-16:31)	0
25 May- 26 May	2	Night (21:43-01:21)	1
31-May	2	Day (09:56-14:12)	2
31 May-1 June	2	Night (21:16-01:08)	28

EPA Response

Normandeau comments that, contrary to statements from the 2011 Draft Determinations Document, there is no evidence that entrainment varies with river flow or for the assertion that eggs and larvae are equally distributed throughout the river. *See* AR-618 at 245. EPA noted that no in-river ichthyoplankton sampling was conducted during any of the entrainment studies to determine the fraction of the total number of eggs and larvae present in Hooksett Pool that are lost to entrainment. EPA made an argument that the fraction could, at times, be substantial because the fraction of total river flow withdrawn for cooling water at Merrimack Station is significant (*e.g.*, 25-64% or more). *See id*. at 254. EPA correctly concluded that the Facility has the potential to withdraw a significant fraction of the river's flows and planktonic community present in the river at certain times of the year.

However, Normandeau correctly states that entrainment varies with the volume of water withdrawn by the Station and the density of ichthyoplankton in the river, neither of which are influenced by river flow, and the periods when the percentage of the water withdrawn is highest (August) is a period of relatively low (though not zero) entrainment. Therefore, even though the Facility could withdraw a substantial fraction of the water (and ichthyoplankton) at certain times, it does not necessarily amount to a sizeable fraction of overall entrainment because ultimately the density of ichthyoplankton when river flows are lowest (and the fraction withdrawn highest) are relatively low. Ultimately EPA's above-referenced conclusions about river flow and entrainment were one of many factors that EPA considered in determining that entrainment at Merrimack Station's CWISs results in an adverse environmental impact. EPA has not changed its position and, as discussed in detail in Response to Comment III.3.6, maintains that entrainment at Merrimack Station is an adverse environmental impact that must be minimized through the implementation of the best technology available.

9.0 Additional Comments Submitted by Electric Power Research Institute (EPRI)

9.1 Cylindrical wedgewire screens of various slot widths can reduce entrainment and impingement at the station sufficient to satisfy BTA requirements

Comment III.9.1	AR-1577, EPRI, pp. 2-1

The administrative record for the Merrimack Station NPDES permit contains ample evidence that cylindrical wedgewire screens (CWWS) of various slot widths can reduce entrainment and impingement at the station sufficient to satisfy BTA requirements. Although some of the evidence was not available at the time EPA reached its 2011 determination, for example AR-1401, AR-1402, AR-1403, AR-1418, AR-1420, AR-1421), the information developed in these recent research efforts expands and supports prior knowledge of CWWS efficacy, rather than supplants it.

That CWWS would act through a combination of modalities, i.e., physical exclusion, active avoidance, and hydraulic bypass, has been recognized, if not explicitly quantified, from the earlier studies of the technology.

A few key examples from the literature on the technology are:

Otto, R. G., T. I. Hiebert, and V. R. Kranz. 1981. The effectiveness of a remote profile-wire screen intake module in reducing the entrainment of fish eggs and larvae. Pp. 47-56 in Dorn and Johnson (1981).

This study examined efficacy of a 3-ft diameter, 13-ft long, 1-mm slot width CWWS in a side channel of the Mississippi River. The screen was oriented parallel to the ambient currents, which ranged from 1.2 to 2.7 fps, with through-slot velocity 0.4 fps, thus a velocity ratio of 3 to nearly 7. Densities of ichthyoplankton in water drawn through the screen was compared to densities in control samples collected with towed plankton nets and with nets fixed in place beside the CWWS.

Densities of eggs (primarily freshwater drum), and larvae of emerald shiner, carp, and freshwater drum were significantly lower in the CWWS samples than in either type of control samples. For all species of larvae, except crappie, Control sample densities were at least five times as high as the CWWS densities. In addition, larvae collected in CWWS samples were significantly smaller than larvae collected in the controls. For CWWS samples, few larvae were longer than 8 mm, although longer larvae were common in the plankton net controls. Crappie larvae exhibited similar densities in CWWS and net samples; but were smaller in size in CWWS samples.
The authors attributed the density reductions for eggs to exclusion, but concluded that exclusion could not explain the reduction of smaller larvae, particularly slender larvae, which could easily pass through the 1-mm slot. The authors attributed the reduced entrainment of smaller larvae through the CWWS to an ability to sense and react to the flow field perturbations induced by the entrainment flow, and for larvae larger than 8 mm to swimming ability which would allow them to escape entrainment even if they came in direct contact with the screen surface.

Zeitoun, I. H., J. A. Gulvas, and D. Roarabaugh. 1981. Effectiveness of fine-mesh cylindrical wedgewire screens in reducing entrainment of Lake Michigan ichthyoplankton. *Canadian Journal of Fisheries and Aquatic Sciences* 38:120-125.

This study examined two sizes of CWW screens at the bottom of Lake Michigan near the J. H. Campbell power plants. One screen was 14.5 in. in length, 18-in. in diameter, with a slot width of 2 mm. The other was 12 in. in length, 15 in. diameter, and a slot width of 9.5 mm (approximately the standard 3/8" mesh of traveling screens). Both screens were designed to withdraw at 0.5 fps. through-slot velocity at the flow rate used for the study. For comparison to CWWS samples, control samples were collected using a 6-in. diameter open pipe and using a towed 0.5 m plankton net.

Common taxa were Rainbow Smelt, Yellow Perch, Alewife, carp, whitefish, unidentified herring/smelt, and unidentified cyprinid minnows. For all larvae, there was no significant difference between larval densities entrained by the 2.0 mm and 9.5 mm screens. The mean density of larvae in the combined CWWS samples was about 68% of the density of larvae in the open pipe control samples, but only 8% of the density in the towed net samples. Egg densities in the CWWS samples and control pipe samples were much greater in the towed net samples.
The authors attributed the results for all but minnow larvae to active avoidance of the CWW screens and the open pipe by larvae. They concluded that about 90% of the native fish larvae at the site avoided entrainment and open pipe sampling, raising the issue of the appropriate control sampling methodology for comparison with the CWWS sample.

Jude, D. J., C. P. Madenjian, P. J. Schneeberger, H. T. Tin, P. J. Mansfied., T. L. Rutecki, G. E. Noguchi, and G. R. Heufelder. 1982. Adult, Juvenile, and Larval Fish Populations in the Vicinity of the James. H. Campbell Plant, 1981, with Special Reference to the Effectiveness of the Wedge-wire Intake Screens in Reducing Entrainment and Impingement

of Fish. Special Report Number 96. Great Lakes Research Division, The University of Michigan, Ann Arbor.

This study examined entrainment through a working CWWS providing water to Unit 3 of the J. H. Campbell plant on Lake Michigan. The submerged intake draws water through a CWWS array of screens 48 in.-long, with a diameter of 48 in, and slot openings were 9.5 mm. Design through-slot velocity was 0.38 fps. The array was at a depth of 35 ft and surrounded by a riprap wall, which provided habitat for some local fishes. Sampling was performed in 1980 and 1981 to compare densities of fish eggs and larvae entrained through the CWWS to densities in Lake Michigan near the intake using towed plankton nets.

Although densities of fish larvae in CWWS samples were generally lower than in the lake samples, high sampling variability resulted in few statistically significant differences. Significantly higher densities in CWWS samples were found for Yellow Perch larvae and Slimy Sculpin. The authors attributed this to the riprap wall providing spawning habitat for these species at the edge of the CWWS array. Densities of Alewife larvae were significantly lower and lengths were significantly smaller in CWWS samples than in lake samples. Entrained Yellow Perch, Spottail Shiner, Trout-Perch, and Johnny Darter larvae were also smaller than larvae collected in lake samples. The authors attributed the reduced densities and size differences to active avoidance of the CWWS by larger larvae. Due to the location within the riprap wall, sweeping flows would be reduced, and with 9.5 mm slot width, exclusion of larvae and eggs would not occur.

Weisberg, S. B., W. H. Burton, E. A. Ross, and F. Jacobs. 1984. The effects of screen slot size, screen diameter, and through-slot velocity on entrainment of estuarine ichthyoplankton through wedge-wire screens. Prepared by Martin Marietta Environmental Systems, Inc. for Maryland Power Plant Siting Program.

Weisberg, S. B., W. H. Burton, F. Jacobs, and E. A. Ross. 1987. Reductions in ichthyoplankton entrainment with fine-mesh, wedge-wire screens. ***North American Journal of Fisheries Management*** **7:386-393. [AR-740]**

In this study, CWWS were evaluated at the intake of the Chalk Point Steam Electric Station on the Patuxent River, MD. The screens ranged from 18 to 34 in. in length, and 21 to 30 in. in diameter, with slot widths of 1, 2, and 3 mm. CWWS samples were compared to control samples collected by pumping through an open-port pumped, and with plankton nets. Bay Anchovy and Naked Goby were the most common species collected.

Larval entrainment densities increased as slot width increased, however, the increase was not statistically significant due to low numbers captured in the CWWS samples. Consistent with other studies that used open-port and towed net control samples, higher densities in the plankton net samples indicated significant larval avoidance of the open ports. CWWS efficacy was near zero for small larvae (~4 mm), but for larger Bay Anchovy larvae efficacy ranged from 45% to 100% (open port controls) and 62% to 100% (plankton net controls), with higher efficacy for larger larvae. Naked Goby larvae showed a similar pattern with efficacy ranging from 41% to 97% (open port controls) and 81% to 97% (plankton net controls) as size increased. Except for the largest size class, efficacy declined slightly with increasing slot width. Efficacy for Bay Anchovy eggs was 66% for the 2-mm screens and 73% for the 1-mm screens.

Consistent with other studies, these results demonstrate: 1) CWWS efficacy is an increasing function of larval length, 2) avoidance of the screens is a significant modality of effectiveness, and 3) larval avoidance of open ports significantly biases efficacy estimates.
These results demonstrate that CWWS' mode of action is a combination of avoidance, bypass, and exclusion are consistent with the work done by EPRI (2005, 2006).

Electric Power Research Institute (EPRI). 2005. Field evaluation of wedgewire screens for protecting early life stages of fish at cooling water intake structures. Palo Alto, CA. EPRI Report 1010112. [AR-114]

EPRI 2006. Field evaluation of wedgewire screens for protecting early life stages of fish at cooling water intake structures: Chesapeake Bay studies. Palo Alto, CA. EPRI Report 1012542. [AR-

In 2005 and 2006, EPRI published results of field tests of CWW screen efficacy performed in Sakonnet River, RI, the Portage River, OH, and in Chesapeake Bay. The studies used small CWWS with slot width of either 0.5 or 1 mm. Intake velocities were 0.5 and 1 fps. Both studies compared densities of eggs and larvae entrained through CWWS to control densities collected by an intake with a 9.5 mm mesh and plankton net tows.

The 0.5 mm screens were more effective than the 1 mm screens at reducing entrainment. Larval length significantly influenced CWWS efficacy, consistent with exclusion of larvae with head widths larger than the slot widths. Efficacy estimates were based only on comparisons between CWWS densities and control intake densities, even though densities of larvae in towed net samples were often higher than control port densities. Large larvae were most common in the net samples.

Although not explicitly discussed in the reports, the results were consistent with avoidance of the CWWS by larger larvae being an important factor in CWWS efficacy.

These studies are all evidence of the multiple modes of effectiveness of CWWS beyond that of simple passive filters, which can allow high efficacy of CWWS with slot widths larger than 1 mm. The more recent studies (AR-1401, AR-1402, AR-1403, AR-1420, AR-1421) already in the administrative record have provided quantification of expected efficacy as a function of organism size, through-slot and sweeping current velocities, and slot widths.

One additional aspect of CWWS efficacy is that the more valuable, from a population perspective, members of the ichthyoplankton community receive the highest level of protection. The larger larvae and early juveniles, which typically have a far greater probability of surviving to adulthood, than eggs and smaller larvae, are protected by all three modes of effectiveness, while the less valuable stages may principally be protected by hydraulic bypass, and exclusion for small-slot screens. Thus, a strictly numerical view of effectiveness as percent reduction of total entrained ichthyoplankton may greatly underestimate the biological effectiveness of CWWS technology.

As a final point, it is important to note that physical exclusion of early life stages by CWWS may not have the protective effect that is desired. Recent work (EPRI 2017) on survival of eggs and larvae excluded by fine-mesh traveling screens has shown that it is better to let them be entrained, at least at the site studied, than to collect them on a traveling screen. The question of subsequent survival of eggs and larvae excluded by CWWS has not yet been investigated thoroughly.

EPA Response

EPRI's comment generally summarizes research on the efficacy of wedgewire screens for reducing entrainment and provides additional references to support EPA's summary of recent research on this technology from the 2017 Statement. See AR-1534 at 17-21. EPA has included the additional references in the Administrative Record. See AR-1579, AR-1581, AR-1586, and AR-1590, AR-1594, AR-1595.

9.2 The probable cost of cylindrical wedgewire screens would be significantly less than closed- cycle cooling

Comment III.9.2	AR-1577, EPRI, pp. 2-5

EPRI has not investigated the expense of CWWS installation and use at Merrimack Station. However, the probable cost of the CWWS would be significantly less, as much as an order of magnitude, than a closed cycle cooling (CCC) alternative (EPRI 2012), and quantitative estimates of the cost should be far less uncertain for CWWS than for CCC due to the lower engineering complexity and lack of effect on the thermodynamic processes involved in electrical generation.

EPA Response

In its comments on the 2017 Statement, PSNH submitted updated cost information for wedgewire screens and closed-cycle cooling. See AR-1549, AR-1565, AR-1566. The cost of wedgewire screens is substantially less than the cost of closed-cycle cooling and this cost differential was a major consideration in determining the BTA for entrainment at Merrimack Station. See Response to Comment III.5.2.1, 5.2.2, and 5.2.3 for a more detailed discussion of the cost of the technologies.

9.3 There appears to be no reason to believe that half-screens would perform differently than full cylindrical screens

Comment III.9.3	AR-1577, EPRI, pp. 2-5

Studies performed to date have used full cylindrical screens. However, for the Merrimack Station, the water depths are not sufficient to support a typical full-cylinder installation. There appears to be no reason to believe that half-screens would perform differently than full cylindrical screens if the same design principles are used to maintain even flow distribution and low slot velocities over the screen face.

EPA Response

EPRI comments that the proposed half-screen wedgewire design would be expected to perform similar to the traditional cylindrical screens. In its comments on the 2017 Statement, Enercon provides additional support for the proposed half-screen design and similarly suggests that the screens would be expected to perform similar to the cylindrical screen tested in the pilot study. EPA addresses this issue, and additional comments about the proposed design, in Response to Comment III.4.2.

9.4 The costs of closed-cycle cooling are likely to be far greater and more uncertain than cylindrical wedgewire screens

Comment III.9.4	AR-1577, EPRI, pp. 2-5

As commonly occurs, it is highly likely that the social costs of the CWWS alternative are far higher than the monetized benefits. Whether the costs of CWWS sufficiently outweigh the benefits to rule out CWWS as BTA is a social issue and EPRI offers no comment on that decision. However, in comparison, costs of a CCC alternative are likely to be far greater (EPRI 2012), and far more uncertain, than the CWWS alternative.

EPA Response

In its comments on the 2017 Statement, PSNH submitted a comparison of the costs and benefits for wedgewire screens and closed-cycle cooling. *See* AR-1565, AR-1566. As the comment suggests, the cost of wedgewire screens is substantially less than the cost of closed-cycle cooling. EPA considered the costs and benefits of each technology and explains how this issue was factored into its BTA determination in Response to Comments III.5.2.1, 5.2.2, and 5.2.3 and III.5.3.

9.5 It would make sense to operate cylindrical wedgewire screens during August to the extent that river flow and debris fouling permit

Comment III.9.5	AR-1577, EPRI, pp. 2-6

Entrainment BTA is only needed during the time when entrainable life stages are present. Although entrainment numbers are generally lower in August than in earlier spring and summer months, those organisms that would be entrained may be older (PYSL and early juvenile stages) and therefore more valuable from a population perspective. Thus, since CWWS would be installed already, it would make sense to operate them during August to the extent that river flow and debris fouling permit.

EPA Response

EPRI comments that operating the wedgewire screens during August when river flow and fouling conditions permit is sensible and would ensure that any older larval and early juvenile stages present during this time would be protected from entrainment. EPA agrees that there may still be life stages vulnerable to entrainment present during August, albeit in relatively low densities (*See*, *e.g.*, AR-1567 at 33), and agrees that, when conditions permit, operating the screens into August will ensure that the river experiences the greatest entrainment reduction benefit reasonably possible. The Final Permit requires that the wedgewire screens be operated into August 15 when conditions permit. *See also* Responses to Comment III.4.2.

9.6 Low river flows or screen fouling could trigger the need to bypass the cylindrical wedgewire screen system

Comment III.9.6	AR-1577, EPRI, pp. 2-6

Low river flows or screen fouling could trigger the need to bypass the system in order to obtain sufficient cooling water flow to maintain station operations. Without experience with CWWS on the Merrimack River, it is not possible to accurately determine the frequency or severity of fouling events that would require bypass of the CWWS system. If CWWS are selected as BTA for either entrainment and/or impingement, the station will be able to monitor conditions that necessitate bypass and report to EPA on bypass events.

EPA Response

PSNH and Enercon also commented that Merrimack Station should be permitted to bypass the wedgewire screens. EPA is persuaded that incorporating an emergency intake into the design of the BTA for entrainment is justified. *See* Response to Comment III.4.3. Part I.E.4 of the Final Permit allows for an emergency intake system and requires the permittee to minimize use of the system to the greatest extent possible. Further, it requires the permittee to notify EPA (within twenty-four hours of initiating any use of the emergency intake system) of the reason that the wedgewire screens were taken off-line and identify all actions taken or to be taken to address the cause, and minimize the use, of the emergency intake. When the Permittee is operating the emergency intake the traveling screens must be operated consistent with the conditions of the permit.

9.7 Wedgewire screens could meet the criteria to be determined to be BTA under § 125.94(c)(2), (6), or (7).

Comment III.9.7	AR-1577, EPRI, pp. 2-6

If wedgewire screens are designed to provide a maximum through-slot velocity of 0.5 fps or less, then they would meet criteria to be determined to be BTA under § 125.94 (c)(2). Even if through-slot velocity exceeded 0.5 fps, wedgewire screens would still provide impingeable fishes the opportunity to escape impingement, and the ambient currents would assist fish that are impinged in escaping from the screen surface. For these reasons, wedgewire screens alone could qualify as impingement BTA under (c)(6) or (c)(7).

EPA Response

EPRI comments that the design through-screen velocity of the screens is less than 0.5 fps and complies with one of the BTA alternatives for impingement mortality under the Final Rule. EPA agrees that, when operational, the screens would satisfy the BTA for impingement mortality at 40 CFR § 125.94(c)(2). While it may be possible that, even with actual through-screen velocities above 0.5 fps, ambient currents and the relatively small zone of hydraulic influence associated with the screens could also allow the facility to achieve the impingement mortality performance standard, thus satisfying the BTA alternatives at 40 CFR § 125.94(c)(6) or (7) ("systems of technologies" and "impingement mortality performance standard," respectively), meeting either of these compliance alternatives would require additional demonstrations, biological monitoring, and time. *See also* 40 CFR § 122.21(r)(6)(ii). Moreover, EPRI assumes in its comments below, *see* Comment III.9.8, that the wedgewire screens would only operate for "part of the year," and PSNH has commented that wedgewire screens should not be operated year-round at Merrimack Station, based on PSNH's assessment of the potential for damage to the screens when operating in the fall and winter, *see* Response to Comment III.3.1 and III.4.2. Obviously, wedgewire screens would reduce impingement mortality otherwise occurring at the facility only during those periods the screens are in use.

9.8 If cylindrical wedgewire screen technology is in place for part of the year, then use of some other technology during another part of the year would require strong justification

Comment III.9.8	AR-1577, EPRI, pp. 2-6

The protective aspects of wedgewire screens for impingeable fish are that fish may not be impinged due to the low through-slot velocities, and that fish that may be impinged would be swept from the screen surface or assisted in escape from the screen surface by ambient currents. All of this occurs without fish being removed from their habitat. If CWWS technology is in place as BTA for part of the year, then use of some other technology during another part of the year, which would require additional capital costs and may not be as effective, would require strong justification. Occasional by-pass of the CWWS system during periods of extreme fouling would not constitute such justification unless bypass events are frequent and prolonged.

EPA Response

EPRI comments that use of an impingement technology during parts of the year when wedgewire screens are not in use "would require strong justification," because of the "additional capital costs" required and that another technology "may not be as effective." EPA disagrees. Pursuant to EPA's 316(b) regulations:

> the owner or operator of an existing facility must comply with one of the [impingement BTA] alternatives in paragraphs (c)(1) through (7) of this section, except as provided in paragraphs (c)(11) or (12) of this section, when approved by the Director. In addition, a facility may also be subject to the requirements of paragraphs (c)(8), (c)(9), or (g) of this section if the Director requires such additional measures.

40 CFR § 125.94(c). Merrimack Station impinges several thousand fish annually throughout the twelve months of the year. This impingement presents an adverse environmental impact that must be minimized in compliance with CWA § 316(b) and, under the regulations, may be complied with through any number of alternatives. If wedgewire screens (with a through-screen design velocity of 0.5 fps) are in operation whenever Merrimack Station withdraws water through its cooling water intake structure, then the facility will comply with the impingement mortality BTA at 40 CFR § 125.94(c)(2). When the facility withdraws without operating the wedgewire screens, it must still comply with CWA § 316(b) and 40 CFR § 125.94(c).[83] *See also* 40 CFR § 125.94(c)(2) (providing that, for facilities that comply with the maximum design through-screen intake velocity of 0.5 feet per second option, the "maximum velocity must be achieved *under all conditions*") (emphasis added). EPRI cites nothing in the rule that would excuse a facility that complies with one of the impingement BTA alternatives for part of the time it operates from complying with § 125.94(c) for the rest of the time. Under the logic of the comment, Merrimack Station could be excused from the requirements of § 125.94(c) for more than half the year. The Act and its implementing regulations, however, require the facility to "minimize" impingement, which means the facility must reduce impingement "to the smallest amount, extent, or degree reasonably possible." 40 CFR § 125.92(r).

Furthermore, options are available to address year-round impingement at Merrimack Station and comply with 40 CFR § 125.94(c) when the wedgewire screens are not in use. Upgrading the existing traveling screens to ensure that the fish return trough transports fish back to the Merrimack River under all conditions is relatively cost effective and will improve survival of impinged fish in comparison to the existing trough, which doesn't presently return fish to the

[83] The exceptions to § 125.94(c) at subparagraphs (11) and (12) do not apply to Merrimack Station, because the rate of impingement is not *de minimis*, *see* Response to Comment III.4.a., and because the facility does not meet the requirements for a low capacity utilization power generating unit.

river.[84] Because the Permittee will use traveling screens and a fish-friendly return for any seasonal periods it does not operate the wedgewire screens, operating the traveling screens and return during those limited periods the facility uses the emergency intake (i.e., when the wedgewire screens are bypassed to prevent catastrophic damage) would not be overly burdensome and will ensure that impingement mortality continues to be reduced to the smallest amount reasonably possible. *See* 40 CFR § 125.92(r). In addition, during periods when the Facility is not generating power (typically in the fall and spring months, based on net generation over the last five years), it may achieve an actual intake velocity of no greater than 0.5 fps. It may be possible for Merrimack Station to comply with the impingement mortality BTA standard year-round using a combination of these and other technologies and operational measures under 40 CFR § 125.94(c)(6) without substantial additional costs. *See* Response to Comment III.3.1.

Finally, EPRI's comment justifying no impingement control technology when the wedgewire screens are not in use on the basis that another technology "may not be as effective," does not make any sense. It is essentially a claim that, if the more effective available technology cannot be used for part of the year, then no technology, even if available, should be required during that time. Such a view finds no support in the statutory and regulatory requirement to "minimize" adverse environmental impact.

9.9 Debris fouling is typically episodic and seasonal in nature

Comment III.9.9	AR-1577, EPRI, pp. 2-6

EPRI cannot provide comment on the expected frequency of CWWS fouling at the Merrimack station. However, EPRI's ongoing program on debris management at cooling water intakes (refs) would indicate that debris fouling is typically episodic and seasonal in nature. Prior history suggests that debris fouling would be triggered by high-flow events, particularly during spring and fall. Biofouling typically occurs during summer months when ambient river temperatures are high. Although systems can be installed to alleviate fouling, such as air burst and brush cleaning for debris/biofouling and warm water recirculation for frazil ice, there may still be occasions when a bypass system is required to maintain station operation.

EPA Response

EPA agrees that brush cleaning and an air burst system can be used to reduce the likelihood and impact of fouling but that a bypass is nonetheless justified given the potential for clogging to cause significant damage to the screens and other equipment. *See* Response to Comment III.4.3. Consequently, Part I.E.4 of the Final Permit allows for an emergency intake system but requires the permittee to minimize its use to the greatest extent possible. Further, it requires the permittee to notify EPA (within twenty-four hours of initiating any use of the emergency intake system) of

[84] "PSNH acknowledges that impingement survival with Merrimack Station's current system is minimal." AR-846 at 115. "The existing traveling screen has 100% impingement mortality due to the location of the debris return sluice, which discharges into a dry sump and does not allow the fish to enter the river except under high pool elevations." AR-6 at 30 (emphasis added).

the reason that the wedgewire screens were taken off-line and identify all actions taken or to be taken to address the cause, and minimize the use, of the emergency intake. Moreover, the emergency intake cannot take the place of proper operation and maintenance of the screens, airburst system, and associated equipment. *See* 40 CFR § 122.41(e).

9.10 Without a bypass, damage to the screens and to the plant could be catastrophic

Comment III.9.10	**AR-1577, EPRI, pp. 2-7**

Without a bypass to allow maintenance of the plants heat sink, damage to the screens and to the plant could be catastrophic; i.e., the wedgewire screens could collapse requiring complete replacement and the plants condenser system could be severely damaged resulting in long-term (weeks, months) of outage to effect repairs. Plant outage may have local impacts on grid reliability and result in potential increase in rate payers cost. Bypasses are common at most plants including those with traveling water screens. Bypasses are typically actuated when pressure differential across the screen face reach a predetermined safety point.

EPA Response

EPA agrees that a bypass is justified given the potential for clogging to cause significant damage to the screens and other equipment. *See* Response to Comment III.5.D. Consequently, Part I.E.4 of the Final Permit allows for an emergency intake system but requires the permittee to minimize use of the emergency intake system to the greatest extent possible. *See also* Response to Comments III.4.3 and III.9.9.

10.0 Additional Comments Received Super Law Group LLC (on behalf of Sierra Club and Conservation Law Foundation) Regarding BTA After the 2017 Comment Period

It has been more than eight years since EPA determined that converting the Station's antiquated once-through cooling system to closed-cycle cooling with the addition of a proper fish return system is necessary to comply with Clean Water Act section 316(b)'s best technology available ("BTA") requirement and New Hampshire water quality standards. We urge EPA to finalize that determination and issue a final NPDES permit containing the same BTA-related requirements that are in the 2011 draft permit (and the 2014 draft permit) without further delay.

If, however, EPA were to not finalize its proposed BTA determination, then the agency would have to comply with several mandatory obligations imposed by the Administrative Procedure Act (APA) and the Clean Water Act (CWA). As described below, EPA must make a BTA determination with every NPDES permit it issues. Such determination must be grounded in evidentiary support in the record. The agency may not issue a NPDES permit that defers – either explicitly or effectively – the BTA determination until additional studies have been completed.

And EPA may not deprive the public of its right to participate in permitting, either by putting BTA requirements in a later-developed ancillary document outside of the permit, or by issuing a final permit that is not a logical outgrowth of the draft. Finally, EPA is prohibited from issuing a NPDES permit that allows a permittee to indefinitely or permanently avoid compliance with Section 316(b)'s best-technology requirements.

10.1 Executive Summary

Merrimack Station's antiquated once-through cooling system withdraws extremely large volumes of water – nearly 200,000 gallons a minute at its peak – from the Merrimack River's Hookset Pool, thereby killing and injuring large numbers of fish, shellfish, and other aquatic organisms.

In 2011, EPA determined that the best technology available ("BTA") for minimizing the adverse environmental impacts of the Station's cooling water intake structures is closed- cycle cooling. After extensive analysis, EPA found that to satisfy Clean Water Act section 316(b) and New Hampshire water quality standards, the Station must convert its once-through cooling system to a closed-cycle cooling system, operate that system from April to August, when the highest densities of aquatic life are present in the river, and add a fish return system. In determining that closed-cycle cooling is BTA for Merrimack, EPA carefully evaluated and specifically rejected wedgewire screens as BTA, due to numerous technical problems and uncertainties as to the feasibility and effectiveness of installing and operating such screens in the Hookset Pool.

In 2014, while making other changes to other aspects of the permit, EPA issued a new draft NPDES permit for the Station containing exactly the same cooling water intake structure requirements as the 2011 draft permit.

In 2017, without issuing a new draft permit, EPA sought public comment on certain questions relating to the 2011 and 2014 draft permits. In particular, EPA stated it had received new information, which raised substantial new questions about the *potential* for fine-mesh wedgewire screens to qualify for BTA at the Station. EPA stated that it was reconsidering wedgewire screens as the *possible* BTA because, in light of new information, the screens *appear potentially capable* of reducing fish kills to a greater degree than previously estimated (but still not to the same degree as closed-cycle cooling) and logistical and engineering concerns *may* be surmountable. The 2017 notice made clear that EPA remained uncertain as to whether wedgewire screens would, in fact, be feasible and effective at Merrimack. EPA did *not*, at that time, change its 2011 determination that closed-cycle cooling is BTA for the Station. EPA stated that it was looking forward to receiving the results of on-site pilot testing that PSNH intended to conduct in the spring/summer of 2017 to investigate the efficacy of wedgewire screen technology. The agency stated it would consider those results and other information in making permitting decisions. As discussed below, the 2017 testing was apparently inconclusive, leading the Station owner to request an opportunity to conduct even more study feasibility and effectiveness.

In 2018, Granite Shore Power (GSP)[1] acquired the Station, fully aware that EPA's 2011 and 2014 draft permits require closed-cycle cooling. Since then, rather than finalizing the NPDES permit, EPA has instead met with GSP frequently to discuss possible changes to the permit. In September 2018, GSP told EPA that not only does the company not want to install closed-cycle cooling, but it is "no longer interested in installing wedgewire screens" (which PSNH proposed as recently as 2017) because they "do not want to spend the money."[2] A year later, in August 2019, GSP told EPA that it was amenable to receiving a NPDES permit with wedgewire screen requirements, but it still wanted an opportunity to consider whether another compliance option might be preferable to the company. Although PSNH had conducted the pilot testing of wedgewire screens in 2017 and submitted the results to EPA, GSP told EPA that the testing was insufficient to determine the feasibility and effectiveness of a wedgewire system and that GSP wants to do additional studies after receiving a final NPDES permit.

GSP appears to be seeking a final NPDES permit that nominally "selects" wedgewire screens at BTA for the Station (despite the absence of sufficient studies on their feasibility and effectiveness) but does not actually require GSP to install wedgewire screens. GSP wants to conduct additional studies after the permit is issued, and then propose to the agency, based on such studies, that it should be allowed to install something other than wedgewire screens, or to do nothing at all, thereby continuing use of its antiquated, destructive once-through cooling system for the life of the Station. What GSP seeks would be unlawful in numerous respects.

EPA should proceed to issue a final NPDES permit for Merrimack Station with cooling water intake structure requirements matching those in EPA's 2011 and 2014 drafts. If EPA and GSP have not been able to determine the feasibility and effectiveness of wedgewire screens in all the years leading up to the 2011 draft permit and the more than eight years since then, the agency should not cause further delays for additional studies of uncertain technologies. Closed-cycle cooling with a fish return system is proven, effective technology that represents BTA for the Station, and EPA should issue a final NPDES permit reflecting that determination.

If, however, EPA were to revise its proposed BTA determination, then the agency would have to comply with several mandatory obligations imposed by the APA and CWA. First, the CWA requires EPA to make a BTA determination as part of each draft or final NPDES permit the agency issues. The law does not allow EPA to explicitly or effectively defer its BTA determination until the agency has had an opportunity to review additional studies to be submitted after permit issuance. If the agency were to "select" a generic category of technology as BTA without specifying the essential attributes and parameters to be achieved at the permitted facility, and without requiring the permittee to achieve performance meeting those parameters, then there would be no BTA determination at all.

Second, EPA's BTA determination (like all agency decisions) must have adequate supporting evidence in the record, be based on a reasoned determination, and include an explanation that rationally connects the facts found to the choice made. Otherwise, it will be set aside as arbitrary and capricious under the APA. If future studies are still necessary to determine feasibility and effectiveness, then the current record is lacking adequate evidence on those fundamental issues.

Third, NPDES permits must set forth all operative requirements within the four corners of the permit. They may not be structured in a way that allows critical substantive requirements to be developed only after permit issuance by the permittee (with or without agency oversight) and contained in a separate document apart from the permit itself, because that would violate the CWA's and APA's public participation requirements.

Fourth, a permit containing cooling water intake structure requirements similar to those sought by GSP would plainly not be a "logical outgrowth" of the 2011 and 2014 draft permits. Sierra Club and Conservation Law Foundation hereby request, and are legally entitled to, a formal opportunity to review (with the assistance of their technical experts) and submit comments on any new draft permit provisions that are not a logical extension of the prior drafts.

Fifth, and finally, in issuing a NPDES permit, EPA must not only determine which technology is BTA, it must also "require compliance as soon as practicable." Because the deadline for compliance with Section 316(b) has long passed and the Station's NPDES permit is 22 years overdue for renewal, the temporal aspect of compliance is critically important here. A compliance schedule may be used only to allow the permittee a reasonable amount of time to construct and install needed technologies. It must provide a deadline for compliance. A compliance schedule may not be used to gather information for a post-permit-issuance BTA determination. A compliance schedule certainly may not be used to allow a permittee to postpone compliance indefinitely while it develops arguments as to why the permit should be modified to remove the BTA- based requirements it prefers not to spend money to comply with. Relatedly, a compliance schedule should not give a permittee strong incentives to not only delay but also to undermine the feasibility and effectiveness of technologies it does not want to install.

1 Granite Shore Power LLC and GSP Merrimack LLC are referred to collectively as "GSP."

2 U.S. EPA, Memorandum Documenting September 20, 2018, Meeting Between EPA and Granite Shore Power Concerning the Merrimack Station NPDES Permit (Oct. 26, 2018) at 7.

EPA Response to Comments III.10 and III.10.1:

Although the re-opened comment period for certain questions, issues, and information closed on December 18, 2017, Sierra Club and the Conservation Law Foundation ("CLF") submitted additional comments to EPA in a letter dated January 7, 2020, "concern[ing] cooling water intake structure issues in the permit renewal process" ("2020 CWIS Comments"). *See* AR-1680. In general, in the 2020 CWIS Comments, Sierra Club and CLF "urge EPA to finalize [its preliminary BTA] determination and issue a final NPDES permit containing the same BTA-related requirements that are in the 2011 draft permit (and the 2014 draft permit) without further delay."

As the Final Permit indicates, EPA does not agree that the Final Permit's § 316(b)-related requirements should simply match those in the 2011 Draft Permit.[85] EPA reiterates that, in the 2011 Draft Permit, EPA proposed to determine that closed-cycle cooling and a new fish return constitute the best technology available ("BTA") at Merrimack Station, as described and

[85] Moreover, the 2014 Revised Draft Permit is not relevant here as it only addressed the modified proposed limits for FGD wastewater discharges.

explained in the 2011 Draft Determinations Document in the accompanying Fact Sheet. EPA has explained, however, that, since that time, new information has been submitted or become available to EPA that raises substantial new questions concerning the 316(b)-related analysis supporting that proposal. *See* AR-1534. As EPA explained in the 2017 Statement, these new questions and information include:

1. new EPA regulations under CWA § 316(b), 33 U.S.C. § 1326(b), pertaining to cooling water intake structures at existing facilities, 79 Fed. Reg. 48300 (Aug. 15, 2014) (Final Rule) (2014 CWA § 316(b) Regulations);
2. questions about how the 2014 CWA § 316(b) Regulations should be applied to the Merrimack Station NPDES permit;
3. new information regarding the efficacy of cylindrical wedgewire screen technology for reducing impingement mortality and entrainment by cooling water intake structures;
4. new information concerning cylindrical wedgewire screen design (*e.g.*, wedgewire "half-screens") that could facilitate deploying the technology at Merrimack Station;
5. new questions about what would constitute a reasonable schedule for retrofitting Merrimack Station to comply with CWA § 316(b) either by installing cooling towers to enable the facility to operate on a closed-cycle basis or by installing cylindrical wedgewire screens to operate in conjunction with open-cycle cooling;
6. questions about how, if at all, EPA should, when setting NPDES permit limits for Merrimack Station, take account of the substantial drop in the facility's overall capacity utilization, while recognizing that the units still run a great deal at certain times; and
7. questions about how, if at all, EPA should, when setting NPDES permit limits for Merrimack Station, take account of the current state-administered auction process through which PSNH is expected to divest of its electrical generating assets, including Merrimack Station.

AR-1534 at 3-5. EPA agrees that the BTA determination must be rational in light of the information in the record. A rational determination, however, considers the new information, data, and arguments that have become available since the 2011 Draft Permit and that raise substantial new questions. Therefore, EPA reopened the comment period on the Draft Permit in order to provide the public with an opportunity to comment on the new information and the substantial new questions. *Id.* at 3. EPA also responded to the new information and questions by developing options for certain new (or revised) Draft Permit conditions (including for a determination that wedgewire screens—rather than closed-cycle cooling—is the BTA), and by developing new (or revised) analyses in support of the Draft Permit conditions. *Id.* at 3-4. In connection with the reopened comment period, EPA prepared a "Statement of Substantial New Questions for Public Comment" ("2017 Statement") to describe the new information, the substantial new questions, the potential new permit conditions, and the new supporting analyses, so that the public could review the material and comment on it to EPA. *Id.* at 4. With respect to wedgewire screens and closed-cycle cooling, EPA stated that "new information suggests that an effective screen array potentially *can* be implemented in the Hooksett Pool section of the Merrimack River, and that this technology may be more effective at reducing the Facility's entrainment than previously thought" and that, consequently, EPA was reconsidering whether to determine that wedgewire screens, rather than closed-cycle cooling, is the BTA. *Id.* at 18. EPA even included draft permit conditions and a compliance schedule for a finding that wedgewire screens is the BTA at Merrimack Station. *Id.* at 29-32. Thus, Sierra Club and CLF should have anticipated (and did, as demonstrated in these supplemental comments as well as in their timely comments) that the BTA determination in the Final Permit could be wedgewire screens in light of the discussion in the 2017 Statement. Thus, EPA does not agree that the BTA determination is not a "logical outgrowth" of the permit proceeding, including the 2017 Statement. Nor does EPA agree that another—which would be the fourth—notice-and-comment period is necessary at this point. The APA does not require that conditions in a final permit necessarily be subject to a new round of public comment whenever they vary from the conditions proposed in the earlier draft permit. If that was the rule, then agencies would be unable to change permit conditions in response to public comments without first holding a new round of public comment. Such a rule could discourage agencies from fairly considering public comments that might lead to changed permit conditions for fear of repeatedly having to reopen the public comment period. *See Conn. Light & Power Co. v. Nuclear Regulatory Comm'n*, 673 F.2d 525, 533 (D.C. Cir. 1982); *Weyerhaeuser Co. v. Costle*, 590 F.2d 1011, 1031 (D.C. Cir. 1978).

As part of its careful consideration of the 2020 CWIS Comments, Region 1 has reviewed and considered the opening comments and the Executive Summary to the letter. Sierra Club and CLF further discuss the issues identified in more detail later in the 2020 CWIS Comments. Region 1 responds to this material in the more detailed EPA responses that follow.

10.2 EPA Should Issue a Final NPDES Permit Consistent with its 2011 BTA Determination and the 2011/2014 Drafts Without Further Delay

For the following reasons, we ask that EPA proceed to finalize the cooling water intake structure requirements the agency first issued in draft form in 2011.

10.2.1 Merrimack Station's Antiquated Cooling System Kills and Injures the Merrimack River's Aquatic Organisms

The Merrimack Station, built in the 1960s, utilizes an antiquated, once-through cooling system. Since 2001, virtually all new power plants have been required to have closed -cycle cooling systems.[3] But even before that requirement became law, the power industry was rapidly moving to closed-cycle cooling. Roughly three-quarters of the coal-fired power plants and all of the large combined-cycle power plants built in the 1980s and 1990s have closed-cycle cooling systems.[4] As we enter the third decade of the 21st century, the Merrimack Station still lacks cooling technology that became commonplace in the last quarter of the last century.

The once-through cooling system at Merrimack Station withdraws nearly 200,000 gallons per minute (287 million gallons per day ("MGD")) from the Merrimack River killing and injuring large numbers of fish, shellfish, and other aquatic organisms at all of their life stages in several ways, principally through "entrainment" and "impingement." As EPA has explained, entrainment occurs when very small organisms in the river water, such as fish eggs and larvae, are pulled with the water through the cooling water intake structure's screens and into the cooling system. These organisms are subjected to physical impacts, high water temperatures, pressure changes, and exposure to harmful chemicals, such as chlorine. Impingement occurs when larger aquatic organisms, such as juvenile and adult fish, are caught and held against intake screens. When rotating intake screens are rotated, a fish return system is supposed to safely return the impinged organisms to the water. (This will protect certain, more robust species, but not sensitive species.) At Merrimack Station, however, the fish return does not reach the river and, thus, EPA expects that none of the organisms impinged by the Station can survive.[5]

[3] 40 C.F.R. § 125.84(b)(1).

[4] 66 Fed. Reg. 28853, 28855-56 (May 25, 2001).

[5] EPA Region 1 - New England, 2011 Fact Sheet, Attachment D, *Clean Water Act NPDES Permitting Determinations for the Thermal Discharge and Cooling Water Intake Structures at Merrimack Station in Bow, New Hampshire, NPDES Permit No. NH 0001465* (hereinafter, "2011 Intake Structure Determinations") at iii.

EPA Response:

Sierra Club and CLF state that EPA should find that closed-cycle cooling is the BTA for Merrimack Station because, among other reasons, the current once-through system kills and injures "large numbers of fish, shellfish, and other aquatic organisms at all of their life stages in several ways, principally through 'entrainment' and 'impingement.'" EPA agrees that the adverse environmental impacts of the current technology at Merrimack Station are significant and that the current once-through system is not the BTA for minimizing entrainment and impingement within the meaning of § 316(b). *See* Responses to Comments III.3.1, III.3.2, and III.3.6. The determination of which technology(ies) constitutes the BTA under § 316(b), however, is not limited to a consideration of only the numbers of organisms impinged and entrained. Nor is it limited to a choice between just the current system and closed-cycle cooling.

The question of how many organisms a particular system impinges and entrains is an important one, but it is not the only one. In the case of impingement, as the commenter is aware, *see* Comment III.7.2, unless the numbers are so low as to be *de mimimis*,[86] the Final Rule contemplates that the permittee will choose from among a suite of technology alternatives that EPA decided via rulemaking satisfy the requirements of § 316(b) for minimizing impingement, *see* 40 CFR § 125.94(c). EPA agrees that the current system at Merrimack Station does not satisfy any of those impingement mortality control alternatives, *see* Response to Comment III.3.1, but this does not mean that <u>only</u> closed-cycle cooling will satisfy the impingement BTA, *see* 40 CFR § 125.94(c)(2) – (7). Further, EPA never made a preliminary determination that closed-cycle cooling is the BTA for minimizing impingement mortality at Merrimack Station. *See* AR-618 at 347 ("With regard to reducing impingement mortality . . . EPA determined that the BTA involves implementing certain improvements to the fish return system and the intake screens."); AR-1534 (noting that 2011 Draft Permit "proposed certain intake screen operations and fish return system improvements to reduce impingement" at the facility). In the case of entrainment, as the

[86] They are not in this case. *See* Response to Comment III.3.4.

commenter is also aware, *see* Comment III.7.2, the number of organisms entrained is only one of several mandatory and discretionary factors that EPA considers in determining the BTA, *see* 40 CFR § 125.98(f). The entrainment requirements in the permit must reflect EPA's determination of "the maximum reduction in entrainment warranted after consideration of factors relevant for determining the best technology available for minimizing adverse environmental impact at each facility." *Id.* Closed-cycle cooling remains the most effective technology for minimizing the numbers of organisms entrained, but wedgewire screens are expected to substantially reduce entrainment as compared to existing conditions. *See* Responses to Comments III.4(i), III.4.1, III.4.2. When determining the "maximum reduction in entrainment warranted," EPA is required to consider additional factors beyond the numbers entrained, including "[q]uantified and qualitative social benefits and costs of available entrainment technologies." 40 CFR § 125.98(f)(2)(v). In this case, the social costs of closed-cycle cooling are significantly higher than wedgewire screens. *See* Response to Comment III.5.2.1, 5.2.2, and 5.2.3.

EPA may reject "any entrainment control technologies or measures that perform better than the selected technologies or measures," so long as EPA explains why it has rejected such measures. 40 CFR § 125.98(f)(1). As EPA discussed at length in the 2011 Draft Determinations Document, a number of technologies other than closed-cycle cooling exist, which, depending on various considerations, might be appropriate choices for BTA at the facility. At the time, EPA concluded that it appeared that the conditions necessary for an effective wedgewire screen installation would not exist in the Hooksett Pool on a consistent and reliable basis, based on the information in the record at the time. *See* AR-1534 at 17 (citing AR-618 at 271-80). EPA expressed concern that PSNH's proposed design would require so many screens and would occupy such a large area of the river, that it would excessively interfere with public uses of the waterway. *Id.* EPA recognized uncertainties related to sweeping flows, through-screen velocities, slot size, and swimming abilities and overall hardiness of the species of aquatic organisms in question. *Id.* at 18. As EPA acknowledged in the 2017 Statement, however, new information had been submitted or otherwise become available that raised substantial new questions about EPA's conclusions in the 2011 Draft Determinations Document regarding wedgewire screens. *Id.* at 18-22, 33-34. In addition, use of Merrimack Station has changed from a baseload plant to operations more consistent with that of a peaking facility.

As with any NPDES permitting decision, EPA is required to exercise its "considered judgment" when making a BTA determination. *See In re Charles River Pollution Control Dist.*, 16 E.A.D. 623, 626 (EAB 2015). This means that EPA must duly consider issues raised in comments on a Draft Permit and ultimately adopt an approach that is rational in light of all the information in the record. *Id.* EPA must explain with reasonable clarity the reasons supporting its conclusions and the significance of the record facts upon which it relied. *Id.* A BTA determination that does not reasonably consider this new information could be subject to challenge. Furthermore, under the Clean Water Act, EPA "is required to exercise its judgment even in the face of some scientific uncertainty." *In re City of Taunton*, 17 E.A.D. 105, 134 (EAB 2016) (quoting *Upper Blackstone Water Pollution Abatement Dist. v. EPA*, 690 F.3d 9, 23 (1st Cir. 2015)). Accordingly, EPA explains in this Response to Comments document how it has considered the new information regarding wedgewire screens and the impact it has on EPA's proposed determination in the 2011 Draft Permit and Draft Determinations Document that the necessary conditions for an effective wedgewire screen installation are not present at Merrimack Station on a consistent and reliable basis and that wedgewire screen technology is therefore not the BTA. *See* Responses to Comments III.4.2 and III.7.3. EPA concludes that, in light of all of this new information, closed-cycle cooling is not the "best technology available" within the meaning of Section 316(b). See Responses to Comments III.5.2.1, 5.2.2 and 5.2.3 and III.5.3 (including associated responses).

10.2.2 In 2011, EPA Determined that the Station's Antiquated Cooling System Must Be Converted to Closed-Cycle Cooling to Comply with Clean Water Act Section 316(b)'s Best Technology Available Requirement and Issued a Draft NPDES Permit Reflecting That Determination

In 2011, EPA "determined that significant changes to Merrimack Station's current [cooling water intake structures] are necessary to satisfy CWA § 316(b)'s . . . requirement that the location, construction, design and capacity of the facility's [cooling water intake structures] reflect the Best Technology Available for minimizing adverse environmental impacts (BTA)."[6] Specifically, EPA determined that closed-cycle cooling, operated on a seasonal basis (*i.e.*, from April 1 through August 31, when the highest densities of aquatic life are present), is BTA for the Station. Consistent with that determination, the 2011 Draft Permit included the following requirements:

- The intake flow volume for Units 1 and 2 shall be reduced to a level consistent with operating in a closed-cycle cooling (CCC) mode from, at a minimum, April 1 through August 31 of each year (1.77 MGD for Unit 1, 4.20 MGD for Unit 2);

- During any periods that Units 1 and 2 are operating in an open-cycle mode, new travelling screens (or screen inserts) employing all the features of a modified Ristroph, MultiDisc, or WIP screen design shall be installed and operated for the CWISs. At a minimum, these screens shall have:

    - A mesh size no greater than 3/8-inch using smooth-woven screen mesh to minimize fish de-scaling; and
    - Fish buckets that provide a hydraulically stable "stalled" fluid zone that attracts fish, prevents injury to the fish while in the bucket, and prevents fish from escaping the bucket.

- A low-pressure (<10 psi) spray wash system shall be used for each travelling screen to remove fish prior to high-pressure washing of the screens for debris removal;

- The location of the low-pressure spray systems shall be optimized to transfer fish gently to the return sluice;

- Travelling screens shall be operated continuously;

- A new fish return sluice with the following features shall be installed for each CWIS:

  - Maximum water velocities of 3-5 ft/s within the sluice;
  - A minimum water depth of 4-6 inches at all times;
  - No sharp-radius turns (i.e., no turns greater than 45 degrees);
  - A point of discharge to the river that is slightly below the low water level at all times;
  - A removable cover to prevent access by birds, etc;
  - Escape openings in the removable cover along the portion of the sluice that could potentially be submerged; and
  - A slope not to exceed a 1/16 foot drop per linear foot, unless the plant can demonstrate that this is not feasible.

- The fish return sluice shall be in place and operational at all times.[7]

EPA also found that these intake structure requirements would satisfy New Hampshire's applicable water quality standards and that if they "were made significantly less stringent they would be inconsistent with the state's water quality standards as they would likely interfere with attaining the state's water quality criterion for protecting biological and aquatic community integrity."[8]

Furthermore, EPA specifically determined that an alternate technology, wedgewire screens,[9] was not BTA. In an extended discussion in its 2011 Intake Structures Determinations, EPA identified many issues and many uncertainties that prevent wedgewire screens from being BTA at Merrimack Station, including but not limited to:

- Whether wedgewire screens may be effective or not at a particular facility depends on a variety of factors, including the screen slot size, water depths, local hydrodynamics, the relative sizes of the screen mesh and the local organisms, and water withdrawal volumes and velocities.

- Wedgewire screens that have been used or tested at other facilities have had varying degrees of effectiveness.

- There are specific minimum hydrologic and hydrographic conditions that must exist within the waterbody in order for wedgewire screens to operate effectively.

- The performance of wedgewire screens depends on, among other things, the presence of sufficient ambient current to sweep eggs and larvae past the intake screens rather than being drawn into or onto them.

- Minimizing entrainment depends upon the slot width of the screen being small enough to prevent organisms from passing through.

- In particular, EPA stated that "[r]esearch indicates that a slot size of 0.5 mm is likely needed to maximize entrainment reductions and that substantially more entrainment will occur as slot sizes increase to 1.0 mm or larger."

- EPA also expressed concern, based on the in-river configuration of screens presented by PSNH, that the ability of larvae and eggs to survive contact with the screens as they drift downstream is questionable.

- Minimizing impingement depends upon maintaining a low enough intake velocity to allow fish to avoid being trapped against the screens by the force of the water withdrawals.

- Even the slot sizes and velocity are small enough and low enough, adequate ambient sweeping velocity is critical to move the organisms away from the screens, so that they do not end up being impinged on the screens by a combination of forces in the water.

- Adequate ambient sweeping velocity current is also needed to prevent the accumulation of debris ("fouling") on the screen surfaces.

- The fouling of intake screens not only interferes with maintaining adequate withdrawals of cooling water, but also increases the velocity of water passing through unrestricted (unfouled) slots, which can increase impingement or entrainment.

- Yet, as EPA noted, "it is evident that sweeping currents in Hookset Pool are insufficient at critical times."

- PSNH itself expressed concerns about the potential for "frazil ice" (*i.e.*, ice that forms when turbulent water is cooled below the freezing point) to form on the screens and clog the openings.

- Wedgewire screens must also be located in an area with sufficient water depth to enable them to operate effectively.

- Yet, as EPA noted "it is unclear whether adequate water depths exist in Hooksett Pool to accommodate an effective wedgewire screen installation."

- Related issues include whether wedgewire screens would be located in areas where sediment accumulates and must be regularly dredged, whether dredging in and around an area with tightly-packed screens and underground piping is feasible, and whether the screen structures would likely trap branches and other debris drifting downstream.

- As wedgewire screen slot sizes are reduced, the number and size of the array of wedgewire screens increases, as does the potential for fouling of those smaller slots.

- The estimated number of wedgewire screens estimated to be needed at Merrimack ranged from 23 to 76 (depending upon slot width), with each screen over 13 feet in length, forming an array projecting well over 100 feet into the river, which could interfere with the public's use of the river to an excessive degree.

- EPA found that the "number of screens that would be required at Merrimack Station is unprecedent for facilities in the United States."

- EPA also noted that wedgewire screen installations at other facilities have been in waterbodies of very different depth, size, and type than Hooksett Pool, and "[t]he absence of comparable existing wedgewire screen operations raises concerns of the technology's suitability in Hookset Pool."[10]

Based on its extensive analysis of why wedgewire screens would not be feasible or effective in the Hooksett Pool, EPA concluded as follows:

> Having reviewed PSNH's submissions, as well [as] relevant technical and scientific literature, EPA concludes that PNSH's 2009 wedgewire screen proposal would not satisfy the BTA standard of CWA § 316(b) at Merrimack Station. Furthermore, EPA concludes that the rates of entrainment and impingement mortality reduction that the company predicts for its proposal are not supported.[11]
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> * * *
>
> [T]he necessary conditions for an effective wedgewire screen installation are not present at Merrimack Station on a consistent and reliable basis during the period when fish eggs and larvae are present. . . . EPA has identified a number of problems that are likely to undermine the effectiveness of wedgewire screens at Merrimack Station and, therefore, EPA rejects this technology as an option for the BTA at this facility.[12]

[6] EPA Region 1 - New England, 2011 Fact Sheet, Draft National Pollutant Discharge Elimination System (NPDES) Permit to Discharge to Waters of the United States Pursuant to the Clean Water Act (CWA), NPDES Permit No. NH0001465 ("2011 Fact Sheet") at 52.

[7] 2011 Fact Sheet at 52.

[8] 2011 Intake Structure Determinations at 346.

[9] The term "wedgewire screen" refers to a general category of slotted intake screens consisting of wedge-shaped wire welded to a frame. There is no particular slot width common to all or even most wedgewire screens.

[10] 2011 Intake Structure Determinations at 273-280.

[11] 2011 Intake Structure Determinations at 275.

[12] 2011 Intake Structure Determinations at 280.

EPA Response:

Sierra Club and CLF comment that EPA should find that closed-cycle cooling is the BTA for Merrimack Station because, among other reasons, EPA proposed in the 2011 Draft Permit and accompanying Fact Sheet that seasonal closed-cycle cooling is the BTA. To be clear, in 2011, EPA proposed that seasonal closed-cycle cooling was the BTA <u>for entrainment</u> and that the BTA <u>for impingement</u> "involves implementing certain improvements to the fish return system and the intake screens." AR-618 at 347. EPA did note, however, that "the screening system improvements were not needed during closed-cycle cooling operations because closed-cycle cooling was even more effective for reducing impingement mortality." *Id.* at 347-48. In any event, there is, of course, no requirement that a final permit include every limit and condition unchanged from the draft permit. It is the very nature of the public participation process that a final permit may differ from the draft permit as a result of comments and new information received by the permitting authority. Furthermore, in this case, EPA issued a Statement of Substantial New Questions for Public Comment ("2017 Statement") in which it specifically notified the public that it was reconsidering the preliminary BTA determination for Merrimack Station in light of public comments and new information. AR-1534 at 4, 6-7, 12-36. As EPA explained:

> various data, information and arguments submitted during prior comment periods, or that were submitted or became known to EPA after the comment periods,[footnote omitted] raise a number of substantial new questions concerning the Merrimack Station Draft Permit. In response, EPA has decided to issue a public notice reopening the comment period on the Draft Permit in order to provide the public with an opportunity to comment on the new information and the substantial new questions. EPA has also responded to the new information and questions by developing options for certain new (or revised) Draft Permit conditions, and by developing new (or revised) analyses in support of the Draft Permit conditions. In connection with the reopened comment period, EPA has prepared th[e 2017 Statement] to describe the new information, the substantial new questions, the potential new permit conditions, and the new supporting analyses, so that the public can review the material and comment on it to EPA.

Id. at 3-4 (citing 40 C.F.R. § 124.14(b)). EPA expressly noted that it was "reconsidering wedgewire screens as the possible BTA for Merrimack Station in light of public comments and new information," *id*. at 18, and reconsidering "whether the greater cost of closed-cycle cooling is warranted in light of the potentially better-than-previously-estimated performance of wedgewire screens and the possible resolution of logistical and engineering issues," *id.* at 19-20.[87] Sierra Club and CLF's 2020 CWIS Comments make clear that they understood this to be the case. AR-1680 at 2 ("EPA stated it had received new information, which raised substantial new questions about the potential for fine-mesh wedgewire screens to qualify for BTA at the Station" and that EPA "was reconsidering wedgewire screens as the possible BTA.") (emphasis omitted). Furthermore, their comments on the 2017 Statement show that they foresaw that the Final Permit could include a determination that wedgewire screen technology rather than closed-cycle cooling is the BTA for entrainment. *See* Comment III.7.3. Sierra Club and CLF point to no requirement

[87] EPA also reopened the comment period as to the preliminary BTA determination for impingement at Merrimack Station. AR-1534 at 21-22.

that a Final Permit reflect the conditions of a Draft Permit unchanged, and there is none. *See City of Stoughton, Wis. v. US EPA*, 858 F.2d 747, 753 (D.C. Cir. 1988) ("If it were not possible for an agency to reexamine and even modify the proposed rule, there would be little point in the comment procedures."); *Nat'l Black Media Coal. v. FCC*, 791 F.2d 1016, 1022 (2d. Cir. 1986) ("[A] final rule need not be an exact replica of the rule proposed in the Notice."). If EPA was required to re-notice every change between a Draft Permit and a Final Permit, "the comment period would be a perpetual exercise rather than a genuine interchange resulting in [an] improved" permit. *Conn. Light & Power Co. v. NRC*, 673 F.2d 525, 533 (D.C. Cir. 1982). EPA must evaluate any new data, information, or arguments that raise new substantial new questions concerning the conditions in Draft Permit. In this case, EPA has done so and concludes that wedgewire screen technology is available at Merrimack Station and, considering the factors relevant for determining BTA for minimizing environmental impact, reflects the "maximum reduction in entrainment warranted." 40 CFR § 125.98(f); *see* Responses to Comments III.4, III.5.2, III.5.3 (including associated sub-responses).

Sierra Club and CLF also state that EPA should find that closed-cycle cooling is the BTA for Merrimack Station because EPA also found that the cooling water intake structure conditions in the Draft Permit "would satisfy New Hampshire's applicable water quality standards and that if they 'were made significantly less stringent they would be inconsistent with the state's water quality standards as they would likely interfere with attaining the state's water quality criterion for protecting biological and aquatic community integrity.'" EPA has already addressed this issue in Response to Comment III.4.(i) above.

Finally, Sierra Club and CLF state that EPA should find that closed-cycle cooling is the BTA for Merrimack Station because, in 2011, EPA identified "many issues and many uncertainties" associated with wedgewire screens and concluded that the rates of entrainment and impingement mortality reduction from wedgewire screens that PSNH predicted in 2009 are not supported, that the necessary conditions for an effective screen installation are not present on a consistent and reliable basis during the entrainment period, and that, therefore, wedgewire screens are not the BTA at the facility. As also explained above, EPA has re-evaluated wedgewire screen technology at Merrimack Station in light of new information in the record since the above-referenced statements in the 2011 Draft Determinations Document and pursuant to the framework for entrainment BTA determinations laid out in the § 316(b) regulations promulgated after EPA issued the 2011 Draft Permit. EPA's analysis addresses the uncertainties and conclusions noted in the comment. *See* Responses to Comments III.3.1, III.4.2, III.7.3.

10.2.3 In 2014, EPA Re-Issued the Draft NPDES Permit with No Changes to Any of the Cooling Water Intake Structure Requirements.

Three years later, in 2014, EPA issued a second version of the Merrimack Station's draft permit for public comment (hereinafter, the "2014 Draft Permit"). In the 2014 Draft Permit, EPA determined, based on public comments received during the comment period on 2011 Draft Permit and additional information the agency had gathered since then, that vapor compression evaporation (VCE) technology is the best available technology for the Station's discharges of wastewater from its wet flue-gas desulfurization (FGD) scrubber. EPA thus gave public notice that it was reconsidering and revising particular provisions of the 2011 Draft Permit, specifically the effluent limits and reporting requirements for Outfall 003C at Part I.A.4 and for Outfall 003A at Part I.A.2 of the draft permit.

Significantly, despite having also received substantial comments from PSNH in objection to EPA's 2011 cooling water intake structure determinations, EPA did *not* state in its 2014 public notice, or in the 2014 Draft Permit, or in its fact sheet, that EPA was reconsidering, revising, or reopening any of its cooling water determinations or permit provisions.

Indeed, the 2014 Draft Permit issued for public comment retains all of the cooling water intake structure requirements, based on closed-cycle cooling and improvements to the travelling screens and fish return systems, verbatim from the 2011 Draft Permit.

EPA Response:

Sierra Club and CLF state that EPA should find that closed-cycle cooling is the BTA for Merrimack Station because, among other reasons, when EPA issued the 2014 Draft Permit, it did not state that it "was reconsidering, revising, or reopening any of its cooling water determinations or permit provisions," but instead "retain[ed] all of the cooling water intake structure requirements, based on closed-cycle cooling and improvements to the travelling screens and fish return systems, verbatim from the 2011 Draft Permit." Sierra Club and CLF are correct that the 2014 Draft Permit did not revise or revisit the cooling water intake structure conditions of the 2011 Draft Permit. EPA explained in the accompanying Fact Sheet that it was only revising certain effluent limits and reporting requirements in the 2011 Draft Permit relating to Merrimack Station's flue gas desulfurization ("FGD") system in light of new information, data, and arguments EPA had received about the FGD system. AR-1135 at 3. EPA further noted that it was "not seeking additional comment on the [2011] Draft Permit's other provisions." The 2020 CWIS Comments do not explain, however, why a 2014 Draft Permit revising FGD-related provisions but not the CWIS-related conditions of the 2011 Draft Permit should prevent EPA from ever reconsidering portions of its § 316(b) analysis. As mentioned earlier, EPA explained in the 2017 Statement that it was, pursuant to 40 CFR § 124.14(b), reconsidering the BTA preliminary determination from the 2011 Draft Permit in light of new information, data, and arguments it had received that raised substantial new questions about elements of the § 316(b) analysis, *see* Response to Comment III.10.2.2, including information received after the 2014 Draft Permit was issued, *see, e.g.*, 2017 Statement at 18 (citing AR-1231, Exhibit 4; AR-1352, Attachment 1; AR-1361), 33-34 (listing additional information "submitted to, or collected by, EPA relevant to whether cylindrical wedgewire screens should potentially be determined to be a component of the BTA"); Comment III.10.2.4 (recognizing that EPA "promulgated national cooling water intake structure regulations for existing facilities in 2014, after the 2011 and 2014 Draft Permits for the Station were issued for public comment") (emphasis added). The fact that EPA has previously revisited some provisions of the 2011 Draft Permit does not mean that it may never revisit any other provisions of the 2011 Draft Permit, particularly in the face of subsequent new information that raises substantial new questions as to those provisions, because EPA must duly consider such information and adopt a permitting approach that is rational in light of all information in the record. *See In re Jordan Dev. Co., LLC*, 18 E.A.D. 1, 5 (EAB 2019).

10.2.4 In 2017, EPA Sought Public Comment on "New Questions" Related to Cooling Water Intake Structures, But Did Not Change its BTA Determination and Expressed Continuing Uncertainty About the Feasibility and Effectiveness of Wedgewire Screens in Hooksett Pool.

In 2017, without issuing a new draft permit, EPA reopened the public comment period for the Station's draft NPDES permit with respect to what it called "substantial new questions."[13] Some of these questions related to cooling water intake structures.

First, EPA noted that the agency had promulgated national cooling water intake structure regulations for existing facilities in 2014, after the 2011 and 2014 Draft Permits for the Station were issued for public comment. Among other things, the new regulations (the "2014 CWA § 316(b) Regulations") specify categories of information that applicants for renewed NPDES permits must submit to EPA or a state permit writer. However, the 2014 CWA § 316(b) Regulations also provide that, for ongoing permitting proceedings – like the Merrimack permit renewal proceeding – the permit writer should determine whether the permit application materials already submitted are adequate or should be supplemented by information described in Section 122.21(r) of the regulations. EPA determined that such additional information was unnecessary and would unnecessarily delay the final NPDES permit for the Station:

> EPA has considered whether any of the 40 C.F.R. § 122.21(r) information submissions are necessary for this proceeding and has decided that they are not. *EPA has sufficient information in the record to determine the BTA requirements for the Merrimack Station permit.* EPA has collected this information from PSNH's permit application materials as well as from Company responses to EPA requests for information. . . . In addition, EPA has obtained information from research and analysis by EPA's staff and contractors. Moreover, since issuance of the 2011 Draft Permit, EPA has garnered additional information . . . . In light of all of this information, EPA concludes that it can address the appropriate factors under the statute and regulations without additional information submissions under 40 C.F.R. § 122.21(r). In fact, *directing PSNH to make those submissions now would unnecessarily delay completion of the Final Permit for Merrimack Station.* Therefore, EPA declines to call for new submissions from PSNH under 40 CFR 122.21(r).[14]

Second, EPA stated that it had received new information about the *potential* for wedgewire screens to qualify as BTA at the Station. EPA reiterated in 2017 that its analysis for the 2011 Draft Permit documented "significant uncertainty about the effectiveness of wedgewire screens."[15] EPA then stated that it was "reconsidering wedgewire screens as the *possible* BTA,"[16] but also made clear that, even despite the new information, substantial questions remain about the *possible* or *potential* feasibility and effectiveness of wedgewire screens in Hooksett Pool.[17] For example, EPA again raised the concerns about fouling of wedgewire screens by debris during

August due to low flow conditions and in winter due to "frazil ice."[18] And EPA explained that, even if the engineering and other feasibility problems could be surmounted, and even if the performance of wedgewire screens might be "potentially better-than-previously-estimated," "closed-cycle cooling would still be expected to reduce entrainment to a greater degree than wedgewire screens."[19]

EPA did *not*, in 2017, change its 2011 determination that closed-cycle cooling is BTA for the Station. In particular, EPA noted that PSNH informed the agency that it intended to do on-site pilot testing in the spring/summer of 2017 to investigate the efficacy of wedgewire screen technology. EPA stated that it welcomed submission of the data and would consider those results and other information in making permitting decisions.[20] However, as discussed below, although PSNH conducted the testing in 2017, GSP has told EPA that the study was not sufficient and that even more studies are needed to assess the potential feasibility and effectiveness of wedgewire screens in Hooksett Pool.

[13] EPA Region 1 – New England, Statement of Substantial New Questions for Public Comment, Merrimack Station (NPDES Permit No. NH0001465) (hereinafter "2017 Statement of New Questions").
[14] 2017 Statement of New Questions at 16.

[15] 2017 Statement of New Questions at 18.

[16] 2017 Statement of New Questions at 18.

[17] For example, EPA stated "new information *suggests* that an effective screen array potentially can be implemented . . . and that this technology *may be more effective* . . . than previously thought." "[T]his *suggests* that . . . wedgewire screens *could potentially be viable* . . ." "[N]ew information *suggests* that . . . slot sizes larger than 0.5 mm *may be able* to reduce . . . entrainment . . . more effectively than previously thought." "*It is possible* that . . . the sweeping flow *may be sufficient* to enable a substantial number of eggs and larvae to avoid entrainment." "*[S]ome larvae may* actively avoid entrainment." "[W]edgewire screen technology *appears potentially capable* of reducing entrainment . . . to a greater degree than previously estimated." 2017 Statement of New Questions at 18-19 (emphasis added).

[18] 2017 Statement of New Questions at 20, 22.

[19] 2017 Statement of New Questions at 19-20.

[20] 2017 Statement of New Questions at 20, 29.

EPA Response:

Sierra Club and CLF comment that EPA should find that closed-cycle cooling is the BTA for Merrimack Station because, among other reasons, in the 2017 Statement, EPA expressed "continuing uncertainty" about the availability and effectiveness of wedgewire screens at Merrimack Station and did not "change its 2011 determination."[88]

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[88] Although the comment also highlights EPA's finding that certain submittals from the Permitttee under 40 C.F.R. § 122.21(r) are not necessary for EPA to make a BTA determination, it fails to explain the significance of this finding to Sierra Club and CLF's assertion that EPA may only finalize a permit that determines that closed-cycle cooling is

While the 2017 Statement did not "change [EPA's] 2011 determination" or include "a new draft permit," it explained that new information about wedgewire screens raised substantial new questions about their availability and effectiveness for minimizing entrainment at Merrimack Station, directed the public's attention to specific information, data, and arguments in the record, made clear that EPA was reconsidering wedgewire screens as a candidate technology at the facility based on this new information, and even included draft BTA permit conditions for wedgewire screens and a compliance schedule for installing them there. AR-1534 at 17-21, 30-32. The comment cites no legal authority for the proposition that EPA was required to issue a new draft permit along with the 2017 Statement or otherwise "change" its preliminary BTA determination. EPA issued the 2017 Statement pursuant to 40 CFR § 124.14(b), which authorizes EPA to "take one or more" listed actions. *See* AR 1534 at 3-4. One such action includes reopening the comment period—"to give interested persons an opportunity to comment on the information or arguments submitted"—but nowhere requires EPA to also issue a new draft permit. 40 CFR § 124.14(b)(3). It was not improper or incomplete for EPA to issue the 2017 Statement for the purpose of soliciting public comment on the new information, data, and arguments without also issuing a new draft permit or changing the preliminary BTA determination.

Furthermore, for EPA to refer to new information in the 2017 Statement as "suggesting that the conditions in Hooksett Pool can, in fact, accommodate an appropriate wedgewire screen installation," AR-1534 at 18 (emphasis added), or "suggesting that adequate sweeping flows are likely to exist during the time period when the majority of eggs and larvae are present," *id.* (emphasis added), is entirely reasonable in light of EPA's determination that "substantial new questions" had been raised. The comment seems to take the position that EPA should have given definitive "answers" in the 2017 Statement, yet it provides no authority and offers no explanation for such a position. Moreover, EPA's characterization of the information does not demonstrate profound uncertainty that would prevent EPA from later determining that wedgewire screens are the BTA for Merrimack Station. To the contrary, EPA recognized that the new information called into question EPA's previous conclusions about the availability and efficacy of wedgewire screens at Merrimack Station. *See also* Response to Comment III.4.2. Nor is it inappropriate, or even surprising, for EPA to highlight in the 2017 Statement, for example, "[l]aboratory investigations, field studies, and new analysis" that "suggest that wedgewire screens with slot sizes larger than 0.5 mm may be able to reduce the entrainment of fish larvae at Merrimack Station more effectively than previously thought," *id.* at 18-19 (emphasis added), since uncertainty is inherent in most scientific inquiry. To the extent the comment suggests that absolute certainty is required to support a permitting decision, it is at odds with established case law recognizing that some level of uncertainty is expected and acceptable and does not necessarily prevent EPA from exercising its permitting discretion. *See In re City of Attleboro*, 14 E.A.D. 398, 413 (EAB 2009); 40 CFR § 125.98(f) (providing that the entrainment requirements in a permit must reflect the permitting authority's determination of the maximum reduction in

the BTA at Merrimack Station. As EPA said in the 2017 Statement, "EPA concludes that it can address the appropriate factors under the statute and regulations without additional information submissions under 40 C.F.R. § 122.21(r)."AR-1534 at 16.

entrainment warranted); *see also Miami-Dade Co. v. EPA*, 529 F.3d 1049, 1065 (11th Cir. 2008). It would be ill-advised to demand that EPA "ignore evidence simply because it falls short of absolute scientific certainty." *Northwest Ecosystem Alliance v. U.S. Fish & Wildlife Serv.*, 475 F.3d 1136, 1147 (9th Cir. 2007).

Elsewhere in this Response to Comments document, EPA has considered the uncertainties with wedgewire screens that it highlighted in 2011 and determined that the new information resolves or sufficiently lessens those uncertainties such that EPA may reasonably conclude that wedgewire screen technology is available at the facility and will reduce entrainment "to the smallest amount, extent, or degree reasonably possible," 40 CFR § 125.92(r) (defining "minimize" in the context of § 316(b)), based on new designs that overcome logistical and engineering concerns, developing scientific research on the impact of hydraulic bypass and larval avoidance on entrainment, and confirmatory results of PSNH's site-specific pilot study of wedgewire screens. *See* Response to Comment III.4.2. EPA recognizes that some uncertainty remains, but it is not so great as to preclude a reasoned decision. *See id.* Significant in EPA's determination that wedgewire screens would reflect the "maximum reduction in entrainment warranted," 40 CFR § 125.98(f), at Merrimack Station is the large difference in the social costs of installing and operating wedgewire screens and closed-cycle cooling at the facility, particularly in light of the much closer estimates of entrainment reduction from each technology.[89] EPA analyzes these and other relevant factors in Responses to Comments III.5.2.1, 5.2.2, and 5.2.3 and III.5.3 and associated responses.

10.2.5 Because EPA Has Ample Record Support for the Feasibility and Effectiveness of Closed-Cycle Cooling as BTA and Lacks Evidence to Support Any Other Technology as BTA, EPA Should Proceed to Finalize its 2011 BTA Determination.

In December 2017, Conservation Law Foundation, Sierra Club, Earthjustice and Environmental Integrity Project submitted comments regarding the cooling water intake structures at Merrimack Station in response to EPA's Statement of New Questions. Those comments stressed that EPA's preliminary BTA determination – that Merrimack Station should achieve reductions in impingement and entrainment equivalent to seasonal use of cooling towers and continual use of rotating screens with an improved fish return system – was sound, supported by record evidence, and should be finalized promptly because it was long overdue.

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[89] To the extent the comment asserts that closed-cycle cooling should be the BTA because it "would still be expected to reduce entrainment to a greater degree than wedgewire screens," we note that the standard is not simply which requirements would reduce entrainment to the greatest degree, but rather which reflect the "maximum reduction in entrainment warranted after consideration of [relevant] factors." 40 C.F.R. §§ 125.98(f) (emphasis added); *see also Entergy Corp. v. Riverkeeper, Inc.*, 556 U.S. 208, (219 2009) (rejecting an interpretation of § 316(b) that would require EPA to select the technology that "achieves the greatest possible reduction in environmental harm"). For instance, EPA is required to consider the "[q]uantified and qualitative social benefits and costs of available entrainment technologies." *Id.* § 125.98(f)(2)(v). In this case, the social costs of closed-cycle cooling are significantly higher than wedgewire screens, while the social benefits are comparatively much closer.

In contrast, we noted that the permittee's request for more time to demonstrate that wedgewire screens could be used as a complete replacement for cooling towers, was ill considered:

> EPA should not reopen the 2011 BTA determination because the permittee is now proposing to study a new compliance option, wedgewire…screens. This determination is long overdue and cannot be further delayed for more studies… Overall, the performance of a wedgewire...screen system that has not yet been designed, of an unknown slot-width size, in environmental conditions that have not been fully assessed, cannot be considered equivalent to closed-cycle cooling. In contrast, cooling towers are available, proven, and considerably more effective than wedgewire . . . screens at minimizing both entrainment and impingement, as well as thermal discharges. They are the best technology available.[21]

Two years later, little has changed in the record or in the river. Merrimack Station is still running the same fish-killing cooling system that it had in place in 1992, when the NPDES permit was last issued. EPA was required by law to make a BTA determination decades ago, and actually published a draft determination in 2011, nearly a decade ago at this point. EPA reaffirmed that determination in 2014 and took additional comment and reviewed additional studies in 2017. But as discussed above, that additional inquiry did not establish a record that warrants any changes to EPA's long-delayed 2011 BTA determination.

The time for studies is over. Between them, PSNH and GSP have had nearly a decade to research, prepare, and work towards installing more protective cooling water intake technologies based on EPA's 2011 draft BTA determination and the 2014 reaffirmation of that determination. After all those long and illegal years of delay, Merrimack Station's owners still have not assembled evidence that would justify overturning that determination.

The only lawful and reasonable course of action is for EPA to finalize the 2011 BTA determination and require compliance on the shortest possible schedule. As EPA noted in the 2017 Statement of New Questions, EPA's new regulations "require compliance as soon as practicable" with Section 316(b).[22] EPA should impose the schedule of deadlines and milestones for installing closed-cycle cooling that the agency set forth in its 2017 Statement of New Questions.[23]

Accordingly, EPA has built an extensive record in support of the 2011 Draft Permit and the 2014 Draft Permit, has made rational decisions, supplied explanations that connect its decisions to the facts found, and nearly a decade has passed without the Station being directed to upgrade its cooling system as EPA found was necessary to comply with the Clean Water Act and New Hampshire water quality standards. EPA should proceed to issue a final NPDES permit for the Station containing cooling water intake structure requirements matching those in the 2011 Draft Permit and the 2014 Draft Permit.

[21] AR-1573 at 16, 18.

[22] 2017 Statement of New Questions at 23.

[23] 2017 Statement of New Questions at 27-28.

EPA Response:

Sierra Club and CLF state that EPA should find that closed-cycle cooling is the BTA for Merrimack Station because EPA's preliminary BTA determination "was sound, supported by record evidence, and [is] long overdue." Sierra Club and CLF reiterate some of their timely comments on the 2017 Statement in which they, along with other organizations, said that "the performance of a wedgewire-half screen system that has not yet been designed, of an unknown slot-width size, in environmental conditions that have not been fully assessed, cannot be considered equivalent to closed-cycle cooling." They further comment that, EPA "took additional comment and reviewed additional studies in 2017[, b]ut "as discussed above, that additional inquiry did not establish a record that warrants any changes to" the 2011 preliminary determination.

EPA agrees that the preliminary BTA determination was sound and supported by the information in the record at the time. And, as EPA said in the 2017 Statement:

> EPA is acutely aware that the Merrimack Station . . . permit[] ha[s] been administratively continued for a lengthy period and is eager to issue [a] new final permit[] for [the] facilit[y] as soon as possible. At the same time, EPA is also committed to providing a fair, legally sound process for the development of the permit[], and to developing scientifically and legally sound permit conditions.

AR-1534 at 9. EPA reiterates that new information, data, and arguments regarding the BTA analysis, particularly as they relate to the availability and efficacy of wedgewire screen technology at Merrimack Station, have come to light since the 2011 Draft Permit that raised substantial new questions as to whether EPA should determine that this technology is the BTA for entrainment at the facility. Moreover, new § 316(b) regulations have become effective, which, although in some respects are very similar to EPA's historical practice of establishing BTA requirements for entrainment based on Best Professional Judgment ("BPJ"), establish a particular framework for the analysis and specify factors relevant to that inquiry. 79 Fed. Reg. 48,300 (Aug. 15, 2014) (codified at 40 CFR § 122.21(r) and part 125, subpart J). In addition, Merrimack Station operates far less now than it did when the 2011 Draft Permit was developed and proposed. AR-1534. PSNH also conducted a successful site-specific pilot study in 2017 demonstrating significant entrainment reductions from wedgewire screens. EPA also reiterates that it is committed to providing a fair, legally sound process for the development of the permit that takes this information into account. EPA has appropriately evaluated the new information and the impact of these developments on its preliminary BTA determination. In the face of technical and scientific complexity and some measure of remaining uncertainty, EPA in this case has reasonably exercised its technical expertise and scientific judgment and concluded that wedgewire screen technology is the BTA at Merrimack Station. *See* Responses to Comments III.4.2 and III.5.3, and associated responses.

In response to Sierra Club and CLF's reiteration of its timely, general comment "that 'the performance of a wedgewire-half screen system that has not yet been designed, of an unknown slot-width size, in environmental conditions that have not been fully assessed, cannot be considered equivalent to closed-cycle cooling," EPA offers several observations. First, there is no requirement that the performance of wedgewire screen technology be "equivalent to closed-cycle cooling" in order to be the BTA at Merrimack Station, because EPA is required to consider additional factors beyond just number of organisms entrained and, in fact, may reject a technology that performs better than the selected technology. 40 CFR § 125.98(f)(1) (authorizing EPA to reject "entrainment control technologies or measures that perform better than the selected technologies or measures"), (2) (requiring EPA to consider several factors beyond entrainment numbers), (3) (authorizing EPA to consider several more factors), (4) (authorizing EPA to "reject an otherwise available technology as a BTA standard for entrainment if the social costs are not justified by the social benefits"); *see also* Responses to Comments III.7.3, III.10.2.1, III.10.2.2. Second, the comment again ignores that PSNH submitted a preliminary design for wedgewire half-screens in 2014. *See* AR-1231 (Attachment 4). Third, in the 2017 Statement, EPA gave notice that it was considering slot sizes from 0.5mm to 3mm and that it would define the appropriate slot size in the Final Permit based on public comments on the 2017 Statement and on the results of the 2017 site-specific pilot study. AR-1534 at 30 & n.5. Sierra Club and CLF, however, chose not to offer any specific comments on slot size, either in response to the 2017 Statement or in their 2020 CWIS Comments. *See* Comments III.7.3, III.10.2.2. Fourth, as noted in the 2017 Statement, PSNH continued to explore the feasibility of wedgewire screens at Merrimack Station, refining the proposed design, and submitting additional data regarding sweeping flows. AR-1534 at 18. EPA also listed additional materials and submittals relevant to the issue of whether wedgewire screen technology is the BTA at Merrimack Station. *Id.* at 33-34. But Sierra Club and CLF did not submit technical comments on this information. Finally, PSNH submitted with its comments on the 2017 Statement a site-specific pilot of 3 mm slot screens to evaluate performance under actual conditions in the Hooksett Pool at the appropriate depth and location, confirming existing information that supported their feasibility and effectiveness. *See* AR-1549 at 21-47; 1550. Two years on, Sierra Club and CLF continue to submit comments that advocate against wedgewire screen technology as the BTA but never offer any specific criticisms of the design or implementation of PSNH's proposed design or confirmatory pilot study.

In this comment and in Comment III.10.3, Sierra Club and CLF claim to have "discussed above" in the 2020 CWIS Comments that EPA's "additional inquiry" highlighted in the 2017 Statement does not "establish a record that warrants any changes to" the 2011 preliminary determination. EPA notes, however, that the 2020 CWIS Comments limit themselves to simply repeating uncertainties about wedgewire screens that EPA mentioned in 2011, broadly claiming that they all remain simply because EPA referred to the new information in the 2017 Statement as "suggesting" wedgewire screens are available and "may" be more effective than previously thought. *See, e.g.*, Comments III.10.2.2, III.10.2.4. The 2020 CWIS Comments do not contain any specific discussion of the information and studies cited in the 2017 Statement, explaining why they are inapplicable and do not support a determination that wedgewire screen technology is BTA at Merrimack Station. Nor did Sierra Club and CLF's timely comments ever specifically criticize the new information or studies added to the record. In the Responses to Comments III.4.2, III.5.2, and III.5.3, EPA addresses the uncertainties highlighted in 2011 and explains its entrainment BTA determination. We also reiterate that, contrary to any suggestion by Sierra Club and CLF, absolute scientific certainty is not required; EPA may exercise its considered judgment even in the face of some uncertainty. *Taunton*, 17 E.A.D. at 134.

10.3 If EPA Proposes Making Significant Changes to the Permit's Cooling Water Intake Structure Provisions, the Agency Must Comply with Mandatory Legal Requirements

As discussed above, EPA should proceed to issue a final NPDES permit for the Station, containing the cooling water intake structure provisions that are in the 2011 Draft Permit and the 2014 Draft Permit. However, if EPA is considering taking the permit in a different direction, the agency must: (i) make a BTA determination; (ii) avoid making an arbitrary and capricious BTA determination; (iii) include all substantive requirements for location, design, construction and capacity of the cooling water intake structures in the permit itself; (iv) allow public comment on the new proposal; and (v) not allow GSP to indefinitely or permanently avoid compliance with Section 316(b)'s BTA mandate by using a compliance schedule to conduct more studies and then seek a modification of the permit's BTA-related requirements that the company prefers not to spend money to comply with.

EPA Response:

In this introductory comment, Sierra Club and CLF summarize major points made in their more detailed comments that follow. EPA provides responses below.

10.3.1 Since it Bought the Station in 2018, GSP and EPA Have Met Frequently and Discussed Possible Changes to the Permit's Cooling Water Intake Structure Requirements.

Documents provided by EPA under the Freedom of Information Act indicate that, since GSP acquired the Station in 2018, GSP and EPA have met frequently – at least five times in person over the past fifteen months, as well as in numerous phone calls – to discuss the cooling water intake structure requirements (and other issues) in the Merrimack NPDES permit. It is becoming readily apparent that GSP not only wants to avoid installing closed-cycle cooling, but it also wants to avoid installing the wedgewire screen system proposed by PSNH as recently as 2017. Indeed, it appears that GSP's goal is to secure a final NPDES permit that will ultimately not require any changes to Station's antiquated once-through cooling system and intake structures.

In September 2018, GSP told EPA that it is "no longer interested in installing wedgewire screens" because they "do not want to spend the money."[24] Although GSP told EPA a year later (in August 2019) that it was now "likely amenable to a permit with wedgewire screen requirements,"[25] GSP also made clear that what it actually wants is for EPA to nominally select wedgewire screens as BTA without specifying in the permit what the slot size should be, when the screens must be operated, what level of effectiveness the screens must achieve, or when they must be installed. Instead, GSP has told EPA that it is seeking a permit containing a "two-stage compliance schedule." That is, GSP wants, an extended period of time after the final NPDES permits is issued "to study screen feasibility and effectiveness."[26] And, then, GSP wants a second, subsequent period of time to "select and implement [an] option for achieving similar effectiveness [to wedgewire screens, if deemed feasible and effective in the studies to be conducted]."[27] Specifically, GSP has asked EPA for a compliance schedule that "would allow the Permittee to recommend a specific slot-size for the screens for its final design."[28]

GSP told EPA that it wanted to be given this extra time after the final NPDES permit is issued in order to study wedgewire screen "feasibility and effectiveness" – even though PSNH had already done pilot testing in the Merrimack River – because GSP believes that it has only "in essence, 'one data point' from that single study and it want[s] to do some additional work to develop a more robust estimate of site-specific wedgewire screen effectiveness to provide a well-supported target effectiveness for the compliance approach to be applied to satisfy CWA § 316(b)."[29] Thus, in GSP's own words, there is not yet sufficient, robust, or well-supported data on the effectiveness of wedgewire screens in the Hooksett Pool.

Furthermore, GSP has made clear that it is requesting a lengthy, two-step compliance schedule not merely to give the company time to complete a final design and install wedgewire screens, but rather to give the company "an opportunity to consider whether another compliance option might be preferable," at which time there might be a "modification of the permit to incorporate the new requirements."[30] Thus, GSP is seeking a permit containing a compliance schedule that allows GSP to propose altogether different permit requirements.

What GSP is seeking would not be legally valid under the CWA or the APA.

[24] U.S. EPA, Memorandum Documenting September 20, 2018, Meeting Between EPA and Granite Shore Power Concerning the Merrimack Station NPDES Permit (Oct. 26, 2018) at 7.

[25] U.S. EPA, Memorandum Documenting August 19, 2019, Meeting Between EPA and Granite Shore Power Concerning the Merrimack Station NPDES Permit (Sept. 8, 2019) at 2.

[26] GSP, "Merrimack NPDES Permit" – Open Items," (undated), provided to EPA Region 1 on September 10, 2019.

[27] GSP, "Merrimack NPDES Permit" – Open Items," (undated), provided to EPA Region 1 on September 10, 2019.

[28] U.S. EPA, Memorandum Documenting August 19, 2019, Meeting Between EPA and Granite Shore Power Concerning the Merrimack Station NPDES Permit (Sept. 8, 2019) at 3.

[29] U.S. EPA, File Memorandum, Notes on October 1, 2019, Telephone Conference Call Between EPA Region 1 and Granite Shore Power, LLC (Oct. 7, 2019) at 3.

[30] U.S. EPA, Memorandum Documenting August 19, 2019, Meeting Between EPA and Granite Shore Power Concerning the Merrimack Station NPDES Permit (Sept. 8, 2019) at 2.

EPA Response:

Sierra Club and CLF begin the comment by noting that EPA and the new Permittee, Granite Shore Power ("GSP"), have "met frequently" to discuss the Merrimack Station NPDES Permit. To the extent the comment is meant to suggest something improper in EPA having such discussions, EPA notes that the comment points to nothing in the statute, regulations, or case law that discourages or prohibits EPA from meeting with a permittee. *See Texas Office of Pub. Utility Counsel v. FCC*, 265 F.3d 313, 327 (5th Cir. 2001) (rejecting "the Petitioners' speculative and perhaps sinister scenario imputed to the *ex parte* communication between the FCC and the interested parties" and noting that such contact "is not shunned in the administrative agency arena," but is often necessary) (citing *Sierra Club v. Costle*, 657 F.2d 298, 400-01 (D.C. Cir. 1981). EPA created records of these conversations, added them to the administrative record for the permit, and, as the comment indicates, provided them to the commenter. EPA notes that it voluntarily provided the commenter with most records documenting EPA's communications with GSP, rather than provided them only in response to FOIA requests as the comment might suggest. *See* AR-1814, AR-1816, AR-1820. Regardless of whether the commenter had requested them directly, EPA was still going to include those records in the Administrative Record for the Merrimack Station permit. It also should be mentioned that while EPA had discussions and shared information with GSP about the Merrimack Station permit, it also discussed the permit and shared information with the commenter. *See* AR-1635; AR-1637; AR-1773; AR-1818.

Sierra Club and CLF continue by commenting that "[i]t is becoming readily apparent that GSP not only wants to avoid installing closed-cycle cooling, but it also wants to avoid installing the wedgewire screen system proposed by PSNH as recently as 2017." EPA notes that this is also the position PSNH took. *See* Comment III.5 (commenting that closed-cycle cooling is not the BTA at Merrimack Station), III.5.2.1 (commenting that, although wedgewire screens are "highly effective at reducing entrainment at substantially less cost as compared to CCC," they are still too costly to be the BTA). Thus, GSP's "apparent" position is nothing new and should not surprise Sierra Club and CLF. The organizations further comment that "it appears that GSP's goal is to secure a final NPDES permit that will ultimately not require any changes to Station's antiquated once-through cooling system and intake structures." But this, too, should surprise no one; many a permittee would prefer a permit that does not require it to make any upgrades.

Next, Sierra Club and CLF comment that a "two-stage compliance schedule" for entrainment would not be appropriate. EPA generally agrees and has not included one in this permit, in part because compliance with the entrainment standard is required "as soon as practicable," 40 CFR § 125.94(b)(2), and because the agency has enough information to make a BTA determination. And while the comment asserts that GSP has said "there is not yet sufficient, robust, or well-supported data on the effectiveness of wedgewire screens in the Hooksett Pool," this is not how PSNH, Enercon, and Normandeau characterized the 2017 pilot study. *See* Comments III.4.1 ("Analyses from Normandeau and Enercon ultimately confirmed use of the wedgewire half-screens with larger diameters yields significant reductions in entrainment and are well suited for the Merrimack River."), III.4.2, III.5.2.1 ("PSNH has shown through its pilot study that installation of 3.0 mm wedgewire screens with a designed through-screen velocity of less than 0.5 fps at Merrimack Station, operated annually from April through July, is highly effective at reducing entrainment.").

The Final Permit establishes a compliance schedule for wedgewire screens that is very similar to the schedule EPA proposed in the 2017 Statement, with slight alterations as described and explained in Response to Comment III.6.2. Sierra Club and CLF had the opportunity to comment on the proposed schedule but chose not to. The schedule in the Final Permit requires compliance "as soon as practicable" with EPA's determination in the Final Permit that wedgewire screens are the BTA for entrainment. Thus, EPA has not just "nominally selected" wedgewire screens. That said, while GSP is working on complying with this schedule, there is nothing that would prevent it from contemporaneously developing new information on another compliance option and submitting a permit modification request based thereon. For instance, GSP could choose to study how specific flow reduction strategies compare to the entrainment reductions achieved by wedgewire screens with a 3.0 mm slot size. If EPA proposed to modify the permit in response to such a request, the public would have the opportunity to participate in that decision. *See* 40 CFR § 122.62.

10.3.2 EPA May Not Issue a NPDES Permit that Defers a BTA Decision Until Further Studies Are Conducted.

Under federal law, EPA cannot lawfully re-issue a NPDES permit without making a BTA determination – that is, without first determining which technology is the best available for minimizing the adverse environmental impact of its cooling water intake structures. Likewise, the agency may not issue a NPDES permit that does not require a level of protection for aquatic life that is consistent with the use of the technology that EPA has determined to be BTA. Deferring either the determination of BTA or the establishment of permit requirements reflecting that determination would violate several provisions of the Clean Water Act and its regulations.

To begin with, Section 316(b) requires EPA to make a BTA determination every time it issues a NPDES permit. Section 316(b) imposes a mandatory, enforceable, time-limited duty on EPA to implement the requirements of that section within the time limits set forth in CWA sections 301 and 306.[31] For existing facilities, the deadline for complying with BTA was March 31, 1989. As EPA's general counsel explained in 1976, "[i]nsofar as neither § 316(b) nor the regulations thereunder specify a time limitation for the application of best technology available, the ultimate compliance date under § 316(b) is governed only by § 301(b)(2)(A) which requires compliance not later than July 1, 1983,"[32] which Congress later extended to March 31, 1989.[33] This 1989 deadline is absolute, and permit writers are without authority to grant an extension in NPDES permits of the Act's time limits for the imposition of technology-based standards.[34] In addition to the statutory obligation to make a BTA determination, EPA's 2014 § 316(b) Regulations provide that, for any permit issued after July 14, 2018, EPA must include permit conditions to implement and ensure compliance with the regulation's entrainment and impingement mortality standards.[35]

In addition to Section 316(b), Section 402 also forbids issuing a NPDES permit without a BTA determination. Section 402(a)(1)(A) authorizes EPA to issue NPDES permits for point source discharges "on condition that such discharge will meet … all applicable requirements under sections [301 and 306]," one of which is Section 316(b)'s requirement that cooling water intake structures reflect BTA.[36] NPDES permits are issued to point sources,[37] which are defined as "conveyances … from which pollutants are or may be discharged,"[38] and Section 316(b) expressly applies BTA requirements to "point source[s]." One of the requirements on which a point source's *discharge* to the surface waters must be conditioned, then, is that its *intake* of those waters for cooling be done in accordance with Section 316(b). If it does not, that discharge does not "meet … all applicable requirements" of Section 301 or 306. Further, Section 402(b) provides a detailed list of the provisions a permit must contain. Included among these is the mandate that such permits "apply, and insure compliance with, any applicable requirements" of Sections 301 and 306.[39] Accordingly, Section 402 prohibits the issuance of a NPDES permit that does not condition the discharge on compliance with Section 316(b).

Indeed, EPA Region 1 has admitted that "[Section] 316(b) determinations *must be revisited with each permit reissuance*. Permit conditions imposed under § 316(b) *must satisfy the statute* and may be based either on applicable regulatory guidelines or, in their absence, on case-by-case Best Professional Judgment (BPJ) determinations."[40] EPA is thus required to compel adherence to the CWA's "best technology available" standard every time it issues a NPDES permit for a point source with an intake structure. In other words, there is no authority allowing EPA to issue a NPDES permit that defers the Section 316(b) BTA determination.

Here, as noted above, GSP is apparently suggesting to EPA that the agency issue a final NPDES permit that nominally selects "wedgewire screens" as BTA, but does not determine what the slot size must be. However, there is no universally accepted definition or standard for the slot size of a wedgewire screen. As discussed above, the slot-size is a critical parameter. All else being equal, smaller slot sizes increase intake velocities leading to increased impingement and entrainment as well as fouling, and also increase the size of the screen array and the interference with the use of the river. Larger slot sizes can increase entrainment because smaller organisms will pass through the screen's mesh. The engineering of wedgewire screen's slot size is critical to feasibility and effectiveness.

Consequently, in the absence of determining the slot size for a wedgewire screen, EPA will not know if the screen system will be feasible or effective. Likewise, without specifying exactly when the screens must be operated, or what level of effectiveness the screens must achieve, or when they must be installed, EPA would not have made a BTA determination in the permit at all, but would be unlawfully deferring that determination until a later time. (In stark contrast, when EPA made its 2011 BTA determination, it included in the draft permit specific numeric requirements for each parameter, such as the maximum volume of cooling water that may be withdrawn, during specified months, and the velocity and other features of the fish return system.[41]) Further, without including a deadline in the permit for when compliance with specified BTA standards must be achieved, EPA would not be requiring the permittee to comply with BTA. That would be illegal under the CWA and would not survive judicial review.

[31] *See Cronin v. Browner*, 898 F.Supp. 1052, 1059 (S.D.N.Y. 1995).
[32] *In Re Brunswick Steam Electric Plant*, U.S. EPA, Decision of the General Counsel, EPA GCO 41 (June 1, 1976).
[33] CWA § 301(b)(2); 33 U.S.C. § 1311(b)(2).
[34] *See, e.g., Bethlehem Steel Corp. v. Train*, 544 F.2d 657, 663 (3rd Cir. 1976) *cert. denied* 430 U.S. (1977); *United States v. Hoboken*, 675 F. Supp. 189, 194 (D.N.J. 1987) ("EPA had no authority to extend

secondary-treatment standard deadlines beyond July 1, 1983"); *State Water Control Bd. v. Train*, 559 F.2d 921, 925 (4th Cir. 1977) ("the legislative history indicates that Congress viewed it as an inflexible target") (quoting *Bethlehem Steel*, 544 F.2d at 661)..
[35] 40 C.F.R. § 125.98(b)(2).
[36] 33 U.S.C. § 1342(a)(1)(A).
[37] Section 402(a)(1) states that permits are issued "for the discharge of [a] pollutant," which is in turn defined as the addition of a pollutant to the waters "from [a] point source." 33 U.S.C. § 1362(12).
[38] *Id.* § 1362(14).
[39] *Id.* § 1342(b)(1)(A).
[40] U.S. EPA – New England, Clean Water Act NPDES Permitting Determinations for Thermal Discharge and Cooling Water Intake from Brayton Point Station in Somerset, MA (July 22, 2002) at § 7.2.2 (emphasis added).
[41] See bullet points on pages __, above.

EPA Response:

Sierra Club and CLF comment that the Final Permit must include a BTA determination and must "require a level of protection for aquatic life that is consistent with the use of the technology that EPA has determined to be BTA." The commenters do not explain exactly what they mean by that phrase, although they later state that EPA may not defer permit conditions reflecting the entrainment BTA determination and that, if EPA concludes that wedgewire screen technology is the BTA, the permit must specify the required slot size, period of operation, level of effectiveness, and when the screens must be installed.

EPA agrees that the Final Permit "must include conditions to implement and ensure compliance with the impingement mortality standard at §125.94(c) and the entrainment standard at §125.94(d)" and include "conditions, management practices and operational measures necessary to ensure proper operation of any technology used to comply with" the impingement and entrainment standards. 40 CFR § 125.98(b)(2). EPA also agrees that the regulations require the permittee to comply with the impingement and entrainment BTA determinations in the Final Permit "as soon as practicable." *Id.* § 125.94(b)(1), (2). Further, we note that the regulations allow for aligning compliance deadlines for impingement and entrainment requirements, such that a permit may require compliance with impingement requirements after the permittee has installed the necessary entrainment and impingement technology and completed an impingement technology performance optimization study. *See id.* § 125.94(b)(1), (2); 79 Fed. Reg. at 48,327 (describing how EPA sought to coordinate compliance scheduling for entrainment and impingement requirements), 48,346-48 (explaining that, in some cases, the optimization study cannot be undertaken until the technologies are installed). The regulations also contemplate that EPA would modify the permit to include conditions and parameters identified in an impingement technology performance optimization study. 79 Fed. Reg. at 48,347. EPA also notes that, while the reference to the 1989 deadline for compliance is applicable to BAT, BPT, and BCT technology standards, *see* 40 CFR § 125.3; 33 U.S.C. § 1311(b)(2), it is not applicable to the BTA standard of § 316(b). In the past, EPA interpreted CWA § 316(b) to incorporate the compliance deadlines from CWA § 301(b)(2) and, as a result, any compliance schedule would have been handled outside an NPDES permit. *See, e.g.*, *Cronin v. Browner*, 898 F.Supp. 1,052 (S.D.N.Y. 1995); *EPA General Counsel's Opinion No. 41* (1976). In the 2014 CWA § 316(b)

Final Rule, however, EPA revised its legal interpretation and decided that, because there is no stated compliance deadline within the "four corners" of CWA § 316(b), compliance with the BTA standard is due *as soon as practicable*. 79 Fed. Reg. at 48,359.

As explained in previous responses, the Final Permit includes a BTA determination that seasonal operation of wedgewire screens with a through-screen velocity no greater than 0.5 fps and slot size no greater than 3 mm is the BTA for entrainment at Merrimack Station and conditions necessary to ensure proper operation, including monitoring of the through-screen velocity, orienting slot openings perpendicular to the predominant direction of ambient flow current, and requiring an airburst system for clearing debris from the screens.[90] Final Permit at Part I.E.1; *see also* Responses to Comments III.4.2, III.5.3, III.7.3; AR-1534 at 30. With respect to impingement, EPA recognizes that, during periods when the facility is not generating electricity or is operating the wedgewire screens, the Permittee would achieve compliance with alternative impingement mortality BTA methods regarding design or actual through-screen velocity because the facility would either not be withdrawing water at all or would be withdrawing in compliance with the Final Permit's maximum through-screen velocity condition of 0.5 fps at the wedgewire screens.[91] *See* 40 CFR § 125.98(c)(2), (3); *see also* Response to Comment III.3.1; Final Permit at Part I.E.2. The Final Permit also includes conditions requiring the Permittee to install and operate a new fish return, with specific conditions relating to its design and operation. *See* Final Permit at Part I.E.3.a. Moreover, the Final Permit contains compliance schedules for installing and operating these new technologies. *See* Final Permit at Part I.E.7. The Final Permit also requires the permittee to conduct an impingement technology performance optimization study, which would be performed after the new technologies have been installed. Final Permit at Part I.E.3.b; *see* 79 Fed. Reg 48,300 at 48,321, 48,347; Response to Comment III.3.1. Optimal screen rotation frequency would also be evaluated in the optimization study.[92] After the optimization study is submitted, EPA could modify the permit pursuant to 40 CFR § 122.62 to reflect additional conditions and measures identified in the study, as appropriate.

Thus, the Final Permit meets the regulatory requirements to include conditions to implement and ensure compliance with the entrainment and impingement standards and to include conditions necessary to ensure proper operation of the technologies used to comply with those standards. The Final Permit also satisfies the comment's demand that the permit set the slot size, the period of operation, and a deadline for when the wedgewire screens must be installed and operational. With regard to the comment that the Final Permit must specify the "level of effectiveness the screens must achieve," EPA reiterates that the Final Permit does specify a maximum through-screen velocity at the wedgewire screens of 0.5 fps and requires monitoring to ensure that

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[90] The Final Permit requires use of the wedgewire screens from April 1 to August 15 each year, whenever the facility is withdrawing water through one or both of its cooling water intake structures, except during periods of emergency bypass when performed in accordance with the applicable emergency intake condition of the permit. Final Permit at Parts I.E.1 and I.E.4.

[91] PSNH proposed wedgewire screens for Merrimack Station with a design through-screen velocity below 0.5 fps, specifically, 0.4 fps. *See* Comment III.4.2.

[92] The permittee could also choose to evaluate flow reductions.

velocity is not exceeded.[93] Final Permit at Part I.E.2 (also Parts I.A.1 and I.A.2). To the extent the commenters would consider that these conditions do not go far enough to address their "level of effectiveness" concern, Sierra Club and CLF have not explained how or why any additional permit condition is required by the statute, regulations, or case law. The comment asserts that "without specifying . . . what level of effectiveness the screens must achieve . . . EPA would not have made a BTA determination in the permit at all, but would be unlawfully deferring that determination until a later time." But Sierra Club and CLF do not explain this conclusion and it does not logically follow, because EPA has not deferred the BTA determination; it has made that determination as discussed above. Sierra Club and CLF attempt to support the comment by drawing a comparison to the 2011 Draft Permit, stating that the preliminary determination included "specific numeric requirements for each parameter, such as the maximum volume of cooling water that may be withdrawn, during specified months, and the velocity and other features of the fish return system." But the Final Permit also includes such requirements, including a flow limit, specific months when the wedgewire screens must be used, a through-screen velocity limit, and specific requirements for the new fish return. Nothing in the statute, regulations, or case law Sierra Club and CLF cite leads to an inexorable conclusion that EPA must include more in the Final Permit to specify the "level of effectiveness" to be achieved, and the comment does not offer any compelling reason to include such conditions.

The Final Permit does not defer an entrainment BTA determination, but rather establishes wedgewire screens with certain specific characteristics as the BTA for entrainment. Moreover, it includes a compliance schedule to implement, and conditions to ensure proper operation of, the wedgewire screens to comply with the BTA determination. With respect to impingement, the Final Permit appropriately aligns compliance with the impingement standard to follow installation of the new technologies to minimize adverse environmental impact and completion of the impingement technology performance optimization study.

10.3.3 EPA's BTA Determinations Must Be Supported by Record Evidence, a Rational Basis, and an Explanation that Logically Connects the New Decisions Made to the Facts Found.

As with any administrative decisionmaking by a federal agency, EPA's Section 316(b) BTA determinations must conform to the APA and be based on "reasoned decisionmaking."[42] "Not only must an agency's decreed result be within the scope of its lawful authority, but the process by which it reaches that result must be logical and rational."[43] A court must reject an agency

[93] The comment is irrelevant that "All else being equal, smaller slot sizes increase intake velocities leading to increased impingement and entrainment as well as fouling," because of the Final Permit conditions regarding maximum through-screen velocity and attendant monitoring. EPA also notes that Sierra Club and CLF's comment that "Larger slot sizes can increase entrainment because smaller organisms will pass through the screen's mesh" ignores new information highlighted by the 2017 Statement that larval avoidance and hydraulic bypass are other mechanisms by which wedgewire screens reduce entrainment. Further, it ignores EPA's statement that it was considering wedgewire screens with slot sizes up to 3 mm and specific request for comment on "the extent to which wedgewire screens with different screen slot sizes can prevent mortality to aquatic life from entrainment and/or impingement and satisfy the BTA requirements of CWA § 316(b)." AR-1534 at 30 n.5. Instead of offering specific comment on this issue, Sierra Club and CLF limited their comment to this one-sentence, generic, and incomplete statement.

decision that, *inter alia*, is based on explanation "that runs counter to the evidence before the agency" or lacks "a satisfactory explanation . . . including a rational connection between the facts found and the choice made."[44]

When EPA preliminarily determined, in 2011, that BTA for the Station was closed-cycle cooling with a fish return system, and that less stringent requirements would fail to comply with either Section 316(b) or New Hampshire water quality standards, the agency did so based on an extensive record and its own independent analysis of data supplied by the applicant. EPA supplied a detailed explanation of its process and its reasoning, including a rational connection between the facts found and the choice made. In 2014 and in 2017, EPA issued new public notices relating to aspects of the Station's NPDES permit, but did not change its BTA determination.

If EPA were to change its 2011 BTA determination, the APA would require the agency to explain how the extensive record that supported its 2011 conclusions, plus any new information obtained since then, will support any new conclusions. In particular, EPA could not finalize a decision that wedgewire screens are "available," and, indeed, the "best technology available," before the evidence needed to support such a conclusion is collected. It would be arbitrary, capricious, and an abuse of discretion for EPA to select wedgewire screens over cooling towers as BTA when the permittee has indicated that it is not yet possible to conclude that wedgewire screens would be feasible and effective or to determine the slot size, level of effectiveness, or other parameters. In the absence of supporting record evidence, a rational basis, and an explanation logically connecting the decisions to the facts, agency action will be held unlawful and set aside as arbitrary and capricious under the APA.[45]

Or, if EPA were to issue a final NPDES permit that not only selects wedgewire screens as BTA, but also contains detailed requirements as to the required slot size, the dates on which the screens must be operated, the area of river that the screens may occupy, the level of effectiveness that the screens must achieve, and all other necessary parameters, including a deadline for installing the screens and having them fully operational, then EPA must have sufficient evidentiary support in the record and a reasoned explanation logically connecting all of those newly-made decisions to the evidence. But EPA does not have the evidence necessary to make those decisions for wedgewire screens. As GSP itself maintains, additional studies on the feasibility and effectiveness of wedgewire screens in the Hooksett Pool are needed to have a well-supported basis for determining their slot size and effectiveness

Similarly, EPA continues to lack needed information about whether ambient velocities in the Hooksett Pool are adequate to create sufficient sweeping flows for wedgewire screens to function and whether there will be adequate water depth.

Indeed, the answers to these questions cannot definitively be determined given the hydrology and hydrography of Hooksett Pool, which is an impoundment between two dams, the Garvins Falls Dam to the north and the Hooksett Dam to the south. Water volume and velocity in the Hooksett Pool is dependent on release rates of the upstream and downstream dams. But these dams are managed for multiple purposes, and releases are not optimized to provide the desired velocities or depths near Merrimack Station. The ambient flow in the river is not guaranteed to meet

Merrimack's needs for adequate sweeping velocities. In other words, operational effectiveness of wedgewire screens is entirely dependent on river conditions that the Station cannot control. There may be needs of other users, for power, storage, water level maintenance, or other purposes that render wedgewire screens highly ineffective despite any potential they may have for use at other locations.

Accordingly, there is not an adequate basis in the record on which EPA could base a determination that wedgewire screens are BTA for Merrimack Station.

[42] *See Allentown Mack Sales & Serv. v. NLRB*, 522 U.S. 359, 374 (1998) (quoting *Motor Vehicle Mfrs. Ass'n of the United States, Inc. v. State Farm Mut. Auto. Ins. Co*., 463 U.S. 29, 52 (1983)).
[43] *Id.*
[44] *Grosso v. Surface Transp. Bd.*, 804 F.3d 110, 116 (1st Cir. 2015) (quoting *State Farm*, 463 U.S. at 43); *see also Southcoast Hosps. Grp., Inc. v. NLRB*, 846 F.3d 448, 453 (1st Cir. 2017).
[45] 5 U.S.C. § 706(2)(a).

EPA Response:

Sierra Club and CLF comment that, if EPA determines in the Final Permit that wedgewire screen technology is the BTA at Merrimack Station, EPA must explain how the record information supports its determination. EPA agrees and has done so. *See* Responses to Comments III.4, III.5.2, III.5.3 (including associated responses).

Sierra Club and CLF comment that EPA may not determine that wedgewire screen technology is the BTA "when the permittee has indicated that it is not yet possible to conclude that wedgewire screens would be feasible and effective or to determine the slot size, level of effectiveness, or other parameters." Sierra Club and CLF comment that "GSP itself maintains [that] additional studies on the feasibility and effectiveness of wedgewire screens in the Hooksett Pool are needed to have a well-supported basis for determining their slot size and effectiveness." The comment ignores, however, PSNH's statements and supporting information to the contrary based on its site-specific pilot study of wedgewire screens and EPA's statements that it would carefully consider the data collected in this study in its BTA determination. Overall, PSNH reported that its biological and engineering consultants, Normandeau and Enercon, concluded that "wedgwire screens are technologically feasible at Merrimack Station" and that the "installation of 3.0 mm wedgewire screens with a designed through-screen velocity of less than 0.5 fps at Merrimack Station operated annually from April through July would therefore substantially reduce" entrainment at the facility. Comment III.4.1. More specifically, PSNH reported that:

> Normandeau and Enercon confirmed that a constant and high sweeping flow velocity was present in April through July.[fn omitted] The wedgewire screens proposed for Merrimack Station would have a through-screen velocity of 0.4 fps;[fn omitted] and, the average observed sweeping flow in the Merrimack River was 2.9 fps during field operations conducted during the peak entrainment period in 2009 and 2012.[fn omitted] This results in a ratio of sweeping velocity to the through-slot velocity of the screens of approximately 7:1.[fn omitted] The sweeping flows observed

> during execution of the 2017 Study Plan were 1.0 fps or greater for almost the entirety of the test, resulting in a ratio of 2:1 or greater.[fn omitted]

Comment III.4.2. PSNH's site-specific study also concluded that screens with 3 mm slot width "alleviate many of the[] fouling and debris accumulation issues, and [that] these issues would be further minimized by construction of the system with the proposed air burst system[fn omitted] and construction of the screen mesh with a Z-alloy that is proven to substantially reduce biofouling compared to stainless steel screens." *Id.* In addition, the study concludes that issues identified with the large number of screens previously thought to be required "are alleviated through the use of 96-inch, 3.0 mm slot-width wedgewire half-screens," and that, "because the screens extend approximately four feet from the river bottom, they will not interfere with public recreation in the Merrimack River." *Id.* Thus, the previous permittee—whose "shoes" GSP has "stepped into" for purposes of this permit proceeding—concluded, based on a site-specific study by its biological and engineering consultants, that the conditions for installation and operation of wedgewire screens exist and that the technology is feasible and would be effective at Merrimack Station. EPA generally agrees, as provided in Response to Comment III.4.2.

Sierra Club and CLF also comment that EPA "continues to lack needed information about whether ambient velocities in the Hooksett Pool are adequate to create sufficient sweeping flows for wedgewire screens to function and whether there will be adequate water depth." Again, the comment simply ignores the new information, data, and arguments that ambient velocities and water depth are adequate. *See supra*; Response to Comment III.4.2. Sierra Club and CLF fail to substantiate the comment by, for instance, confronting the new information and explaining why it is insufficient. EPA explains why these previously identified uncertainties do not prevent EPA from finding now, based on new information emphasized in the 2017 Statement, including site-specific data collected by PSNH since 2011, that wedgewire screen technology is the BTA for entrainment at Merrimack Station. *See* Responses to Comments III.4, III.5.2, III.5.3 (including associated responses).

Finally, Sierra Club and CLF also reiterate comments they submitted in 2017 related to the Garvins Falls Dam and Hooksett Dam. EPA provides responses to those comments at Response to Comment III.7.3.

10.3.4 EPA May Not Issue a NPDES Permit that Allows Material BTA Requirements to Be Developed After the Fact and Contained Only in a Separate, Non-Permit Document.

As the federal courts have held, when issuing a NPDES permit, EPA must include all of the effluent limitations and other discharge-related limitations in the permit itself. EPA may not issue a NPDES permit with a provision allowing critical substantive requirements to be developed by the permittee at a later time (with or without EPA oversight and approval) and contained only in some other document, outside the permit, because that would violate, among other things, the CWA and APA's public participation requirements.

For example, in *Waterkeeper Alliance, Inc. v. United States EPA*,[46] the United States Court of Appeals for the Second Circuit remanded an EPA regulation that would have allowed NPDES permits for concentrated animal feeding operations to omit critical aspects of the operations' pollution control requirements, which would instead be developed by the permittees and contained in a separate nutrient management plan. The court explained at length that this was illegal for various reasons:

> [T]he permitting scheme established [by EPA] . . . violates the Clean Water Act's public participation requirements and is otherwise arbitrary and capricious under the Administrative Procedure Act.
>
> Congress clearly intended to guarantee the public a meaningful role in the implementation of the Clean Water Act. The Act unequivocally and broadly declares, for example, that "public participation in the development, revision, and enforcement of any regulation, standard, effluent limitation, plan, or program established by the Administrator or any State under this Act shall be provided for, encouraged, and assisted by the Administrator and the States." 33 U.S.C. § 1251(e). Consistent with this demand, the Act further provides that there be an "opportunity for public hearing" before any NPDES permit issues, see 33 U.S.C. §§ 1342(a), 1342 (b)(3); that a "copy of each permit application and each permit issued under this section [1342] shall be available to the public," see 33 U.S.C. § 1342(j); and that "any citizen" may bring a civil suit for violations of the Act, see 33 U.S.C. § 1365(a).
>
> The . . . Rule deprives the public of the opportunity for the sort of regulatory participation that the Act guarantees because the Rule effectively shields the nutrient management plans from public scrutiny and comment [by] fail[ing] to require that the terms of the nutrient management plans be included in the NPDES permits . . .This scheme violates the Act's public participation requirements in a number of respects. First and foremost, in light of our holding that the terms of the nutrient management plans constitute effluent limitations that should have been included in NPDES permits, the . . . Rule deprives the public of its right to assist in the "development, revision, and enforcement of . . . [an] effluent limitation." 33 U.S.C. § 1251(e) (emphasis added). More specifically, the . . . Rule prevents the public from calling for a hearing about – and then meaningfully commenting on – NPDES permits before they issue. See 33 U.S.C. §§ 1342(a), 1342 (b)(3). The . . . Rule also impermissibly compromises the public's ability to bring citizen-suits, a "proven enforcement tool" that "Congress intended [to be used . . .] to both spur and supplement government enforcement actions." Clean Water Act Amendments of 1985, Senate Environment and Public Works Comm., S. Rep. No. 50, 99th Cong., 1st Sess. 28 (1985). Under the . . . Rule, as written, citizens would be limited to enforcing the mere requirement to develop a nutrient management plan, but would be without means to enforce the terms of the nutrient management plans . . . This is unacceptable.

> And even assuming, arguendo, that the nutrient management plans did not themselves constitute effluent limitations, we would still hold that the . . . Rule violates the Act's public participation requirements. Nutrient management plans are . . . a critical indispensable feature . . . a sine qua non of the "regulation, standard, plan, or program" . . .Given that the . . . Rule forestalls – rather than "provides for, encourages, and assist[s]" – public participation in the development and enforcement of nutrient management plans, and given that nutrient management plans are an important "regulation, standard, effluent limitation, plan or program" established by the EPA to regulate . . .discharges, the . . . Rule violates the plain dictates of 33 U.S.C. § 1251(e).[47]

The structure of the NPDES permit that GSP is apparently seeking here for Merrimack Station would run afoul of all the legal dictates articulated by the Court of Appeals in that case. For example, like effluent limitations the BTA requirements are required to be in every NPDES permit that EPA issues to a facility that has a cooling water intake structure.[48] If EPA does not specify in the permit the slot size, the required operational dates, the size and location of the screen array, the degree of effectiveness in reducing impingement and entrainment, when the screens must be installed, and other important parameters but instead leaves the permittee to later propose a plan for these terms, then permit is missing key elements. These are all "critical indispensable features" of BTA requirements based on wedgewire screens.

Further, if EPA were to issue a NPDES permit that leaves out these critical elements, it would violate the public's guaranteed rights of public participation. Whether commenting on a draft permit, appealing a final permit, or enforcing a final permit – all of which Congress included as important procedural safeguards in the CWA – the public would be deprived of the opportunity to review, comment on, appeal, or enforce critical components of the permit's BTA requirements, because they would not be in the permit and not available because they would not yet have been developed. They would be only in separate reports to be prepared later by the permittee or in subsequent correspondence between the permittee and EPA. This is unacceptable.

For all of these reasons, too, EPA should not issue a NPDES permit like that requested by GSP.

[46] 399 F.3d 486 (2d Cir. 2005).
[47] 399 F.3d at 503-04.
[48] See discussion associated with footnotes __ to __, on pages __ to __, above.

EPA Response:

Sierra Club and CLF comment that the Final Permit must "specify . . . the slot size, the required operational dates, the size and location of the screen array, the degree of effectiveness in reducing impingement and entrainment, when the screens must be installed, and other important parameters" because a permit without these details would "violate the public's guaranteed rights of public participation." The comment relies on *Waterkeeper Alliance, Inc. v. United States EPA*, 399 F.3d 486 (2d. Cir. 2005), a case in which the United States Court of Appeals for the Second Circuit overturned certain provisions of EPA's promulgation of a rule governing permitting requirements and effluent limitation guidelines for concentrated animal feeding operations (CAFOs)—which are point sources regulated by the CWA—because the Court found they would deprive the public of the opportunity to participate in the development of important permit provisions. 399 F.3d at 492, 503-04.

The Second Circuit did not have occasion in *Waterkeeper Alliance* to examine § 316(b) of the Act. Thus, the case does not specifically hold that "the slot size, the required operational dates, the size and location of the screen array, the degree of effectiveness in reducing impingement and entrainment, [and] when the screens must be installed" are required elements of a NPDES Permit. In any event, the Final Permit does include, for various other reasons, "the slot size, the required operational dates, the size and location of the screen array, [and] when the screens must be installed."[94] More specifically, the Final Permit requires the Permittee to operate a wedgewire screen intake system with a slot size "no greater than 3.0 mm," "from April 1 through August 15," "positioned as close to the west bank of the Hooksett Pool segment of the Merrimack River and the CWIS as possible, while" meeting other specifications and requirements. Final Permit at Part I.E.1. The Final Permit also includes a compliance schedule establishing "when the screens must be installed." *See* Final Permit at Part I.E.7.

Sierra Club and CLF comment that the Final Permit must specify "the degree of effectiveness in reducing impingement and entrainment." EPA has already responded to this comment with respect to entrainment, *see* Response to Comment III.10.3.3, and Sierra Club and CLF do not offer any additional reason why such a condition is required by *Waterkeeper Alliance*. With respect to impingement, as explained in greater detail in Response to Comment III.3.1, EPA believes that the Permittee may choose to comply with the "systems of technologies" standard at § 125.94(c)(6). Or, the Permittee could instead choose to upgrade its existing traveling screens to meet the definition in the rule. *See* 40 CFR § 125.92(s). In either case, the permittee will be required to develop impingement mortality performance data based on an impingement technology performance optimization study performed <u>after</u> the new fish return is installed and, in the latter case, after the traveling screens are upgraded. Only then would EPA modify the permit to incorporate the operating conditions and parameters identified in the study.[95] Final Permit Part I.E.2.b. Thus, the regulations do not require the Final Permit in this case to specify "the degree of effectiveness in reducing impingement." EPA further notes that the same court that reviewed the CAFO-related rule in *Waterkeeper Alliance*, reviewed the 2014 § 316(b) regulations and upheld them in their entirety. *Cooling Water Intake Structure Coal. v. EPA*, 905 F.3d 49 (2d. Cir. 2018).

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[94] Sierra Club and CLF also comment that the Final Permit must, under the holding of *Waterkeeper Alliance*, include "other important parameters." The comment fails, however, to offer any specifics about such parameters. As such, it is too vague and imprecise a comment for EPA to evaluate or respond to, let alone adjust the Permit to incorporate. *See In re Sutter Power Plant*, 8 E.A.D. 680, 694 (EAB 1999); *see also* 40 C.F.R. § 124.17(a)(2) (requiring EPA to respond to "all <u>significant</u> comments") (emphasis added).

[95] The modification would be subject to public participation requirements, *see* 40 C.F.R. § 122.62, and, thus, does not implicate the Second Circuit's concerns about public comment and citizen enforcement in *Waterkeeper Alliance*.

Finally, in light of Sierra Club and CLF's comments stressing the Second Circuit's holdings regarding public participation in *Waterkeeper Alliance*, EPA reiterates that, in this permit proceeding, it has thrice sought public comment—first in 2011, again in 2014, and finally in 2017. In the most recent round, EPA specifically notified the public that it was reconsidering as the BTA seasonal operation of wedgewire half-screens from April 1 to August 31[96] with a slot size up to 3 mm and a maximum through-screen velocity of 0.5 fps. AR-1534 at 17-21, 29-31 & n.5. EPA sought comment specifically on these issues and included sample permit provisions in the event it "determines that the BTA for Merrimack Station includes the cylindrical wedgewire screen option." *Id.* EPA also notified the public that new information, data, and arguments appeared to address the uncertainties EPA identified in the 2011 Draft Permit that caused EPA to conclude at that time that wedgewire screens were not available at Merrimack. *Id.* at 17-21, 33-34. EPA further discussed the site-specific pilot study that PSNH had been working on and notified the public that it would carefully consider data and results of that study in its BTA determination. *Id.* at 18, 20, 30 n.5. EPA also included a compliance schedule for wedgewire screens and sought public comment on it. *Id.* at 29-33. EPA also sought comment on how the new information and regulations should affect the impingement BTA. *Id.* at 14-17, 21-22. While Sierra Club and CLF participated in the 2017 public comment period, they chose not to offer specific critiques of the new information, data, and arguments regarding BTA that EPA identified in the 2017 Statement. *See* Comments III.7 (and associated sub-comments). In 2020, Sierra Club and CLF submitted more comments to EPA in which they again chose not to identify any specific inadequacies of the new information, including the pilot study, and do not specifically dispute PSNH's findings about the effectiveness of the screens. EPA has offered repeated opportunities (with extended comment periods)[97] for the public to offer comment on permit provisions regarding § 316(b) requirements and participate in the development of the Final Permit.

10.3.5 A NPDES Permit Determining that Wedgewire Screens Are BTA, or a Permit Containing the Approach to BTA Sought by GSP, Would Not Be a Logical Outgrowth of the 2011 Draft Permit.

As EPA is well aware, the APA, EPA's regulations, the federal courts, and EPA's Environmental Appeals Board (EAB) all require that a final permit issued by EPA must be a "logical outgrowth" of the draft permit; otherwise, EPA would have failed to give proper notice and allow the public the legally required opportunity for public comment.49

Although EPA has issued two draft permits for public comment (in 2011 and 2014) and has sought comment on "significant new questions" (in 2017), a new determination that wedgewire screens are now BTA would not be a logical outgrowth of the draft permits. Nor would a permit

[96] EPA also recognized that the Permittee proposed to deploy the screens from April 1 to July 31, AR-1534 at 20, and specifically sought public comment on the period over which wedgewire screens should be operated, *id.* at 21.
[97] The comment period for the 2011 Draft Permit lasted five months. AR-1534 at 6. On the 2014 Draft Permit, EPA offered a two-stage comment period that lasted roughly six months. *Id.* The comment period for the 2017 Statement ran for roughly four-and-a-half months.

that makes a nominal selection of BTA and leaves the selection of the critical parameters to later determination based on future studies of feasibility and effectiveness.

As explained above, the record does not support any change to EPA's BTA 2011 determination. If EPA were to obtain further new data that would support a change in that determination, such material and EPA's supporting rationale must be subjected to public comment. Sierra Club and Conservation Law Foundation request an opportunity to engage technical experts to review the permit provisions and EPA's supporting rationale for any changes to the 2011 BTA determination them and to submit comments based on their evaluation.

In 2016 and 2017, when PSNH wanted EPA to change its BTA determination from closed-cycle cooling to wedgewire screens, the company told the agency that, in light of the 2014 § 316(b) Regulations and the new technical information submitted to EPA, a revised permit would not be a "logical outgrowth" of the draft permits and that, under the APA as well as EAB and judicial precedent, EPA would be obligated to issue a Revised Draft Permit for public comment.[50]

In the final analysis, EPA has two choices under the law – it can proceed to finalize a NPDES permit that is similar enough to the 2011 and 2014 draft permits that it is a "logical outgrowth," or, if EPA proposes to make dramatic changes like those sought by GSP, then the agency must subject that new permit to public notice and public comment as the company itself requested.

[49] 5 U.S.C. § 553(b), (c); 40 C.F.R. §§ 124.6(d), 124.10(a)(1)(ii). The first judicial decision using the "logical outgrowth" language was a First Circuit case involving an EPA air quality transportation control plan for the Boston area. *South Terminal Corp. v. EPA*, 504 F.2d 646, 659 (1st Cir. 1974). *See also, e.g.*, *NRDC v. EPA*, 279 F .3d 1180, 1186 (9th Cir.2002); *In re D. C. Water and Sewer Auth.*, NPDES Appeal Nos. 05-02, 07-10, 07-11, 07-12, 2008 EPA App. LEXIS 15, *112 (EAB March 19, 2008) (holding that "new language in the Final [NPDES] Permit was not a logical outgrowth of the language in the previous draft and, accordingly, [Friends of the Earth and Sierra Club] were denied the opportunity to provide meaningful comments," and remanding the permit to EPA Region 3).

[50] Letter from Eversource Energy to U.S. Environmental Protection Agency – Region 1 (Dec. 22, 2016) (AR-1352) at 7-8; Letter from Eversource Energy to U.S. Environmental Protection Agency – Region 1 (Apr. 12, 2017) (AR-1357) at 2.

EPA Response:

Sierra Club and CLF comment that a determination that "wedgewire screens are now BTA would not be a logical outgrowth of the draft permits." They further comment that "a permit that makes a nominal selection of BTA and leaves the selection of the critical parameters to later determination based on future studies of feasibility and effectiveness" would not be a logical outgrowth. As to the latter point, the Final Permit does not do that. *See* Response to Comment III.10.3.2. As to the "logical outgrowth" requirement in general, EPA discussed the standard in the 2017 Statement. *See* AR-1534 at 10-11. EPA notes that the comment mischaracterizes the standard to the extent it contends that the Final Permit must be a logical outgrowth of <u>only</u> the 2011 and 2014 Draft Permits in this case. The logical outgrowth inquiry should not ignore the 2017 Statement. *See Miami-Dade County v. EPA*, 529 F.3d 1049, 1059–60 (11th Cir. 2008); *Nat'l Elec. Mfrs. Ass'n v. EPA*, 99 F.3d 1170, 1172 (D.C. Cir. 1996); *In re DC Water & Sewer Auth.*, 13 E.A.D. 714, 760 (EAB 2008) (noting that the EAB "consider[s] the evolution of the permit condition at issue").

"A rule is deemed a logical outgrowth if interested parties 'should have anticipated' that the change was possible, and thus reasonably should have filed their comments on the subject during the notice-and-comment period." *Ne. Md. Waste Disposal Auth. V. EPA*, 358 F.3d 936 (DC Cir. 2004); *see also Riverkeeper, Inc. v. EPA*, 358 F.3d 174, 202 (2d. Cir. 2004) ("The EPA is only required to 'fairly apprise interested persons of the subjects and issues' of its rulemaking."). The key question, then, is whether Sierra Club and CLF should have anticipated from the combination of the 2011 Draft Permit, the 2014 Draft Permit, the 2017 Statement, and the supporting record that the Final Permit could include a determination that seasonal use of wedgewire screen technology with a 3 mm slot size is the BTA for entrainment at the facility. In the 2011 Draft Permit, EPA explained that it was, based on the information available to EPA at the time, proposing to reject wedgewire screen technology as the BTA for Merrimack Station based on a variety of site-specific considerations and the effectiveness of wedgewire screens for reducing entrainment. *See* AR-618 at 271-280. In the 2017 Statement, EPA explained that comments and new information raised substantial new questions as to EPA's earlier reasons for not proposing wedgewire screens. As explained earlier, *see* Responses to Comments III.4.2, III.7.3, III.10.2.2, in the 2017 Statement, EPA notified the public that it was reconsidering the preliminary BTA determination for Merrimack Station in light of these public comments and new information. AR-1534 at 4, 6-7, 12-36. As EPA explained:

> various data, information and arguments submitted during prior comment periods, or that were submitted or became known to EPA after the comment periods,[footnote omitted] raise a number of substantial new questions concerning the Merrimack Station Draft Permit. In response, EPA has decided to issue a public notice reopening the comment period on the Draft Permit in order to provide the public with an opportunity to comment on the new information and the substantial new questions. EPA has also responded to the new information and questions by developing options for certain new (or revised) Draft Permit conditions, and by developing new (or revised) analyses in support of the Draft Permit conditions. In connection with the reopened comment period, EPA has prepared th[e 2017 Statement] to describe the new information, the substantial new questions, the potential new permit conditions, and the new supporting analyses, so that the public can review the material and comment on it to EPA.

Id. at 3-4 (citing 40 CFR § 124.14(b)). EPA expressly noted that it was "reconsidering wedgewire screens as the possible BTA for Merrimack Station in light of public comments and new information," *id*. at 18, and reconsidering "whether the greater cost of closed-cycle cooling is warranted in light of the potentially better-than-previously-estimated performance of wedgewire screens and the possible resolution of logistical and engineering issues," *id.* at 19-20.[98] Sierra Club and CLF's 2020 CWIS Comments make clear that they understood this to be the case. AR-

[98] EPA also reopened the comment period as to the preliminary BTA determination for impingement at Merrimack Station. AR-1534 at 21-22.

1680 at 2 ("EPA stated it had received new information, which raised substantial new questions about the potential for fine-mesh wedgewire screens to qualify for BTA at the Station" and that EPA "was reconsidering wedgewire screens as the possible BTA.") (emphasis omitted). Furthermore, their comments on the 2017 Statement show that they foresaw that the Final Permit could include a determination that wedgewire screen technology, rather than closed-cycle cooling, is the BTA for entrainment. *See* Comment III.7.3. The 2017 Statement also indicated that EPA was considering seasonal operation of the screens and slot sizes up to 3 mm. AR-1534 at 21, 30 n.5. The 2017 Statement even included an option for new Draft Permit conditions for wedgewire screens and a compliance schedule applicable to such a BTA determination. *Id.* at 29-32. EPA sought public comment on all of these issues raised within the statement. *Id.* at 70. Thus, Sierra Club and CLF were fairly apprised and should have anticipated that the Final Permit could include a determination that wedgewire screen technology is the BTA. Moreover, in both their initial comments on the 2017 Statement and their 2020 CWIS Comments, they reveal that they did anticipate that the Final Permit might include such a BTA determination. Accordingly, EPA disagrees with the comment that the BTA determination is not a logical outgrowth.

Sierra Club and CLF comment that they have explained in their 2020 CWIS Comments that "the record does not support any change to EPA's BTA 2011 determination." EPA disagrees. Sierra Club and CLF have voiced general opposition to EPA reconsidering the bases for rejecting wedgewire screens in the 2011 Draft Permit, but neither their organizations' timely comments nor their 2020 CWIS Comments offer specific, detailed refutation of the new information EPA emphasized in the 2017 Statement, including new designs since 2011 to overcome issues with size and number of the array originally envisioned, research regarding efficacy of wedgewire screens as it relates to hydraulic bypass and larval avoidance, and site-specific data collected by PSNH. Sierra Club and CLF "request an opportunity to engage technical experts to review the permit provisions and EPA's supporting rationale for any changes to the 2011 BTA determination them [sic] and to submit comments based on their evaluation." But they have already had such an opportunity and have twice passed on it. In particular, they do not explain why they could not engage technical experts to review the new information and rationale during the nearly four-and-a-half month comment period for the 2017 Statement. The 2017 Statement also included new draft permit conditions related to a wedgewire screens BTA determination, but Sierra Club and CLF did not offer comments, technical or otherwise, on those either. Furthermore, even in the 2020 CWIS Comments two years on, Sierra Club and CLF again pass on the opportunity.[99] In other words, Sierra Club and CLF have had multiple "opportunit[ies] to engage technical experts" to review the new information, data, arguments, and new Draft Permit conditions specified in the 2017 Statement, but have failed to seize them. Moreover, Sierra Club and CLF do not need to review every new BTA permit provision in order for the Final Permit to be a logical outgrowth of the 2017 Statement. Likewise, EPA does not agree that any new data used by EPA to support the BTA determination "must be subjected to public comment." Courts have recognized that "the

[99] Nor did they include technical comments on PSNH's site-specific study, which provides supplementary data confirming information already in the record. The study, and Normandeau's analysis of the potential biological benefits of wedgewire screens at Merrimack Station based on the study, have been publicly available since the 2017 public comment period. *See* AR-1550, AR-1567. Moreover, EPA specifically noted in the 2017 Statement that it would "carefully consider" the study when making the final BTA determination for Merrimack Station. AR-1534 at 20, 30 n.5.

public need not have an opportunity to comment on every bit of information influencing an agency's decision." *Texas Office of Pub. Utility Counsel v. FCC*, 265 F.3d 313, 326 (5th Cir. 2001) (internal quotation marks omitted); *see also BASF Wyandotte Corp. v. Costle*, 598 F.2d 637, 644-45 (1st Cir. 1979). If that were the case, permitting decisions could be subject to a never-ending circle of public comment. *Cf. Rybachek v. EPA*, 904 F.2d 1276, 1286 (9th Cir. 1990).

Similarly, EPA does not agree that it must reopen the comment period to subject the permitting decision to a fourth round of public comment. EPA may, in its discretion, reopen the public comment period "[i]f any data[,] information[,] or arguments submitted during the public comment period . . . appear to raise substantial new questions concerning the permit." 40 CFR § 124.14(b). But EPA does not find in this case that Sierra Club and CLF's comments—during the comment period or after—raise substantial new questions about the availability and effectiveness of wedgewire screens at Merrimack Station, in part because Sierra Club and CLF do not confront the new information with any specificity. And while Sierra Club and CLF's comment states that they want "an opportunity to engage technical experts to review the permit provisions and EPA's supporting rationale for any changes to the 2011 BTA determination them [sic] and to submit comments based on their evaluation," they do not explain why a new comment period is needed, given the opportunity they had during the lengthy comment period provided on the 2017 Statement or since, as they developed their 2020 CWIS Comments. Moreover, the record (including this Response to Comments document and information referenced in the 2017 Statement) adequately explains EPA's reasoning for the BTA determination so that a dissatisfied party could develop a permit appeal. *In re Town of Concord*, 16 E.A.D. 514, 531-32 (EAB 2014). Furthermore, as Sierra Club and CLF themselves have recognized, *see* Comments II.3.2.3, III.7.2, III.7.3, III.10.2.5, III.10.3.6, III.10.4, further delay in this permit proceeding would be inadvisable. *Town of Concord*, 16 E.A.D. at 531-32. In addition, Sierra Club sued EPA in 2016 complaining of unreasonable delay in issuing the Merrimack Station NPDES permit. AR-1534 at 8-9. The case was ultimately dismissed by the U.S. Court of Appeals for the First Circuit, but EPA agreed that finalizing this permit was an important priority, and the Agency is trying to do just that. Reopening the comment period at this time is neither necessary nor in the public interest.

10.3.6 Compliance with BTA Is Long Overdue at Merrimack Station. A "Compliance Schedule" Cannot Be Used to Allow GSP to Undo the BTA Determination in the Permit and Avoid Ever Having to Comply with BTA.

Finally, in issuing a NPDES permit EPA must not only determine which technology is BTA, it must also "require compliance as soon as practicable."[51] Because the deadline for compliance with Section 316(b) has long passed and the Station's NPDES permit is 22 years overdue for renewal, the temporal aspect of compliance is critically important here. A compliance schedule may be used only to allow the permittee a reasonable amount of time to construct and install needed technologies. Further, it must provide a deadline for compliance. A compliance schedule may not be used to gather information for a post-permit-issuance BTA determination. And a compliance schedule certainly may not be used to allow a permittee to postpone compliance indefinitely while it develops arguments as to why the permit should be modified to remove the BTA-based requirements it prefers not to spend money to comply with.

Under the CWA and EPA's regulations, compliance schedules are never available simply to give an agency time to make a permitting decision. The CWA defines "schedule of compliance" as a schedule of "*remedial measures* including an enforceable sequence of actions or operations leading to *compliance* with an effluent limitation, other limitation, prohibition, or standard."[52] Thus, "any compliance schedule contained in an NPDES permit *must include an enforceable final effluent limitation*."[53] In other words, "in order to grant a compliance schedule in an NPDES permit, the permitting authority has to make a reasonable finding, adequately supported by the administrative record, that the compliance schedule 'will lead[] to compliance with a … limitation' … 'by the end of the compliance schedule.'"[54] EPA's guidance makes crystal clear that compliance schedules (where they are otherwise permissible) may only be used to allow the permitee time to add the equipment necessary to meet the operational conditions established in the permit, not to give the regulator time to develop those conditions in the first place: "a compliance schedule based solely on time needed to develop a site specific criterion" for NPDES permits "is not appropriate."[55]

As EPA's general counsel stated in the cooling water context, "a compliance schedule under the § 316(b) regulations must take into consideration the time necessary to implement the appropriate technology at a given intake structure,"[56] and thus relevant factors are "whether there is any need for modifications to treatment facilities, operations or measures," "the steps needed to modify [them] and the time those steps would take."[57] Thus, it is improper to use a compliance schedule for gathering information to be used by EPA to determine or establish a BTA limitation that should have been in the permit in the first place.

If EPA were to need more information to make a BTA determination, it would have to obtain that information *before* making the determination; it cannot use a compliance schedule in the permit to do so. But EPA is out of time to collect more studies. As EPA acknowledged again in 2017, "the statutory deadline for compliance with the BTA standard of CWA § 316(b) ha[s] already passed."[58] Indeed, it passed decades ago. EPA must renew this permit now, and the renewal must include a BTA determination.[59] EPA's regulations do not require Region 1 to reopen its 2011 draft BTA determination, nor do they provide incentive or justification for doing so. To the contrary, the regulations authorize Region 1 to finalize the determination it made in 2011. As noted above, EPA determined in 2017 that, given that this is an "ongoing permitting proceeding" with extensive information already having been collected and analyzed by the agency, it is not necessary for the application to be supplemented by the information described in Section 122.21 of the 2014 § 316(b) Regulations.[60] If EPA has the information it needs to make a BTA determination, then there is no reason to conduct further studies. If EPA were to believe that further studies are needed to determine key parameters of the BTA for Merrimack Station, then the agency would have to use CWA section 308 request to obtain such studies before making a permitting decision, rather than making a BTA determination and using a compliance schedule in the permit to obtain such studies after the fact.

Moreover, apart from the improper use of a compliance schedule to gather data to make a BTA determination, there is another aspect of the compliance schedule GSP is seeking that is also not permitted under the CWA because it improperly creates incentives not only for GSP to delay but also for it to undermine the effectiveness of wedgewire screens in any further study. As discussed above, GSP has admitted that it is no longer interested in installing wedgewire screens, and is amenable to a permit containing wedgewire screen requirements only if it can, after the permit has been issued, conduct a study on wedgewire screens that the company will then use to propose some other compliance option. If GSP submits a study purporting to show that wedgewire screens are infeasible in Hooksett Pool due to fouling, insufficient sweeping flows, insufficient water depth or other factors (which EPA already determined in 2011), then GSP would likely use that study to argue that it should be relieved of the obligation to install wedgewire screens. Or if GSP's study shows that wedgewire screens are feasible but have low effectiveness, then GSP can be expected to use that study to argue that some alternative method of compliance (or no changes to its cooling system at all) would provide a similar level of performance to wedgewire screens and should be allowed by EPA. (Indeed, GSP's proposed two-stage compliance schedule states that the second period would be "to select and implement [an] option for achieving similar effectiveness [to wedgewire screens]."[61] Only if GSP submits a study purporting to show that wedgewire screens would be both feasible and highly effective in Hooksett Pool, would GSP have to actually install wedgewire screens (after the delay caused by the study) or some other technology shown to have an equally high level of effectiveness. The more effective wedgewire screens are shown to be, the more likely they would have to be installed and the higher the bar for substitute technology or operational measures. Thus, while PSNH had an incentive to show that wedgwire screens would be effective, if a permit were issued determining wedgewire screens to be BTA, from that point forward GSP's economic incentives would be reversed; the company would have nothing to gain by proving their feasibility and effectiveness, and would have much to gain by trying to prove the opposite, that wedgewire screens would not be feasible or that their effectiveness would be limited. (Of course, GSP would also have an economic incentive to delay, by seeking extensions and/or submitting incomplete or inclusive studies requiring supplementation.) EPA should not allow GSP to game the system in such manner.

[51] 40 CFR § 125.94(b).
[52] CWA § 502(17); 33 U.S.C. § 1362(17) (emphasis added); see also 40 C.F.R § 122.2; U.S. EPA, Compliance Schedules for Water Quality-Based Effluent Limitations in NPDES Permits, May 10, 2007 memorandum from EPA Headquarters ("May 10, 2007 EPA Guidance") at 2, ¶ 2.
[53] May 10, 2007 EPA Guidance at 2, ¶ 3 (citing CWA §§ 301(b)(1)(C) and 502(17); Star-Kist Caribe, Inc. 3 E.A.D. 172, 175, 177-178 (1990); 40 C.F.R. §§ 122.2, 122.44(d), and 122.44(d)(I)(vii)(A)).
[54] Id. at 2, ¶ 5 (citing CWA §§ 301(b)(I)(C) and 502(17); 40 C.F.R. §§ 122.2, 122.44(d)(1)(vii)(A)).
[55] May 10, 2007 EPA Guidance at 3, ¶ 11. Likewise, compliance schedules are not appropriate to allow time to develop a Total Maximum Daily Load (TMDL) or a Use Attainability Analysis (UAA). Id. at 3, ¶¶ 10, 11.
[56] In Re Brunswick Steam Electric Plant, U.S. EPA, Decision of the General Counsel, EPA GCO 41 (June 1, 1976)
[57] May 10, 2007 EPA Guidance at 3, ¶¶ 8, 9.
[58] 2017 Statement of New Questions at 23.
[59] 40 C.F.R. § 125.98(b)(2).
[60] 2017 Statement of New Questions at 16; see also 40 C.F.R. § 125.98(g).
[61] GSP, "Merrimack NPDES Permit" – Open Items," (undated), provided to EPA Region 1 on September 10, 2019.

EPA Response:

Sierra Club and CLF reiterate and expand upon earlier comments about the use of a compliance schedule to delay the BTA determination. In particular, the organizations comment that the compliance schedule must provide a deadline for compliance. EPA responds that the compliance schedule in the Final Permit for the entrainment BTA is very similar to the one proposed in the 2017 Statement (on which Sierra Club and CLF chose not to offer specific comments) and does provide a deadline for compliance. Sierra Club and CLF also comment that a compliance schedule may only provide a reasonable amount of time to construct and install needed technologies, may not be used to gather information for a post-permit-issuance BTA determination, and may not be used to allow a permittee to postpone compliance indefinitely. While the schedule in the Final Permit provides a reasonable time to construct and install the needed technologies, it does not provide additional time "to gather information for a post-permit-issuance BTA determination" or "allow [the] permittee to postpone compliance indefinitely." EPA has enough information to make a BTA determination now. That said, while the Permittee is working on complying with this schedule, there is nothing that would prevent it from simultaneously developing new information on another compliance option and submitting a permit modification request based thereon. *See also* Response to Comment III.10.3.1. The Final Permit establishes a compliance schedule that requires compliance "as soon as practicable" with EPA's determination in the Final Permit that wedgewire screens are the BTA for entrainment.

Sierra Club and CLF also comment that EPA acknowledged in 2017 that, "the statutory deadline for compliance with the BTA standard of CWA § 316(b) ha[s] already passed." The comment, however, misreads the 2017 Statement. The 2017 Statement recounts that, in the past, EPA interpreted the Act to mean that the statutory deadline for compliance with the BAT, BPT, and BCT technology standards also applied to the BTA standard. AR-1534 (citing *In re Brunswick Steam Elec. Plant*, EPA General Counsel's Opinion No. 41, 1976 WL 25235 (1976)). The 2017 Statement notes, however, that EPA revised this interpretation in the 2014 CWA § 316(b) Final Rule and decided that § 316(b) has no statutory deadline for meeting the BTA standard. *Id.* (citing 79 Fed. Reg. at 48,359). In other words, the statutory deadline for compliance with the BTA standard has not passed. As a result, final permits may include compliance schedules for BTA requirements and require compliance with the BTA standard "as soon as practicable." *Id.*

Finally, Sierra Club and CLF comment that the type of schedule they discuss could incentivize the Permittee to perform studies that attempt to prove that wedgewire screens are not feasible at Merrimack Station or are less effective than some other compliance option. First, the schedule Sierra Club and CLF describe is not in the Final Permit. Second, EPA has sufficient information to support the BTA determination and compliance schedule in the permit. Third, even with a determination that Sierra Club and CLF's preferred technology (i.e., closed-cycle cooling) is the BTA and without the type of compliance schedule described in the comment, the Permittee may still be incentivized to perform such studies and may present new information to EPA in an attempt to change the BTA determination. EPA is well aware that a permittee may prefer to avoid fiscal expenditures necessary to make facility upgrades to comply with a NPDES Permit, if possible. If the Permittee chooses to perform additional studies to support a request for a modification, it may do so and present them to support a request for a permit modification, which would be subject to appropriate public participation requirements. 40 CFR § 122.62; *see* Response to Comment III.10.3.2.

10.4 Conclusion

EPA should proceed, without further delay, to finalize its 2011 BTA determination and to issue a final NPDES permit containing cooling water intake structure requirements based on closed-cycle cooling it proposed in 2011 and 2014. If, however, EPA were to change its determination, EPA would not be legally authorized to issue a NPDES permit with the approach to BTA that GSP is seeking, for all of the reasons given above.

The permitting process for Merrimack Station has taken far too long already. EPA should not, at the behest of a new owner of the Station, further delay issuance of the permit and disregard years of work and analysis by the agency. Changing course, as requested by GSP, would not only continue degradation of the Merrimack River and undermine the integrity of the Clean Water Act and its permitting process, but would also amount to an unwarranted windfall to the company, which acquired the Station knowing full well that EPA had made a proposed determination that BTA and state water quality standards required converting the Station's cooling system to closed-cycle cooling (and whose bid and purchase price for the Station must have factored in that risk). GSP is now objecting not only to installing cooling towers but also to wedgewire screens or any other technology that might cost more than they want to spend. EPA should not be complicit in GSP's evasion tactics.

EPA Response:

Although the process has been lengthy, EPA has proceeded without unreasonable delay to finalize this NPDES Permit. As EPA explained in the 2017 Statement, numerous events and issues have contributed to the time required to issue this permit. *See, e.g.*, AR-1534 at 5-9. EPA reiterates them and incorporates them here by reference. EPA agrees with the comment that EPA should not "delay issuance of the permit." EPA notes, however, that Sierra Club and CLF's comment to issue another Draft Permit and institute a fourth comment period, *see* Comment III.10.3.5, would do just that (i.e., "delay the issuance of the permit"). Another comment period is not necessary, and, for the reasons explained in the responses above and to avoid "further delay," EPA declines to take that step.

EPA likewise agrees with the comment that it should not "disregard years of work and analysis by the agency." EPA has not done so here; rather, EPA has evaluated all of the information, including public comments on, and the new information, data, and arguments highlighted in, the 2017 Statement, and considered how it impacts the 2011 preliminary BTA determination. Based on all the information in the record, EPA has reasonably concluded that wedgewire screen technology is the BTA for Merrimack Station.[100]

[100] With respect to the comment that "GSP is now objecting not only to installing cooling towers but also to wedgewire screens or any other technology that might cost more than they want to spend," such a position would be no different than that taken by the previous permittee. See Comments III.3, III.4, and III.5 (including associated comments).

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1.0 Definition of "Metal Cleaning Waste" Compared to EPA Regulations

Comment IV.1.1	**AR-841, UWAG, pp. 32-33**

Comment: Under the present Merrimack permit, chemical cleaning wastes from cleaning the boiler tubes (waterside boiler wastes), as well as various wastes considered "low volume wastes," are treated in the wastewater treatment plant and then discharged to a combined treatment pond.

In the draft permit, EPA Region 1 made three changes for Outfall 003B that redefine "metal cleaning waste" and differ from EPA regulations. First, it expanded the scope of regulation from traditional waterside "chemical cleaning" boiler wastes to also include all gas side ash washwater. This means Outfall 003B must meet limits not once every seven years or so, as in the past, but more like six or seven times a year. Second, Region 1 moved the compliance point from the combined treatment pond outfall to the wastewater treatment plant discharge.
Third, Region 1 now would require each metal cleaning waste to be stored, managed, treated, discharged, and monitored separately, with no commingling with other wastewater.

It appears that EPA's intent is for 003B conditions to apply only while "metal cleaning waste" is being discharged, but the general description indicates that the outfall includes all wastewater discharged from Waste Treatment Plant #1, including low volume wastes and stormwater. Thus, the permit would require a composite sample to be collected every day there is any discharge from the existing facility.

EPA Response: EPA Region 1 disagrees with the commenter's claim that there are three ways in which the Draft Permit either redefines "metal cleaning waste" or otherwise differs from EPA regulations.

First, contrary to the commenter's assertion, the Region did not expand the scope of the regulation. As explained in the 2011 Fact Sheet to the Draft Merrimack Station Permit, and unchanged by the 2015 Steam Electric Effluent Limitations Guidelines (Steam Electric ELGs) Rule, metal cleaning is defined in the regulations as:

> any wastewater resulting from cleaning [with or without chemical cleaning compounds] any metal process equipment including, but not limited to, boiler tube cleaning, boiler fireside cleaning, and air preheater cleaning.

40 CFR § 423.11(d). Thus, the plain language of this regulation defines *metal cleaning waste* to include *any* wastewater generated from *either the chemical or nonchemical cleaning of metal process equipment*. Furthermore, the regulations define *chemical metal cleaning waste* as *any wastewater resulting from cleaning of any metal process equipment with chemical compounds, including, but not limited to, boiler tube cleaning.* EPA also uses, but does not expressly define, the term *nonchemical metal cleaning waste* in the regulations when it states that it has *reserved* the development of best available technology (BAT) ELGs for such wastes. 40 CFR § 423.13(f). The *metal cleaning waste* and *chemical metal cleaning waste* definitions make clear that *nonchemical metal cleaning waste* is any wastewater resulting from the cleaning *without* chemical cleaning compounds of any metal process equipment. Finally, the regulations define *low volume waste* as:

> …wastewater from all sources except those for which specific limitations or standards are otherwise established in this part. Low volume waste sources include, but are not limited to, the following: Wastewaters from ion exchange water treatment systems, water treatment evaporator blowdown, laboratory and sampling streams, boiler blowdown, floor drains, cooling tower basin cleaning wastes, recirculating house service water systems, and wet scrubber air pollution control systems whose primary purpose is particulate removal. Sanitary wastes, air conditioning wastes, and wastewater from carbon capture or sequestration systems are not included in this definition.

40 CFR § 423.11(b). The waste sources listed as examples of low volume wastes include various process and treatment system wastewaters and do not include wastewater generated from washing metal process equipment. Additionally, the ELGs establish metal cleaning wastes as other sources with specific standards and limitations. Therefore, metal cleaning wastes are distinct from and not included in the definition of low volume wastes.

With respect to the commenter’s claim that “Outfall 003B must meet limits . . . six or seven times a year,” EPA agrees that limits must be met each time there is a discharge of metal cleaning wastewater. However, the discharge frequency for metal cleaning wastes is now expected to be lower based on the decrease in operations at Merrimack Station. Granite Shore Power, the current owner of Merrimack Station, has indicated that it will continue to operate the Station as a “peaking facility” in the foreseeable future. *See* Chapter II of this document.

Neither the Region’s definition of metal cleaning waste to include both chemical and nonchemical metal cleaning waste (*e.g.,* gas side ash washwater) nor the Region’s requirement that metal cleaning limits be met at Outfall 003B when metal cleaning waste is discharged alter or expand the scope of the Steam Electric regulations. On the contrary, the definition and application of effluent limits are consistent with such regulations. *See* 40 CFR Part 423; *see also* Response to Comment IV.1.2 below.

Second, the commenter correctly identifies that Region 1 moved the compliance point from the combined treatment pond outfall to the Wastewater Treatment Plant #1 discharge. Movement of the compliance point to the appropriate location - after treatment but before combining with other wastestreams, does not constitute a redefinition of metal cleaning waste and is, in fact, necessary to ensure consistency with EPA regulations, as explained below.

Merrimack Station's existing permit issued June 25, 1992, (1992 Permit) applies total copper and total iron limits for the discharge from Outfall 003B: ash settling pond discharge during chemical cleaning.[1] Therefore, the 1992 Permit allows copper and iron limits for metal cleaning discharges to be met due to dilution provided by the slag settling pond water. Since 1992, the slag settling pond has been permitted to discharge up to 19.1 MGD of wastewater from multiple sources, including slag sluice water, low volume wastes, landfill leachate, stormwater from multiple sources, and metal cleaning wastes. However, the metal cleaning waste is reported to amount to only a tiny fraction of the total flow from the pond.[2]

The 2011 Fact Sheet provides that "[a]pplying the copper and iron limit of 1.0 mg/L to the combined waste streams from the Slag Settling Pond would potentially allow the Permittee to 1) comply by diluting the metal cleaning waste stream rather than treating it, and 2) discharge a total mass of copper and iron in excess of that authorized by the NELGs." 2011 Fact Sheet, p. 27. Importantly, the Region further explains, in the 2011 Fact Sheet, that EPA's regulations prohibit the commingling of distinct, separately regulated wastestreams:

> The Steam Electric Power Plant NELGs, *See* 40 C.F.R. Part 423, require that when separately regulated waste streams (i.e., ―waste streams from different sources‖) are combined for treatment or discharge, each waste stream must

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[1] Outfall 003B in the existing, 1992 Permit is located at the discharge point from the slag settling pond to the discharge canal.

[2] The 1997 Permit Application lists boiler water side chemical cleaning flow equal to 2055 gpd, while the discharge from the slag settling pond equals 7.8 MGD. Also, important to note here is that the application identifies "Boiler Gas Side Water Washes," presumably without chemicals, having a flow of 4384 gpd, which are treated in a "6000 Gallon Chem Mix Basin." More recent information indicates that gas-side non-chemical metal cleaning amounts to less than 10,000 gpd, occurring one to five times per year and water-side chemical metal cleaning amounts to 300,000 gallons, occurring once every seven years. In 2011, the average monthly flow from the slag settling pond was approximately 5.3 MGD and the maximum daily flow approximately 13 MGD, which included approximately 1 MGD withdrawal for FGD make-up water when operating. *See* 2011 Fact Sheet, p. 14-15. Still, chemical metal cleaning, as well as non-chemical metal cleaning, flows are a small fraction of the total wastewater discharged from the slag settling pond. Given the substantial reduction in operations during the past several years, which is projected to continue, the flows from all waste sources is expected to be far less than when the facility operated as a base load plant.

> independently satisfy the effluent limitations applicable to it. 40 C.F.R. §§ 423.12(b)(12), 423.13(h).[3] *See also* 40 C.F.R. § 125.3(f) (technology-based treatment requirements may not be satisfied with "non-treatment" techniques such as flow augmentation). Thus, it is not acceptable to determine compliance for different wastewater streams after they have been mixed (or diluted) with each other, unless the effluent limits applicable to them are the same. *See* 40 C.F.R. § 122.45(h) (internal waste streams).

2011 Fact Sheet, p. 27 (internal footnote omitted); *see also* 40 CFR § 122.41(j) *Monitoring and Records* (establishing that samples and measurements taken for the purpose of monitoring shall be representative of the monitored activity); 40 CFR § 125.3(e) (technology-based treatment requirements are applied prior to or at the point of discharge). The 1992 Permit applied both copper and iron limits to the co-mingled, non-similar waste streams at Outfall 003B. EPA has concluded that these limitations was incorrectly applied in the 1992 Permit, as explained here and in the 2011 Fact Sheet.[4] Therefore, Region 1 corrects the error in this Final Permit by changing the compliance point of Outfall 003B from the discharge point of the slag settling pond to the discharge point of Waste Treatment Plant No. 1 (WTP#1).

This change is consistent with the plain text of the CWA and EPA regulations. See Response to Comment IV.1.2 below.

Third, the commenter claims that Region 1 now requires that each metal cleaning waste be stored, managed, treated, discharged, and monitored separately, with no commingling with other wastewater. This is not entirely accurate. As stated above, the Steam Electric Power Plant ELG's require that when separately regulated waste streams (i.e., "waste streams from different sources") are combined for treatment or discharge, each waste stream must independently satisfy the effluent limitations applicable to it. *See* 40 CFR §§ 423.12(b)(13), 423.13(n); 40 CFR § 125.3(f).

It is not acceptable to determine compliance after mixing (or diluting) the different waste streams with each other unless the effluent limits applicable to them are the same. The TSS effluent limitations for the low volume and legacy bottom ash wastes[5] are the same and, as a result, these two waste streams may be combined prior to sampling for compliance. The chemical and nonchemical metal cleaning wastes may also be combined because they are subject to the same limitations.[6] The metal cleaning wastes may not, however, be combined

[3] The provision 40 CFR § 423.13(h) cited in EPA's Fact Sheet has since been re-codified as 40 CFR § 423.13(n). Similarly, subsection 40 CFR §423.129(b)(12) has been re-codified as 40 CFR § 413.12(b)(13). The language in the identified provisions remains the same, but the subsections have changed.

[4] The 2011 Fact Sheet mistakenly described the copper limit (applicable to Outfall 003B in the 1992 Permit) as a technology-based limit. However, that copper limit was a water quality-based effluent limit, which applied because it was more stringent than the 1.0 mg/l technology-based limit derived from the ELGs. *See* 2011 Fact Sheet, p. 16.

[6] The BPT ELGs apply copper and iron limits to both types of metal cleaning wastes, the BAT ELGs apply limits to chemical metal cleaning wastes, and the current BPJ determination of BAT by EPA applies the same limits to the nonchemical metal cleaning wastes. *See* 2011 Fact Sheet.

with the ash, low volume wastes, and combustion residual leachate for compliance monitoring because the metal cleaning wastes are subject to additional effluent limitations for copper and iron. Either the metal cleaning waste streams must be separately monitored for compliance with copper and iron limitations, or a combined waste stream formula (CWF) must be developed if they are co-mingled with other waste streams (*e.g.,* low volume wastes or bottom ash transport water).

As discussed in the 2011 Fact Sheet, commingling of separately regulated wastestreams may be allowed if a CWF is developed for the commingled waste stream. But, "EPA does not, however, currently have sufficient information to derive a combined waste stream limit." 2011 Fact Sheet, p. 27. At this time, the Permittee has not provided the additional information required for the Region to determine limits based on a CWF. The Region suspects that limitations derived using this approach might be infeasible as described in the preamble of the Steam Electric ELG:

> EPA's record demonstrates, however, that combined wastestream limitations and standards at the point of discharge, derived using the building block approach or CWF, may be impractical or infeasible for some combined wastestreams because the resulting limitation or standard for *any* of the regulated pollutants in the combined wastestream would fall below analytical detection levels. In such cases, the permitting authority should establish internal limitations on the regulated wastestream, prior to mixing of the wastestream with others, as authorized pursuant to 40 CFR 122.45(h) and 40 CFR 403.6.62 See TDD Section 14 for more examples and details about this guidance.

80 Fed. Reg. 67884. In addition, waste streams may be combined in certain cases where one of the waste streams (with equal or less stringent limitations) is reused as process water for the other more stringently regulated waste stream. Indeed, the 2015 Steam Electric ELG's allow for this type of situation. Generating units (except for those equal to or below 50 MW) may only discharge pollutants in fly ash or bottom ash transport waters (after a permitted compliance date) if those transport waters are used as process water within an air pollution control scrubber (i.e., flue gas desulfurization system). 80 Fed. Reg. at 67861. Therefore, as an example, low volume wastewater may be used as the wash water for chemical metal cleaning. This would be considered reuse and not commingling of wastestreams. Consequently, the limits for chemical metal cleaning would apply to the resulting wastewater.

Furthermore, EPA acknowledges that the 2011 Fact Sheet and Draft Permit do not appear to be congruous. Specifically, Outfall 003B in the 2011 Draft Permit appears to apply iron and copper limits to all wastewater that passes through Waste Treatment Plant #1 (including low volume and other wastewater), while the 2011 Fact Sheet makes clear that these metals limits would only apply to metal cleaning wastes. Therefore, the description and limits applied at Outfall 003B in the 2011 Draft Permit were - errors that have been corrected in the Final Permit. To clarify, EPA's intent is that Outfall 003B apply to the discharge of metal cleaning wastewater (chemical and non-chemical) *only* and not to the other wastewater streams that are discharged on a daily basis through Waste Treatment Plant #1 (unless those waste streams are re-used as metal cleaning wash water).[7] As a result, footnote 7 in the Draft Permit is no longer necessary because Outfall 003B is dedicated to the discharge of treated metal cleaning (chemical and non-chemical) wastewater only. Therefore, footnote 7 has been removed from the Final Permit.

Comment IV.1.2	AR-1548, PSNH, pp. 189-195

Comment: The effluent guidelines and standards for the steam electric industry are set out in 40 C.F.R. Part 423. They were promulgated in 1974, revised in 1982, and reasserted by the agency on November 3, 2015.[737] They contain BPT limits for the generically referenced "metal cleaning wastes," BAT and NSPS limits for "chemical metal cleaning wastes," and include a holding place for future BAT limits on NCMCWs. This "holding place" remains even after the promulgation of EPA's latest NELGs on November 3, 2015, within which the agency once again elected to "reserve" BAT for NCMCWs due to the fact that the agency:

> [D]oes not have sufficient information on the extent to which discharges of non-chemical metal cleaning wastes occur, . . . the ways that industry manages their non-chemical metal cleaning wastes[,] . . . [the] potential best available technologies or best available demonstrated control technologies, or the potential costs to industry to comply with any new requirements.[738]

The term "metal cleaning waste" is defined as "any wastewater resulting from cleaning [with or without chemical cleaning compounds] any metal process equipment including, but not limited to, boiler tube cleaning, boiler fireside cleaning, and air preheater cleaning."[739] "[C]hemical metal cleaning waste" is defined as "any wastewater resulting from the cleaning of any metal process equipment with chemical compounds, including, but not limited to, boiler tube cleaning."[740] NCMCW is not expressly defined in the regulations despite the fact that the term is used in 40 C.F.R. § 423.13(f). Nevertheless, the agency has repeatedly attempted to establish a working definition of NCMCWs based on a comparison of the two aforementioned terms defined in 40 C.F.R. Part 423: "[A]ny wastewater resulting from the cleaning of metal process equipment without using chemical cleaning compounds."[741]

The BPT limits for the generically defined "metal cleaning wastes" include iron and copper limits (1.0 mg/L) and TSS and oil and grease limits.[742] BAT limitations for "chemical metal cleaning wastes" are the same as the BPT iron and copper limits for "metal cleaning wastes" (*i.e.*, 1.0 mg/L).[743] As mentioned above, there are no current BAT requirements for NCMCWs due to a lack of data regarding this waste stream.[744]

Impacting the application of these effluent limitations to the various "metal cleaning"

[7] PH monitoring at Outfall 003B has been removed from the Final Permit because pH monitoring is required at the end of the slag settling pond (Outfall 003A) and water quality-based pH limitations must be met at the end of the discharge canal (Outfall 003). Therefore, footnote 9 of the Draft Permit has also been removed.

waste streams generated by facilities within the industry is a June 17, 1975 document commonly referred to as the "Jordan Memorandum."[745] EPA used the Jordan Memorandum to clarify the limits for "metal cleaning wastes" applied only to chemical cleaning wastes, explaining that use of the term "metal cleaning wastes" in 40 C.F.R. Part 423 actually meant chemical cleaning wastes and does not include NCMCWs.[746] The memorandum was issued by Bill Jordan of the Permit Assistance & Evaluation Division of EPA Headquarters to Bruce P. Smith of Region 3's Enforcement Division in response to a May 21, 1975 letter from Mr. Smith, noting "some confusion as to what actually constitutes metal cleaning wastes" within the industry.[747] Mr. Smith specifically provided that he was "inclined to agree with . . . companies" that:

> [E]ffluent streams that result exclusively from water washing of ash found on boiler fireside, air preheater, etc. should be considered in the low volume or ash transport waste categories, while effluent streams resulting from cleaning processes involving chemical solution (acid cleaning of boilers) should be considered in the metal cleaning waste source category.[748]

However, because of the perceived "ambigu[ity]" on this issue, Mr. Smith expressly requested EPA Headquarters provide clarification as to what constitutes NCMCWs. Mr. Smith specifically suggested "Headquarters should distinguish the type of cleaning that generates metal cleaning wastes and the type of cleaning that generates low volume wastes."[749]

The Jordan Memorandum explicitly addresses Mr. Smith's concerns. In it, Bill Jordan explains that NCMCWs constitute "low volume" wastes and are therefore not subject to effluent limitations for total copper and total iron in metal cleaning waste. Further, the Jordan Memorandum specifies that "[a]ll water washing operations are 'low volume' while any discharge from an operation involving chemical cleaning should be included in the metal cleaning category."[750]

Due to the Jordan Memorandum, iron and copper limits for "metal cleaning wastes" (meaning chemical metal cleaning wastes) were often included in permits within the industry between 1975 and 1980. At the same time, NCMCWs were classified as low volume wastes and not mentioned by name in many permits. This was to be expected, since "low volume waste" is a residual category for wastewater from all sources that do not have specific limitations.[751]

In proposed amendments to Part 423 published in 1980, EPA recognized that it "adopted a policy" as to the classification and treatment of NCMCWs by and through the Jordan Memorandum.[752] And, this "policy" from the Jordan Memorandum was reaffirmed in EPA's final 1982 NELGs.[753] While EPA originally proposed in 1980 to reject the Jordan Memorandum for facilities that had previously relied upon it by adopting a new definition that purportedly "[made] clear that the 'metal cleaning waste' definition" was meant to include NCMCWs,[754] the agency ultimately succumbed to its equitable concerns regarding the Jordan Memorandum in the 1982 final rule, recognizing that "many dischargers may have relied on [the Jordan Memorandum] guidance." Thus, EPA determined that "until the Agency promulgates new limitations and standards, the previous guidance policy may continue to be applied in those cases in which it was applied in the past."[755]

EPA likewise abstained once again from establishing BAT effluent limitations for NCMCWs in this 1982 rulemaking, acknowledging both the data the agency had collected pertaining to NCMCWs "were too limited to make a final decision" and it had not sufficiently examined either "the available data on waste characteristics of non-chemical metal cleaning wastes [or] the costs and economic impacts of controlling them."[756] Thus, the Jordan Memorandum remained in effect for facilities that had relied on it following EPA's 1982 rulemaking.[757]

The latest NELGs do nothing to change how NCMCWs are regulated at facilities within the industry. In its 2013 proposed rule, EPA set out yet again to establish BAT requirements for NCMCWs equal to previously established BPT limitations for "metal cleaning wastes"[758] while preserving the status quo for those facilities historically authorized to discharge NCMCWs as a low volume waste.[759] In the final NELGs, the agency preserved the status quo for those facilities that rely upon the Jordan Memorandum to discharge NCMCWs as a low volume waste. However, EPA elected to not establish BAT requirements for NCMCWs due to flawed and imprecise data.[760] The agency stated as follows regarding how NCMCWs are to be regulated within the industry going forward:

> By reserving limitations and standards for non-chemical metal cleaning waste in the final rule, the permitting authority must establish such requirements based on BPJ for any steam electric power plant discharged non-chemical metal cleaning wastes. As part of this determination, EPA expects that the permitting authority would examine the historical permitting record for the particular plant to determine how discharges of non-chemical metal cleaning waste had been permitted in the past, including whether such discharges had been treated as low volume waste sources or metal cleaning waste.[761]

In its Response to Comments document, the agency provided that "[b]y not revising the[NCMCW] effluent limitations and standards and not revising the definitions, the final rule will not result in changes to industry operations for the specified wastestream[]."[762] The only reasonable interpretation of the above-referenced statements from the agency's final rulemaking is that NCMCWs will continue to be classified as a low volume waste if they have been historically. This has been recognized as the generally accepted practice for the last 30+ years by all relevant parties (permit writers, regulated community, interested third parties, etc.), with the assistance of the Jordan Memorandum. Any other interpretation by EPA is arbitrary and capricious.

[737] *See* 39 Fed. Reg. 36,186 (Oct. 8, 1974), amended 40 Fed. Reg. 23,987 (June 4, 1975); 47 Fed. Reg. 52,290 (Nov. 19, 1982), amended 48 Fed. Reg. 31,403 (July 8, 1983); 80 Fed. Reg. 67,838 (Nov. 3, 2015) (codified at 40 C.F.R pt. 423).
[738] 80 Fed. Reg. at 67,863.
[739] 40 C.F.R. § 423.11(d) (brackets included in original).

[740] *Id*. § 423.11(c).
[741] AR-608 at 28.
[742] *See* 40 C.F.R. § 423.12(b)(5).
[743] *Compare id.* at § 423.13(e) *with id.* at § 423.12(b)(5).
[744] *See id*. § 423.13(f).
[745] *See generally* Jordan Memorandum.
[746] *Id.* at 3.
[747] *See* Jordan Memorandum, Appendix IV(B) (Letter from Bruce P. Smith, Delmarva-D.C. Section, EPA Region III, to Mr. Bill Jordan, EPA Headquarters (May 21, 1975) at 5).
[748] *Id.*
[749] *Id.* (emphasis added).
[750] Jordan Memorandum at 3.
[751] *See* 40 C.F.R. § 423.11(b).
[752] *See* 45 Fed. Reg. 68,328, 68,333 (Oct. 14, 1980) (to be codified at 40 C.F.R. pts. 125 and 423) (noting that "EPA adopted a policy" in the Jordan Memorandum).
[753] *See* 47 Fed. Reg. at 52,297.
[754] 45 Fed. Reg. at 68,333. The definition of "metal cleaning wastes" was ultimately revised in EPA's final 1982 regulations. *See* 47 Fed. Reg. at 52,305.
[755] 47 Fed. Reg. at 52,297.
[756] *Id.*
[757] *See* EPA, High Capacity Fossil Fuel Fired Plant Operator Training Program Student Handbook, EPA- 453/B-94-056 (Sept. 1994) ("Since non-chemical metal cleaning is not currently specifically regulated, it is classified under low volume wastes.").
[758] *See* 78 Fed. Reg. 34,432 (June 7, 2013) (to be codified at 40 CFR pt. 423).
[759] *See, e.g.*, *id.* at 34,436 n.1, 34,465.
[760] *See* 80 Fed. Reg. at 67,863.
[761] *Id.* (emphasis added).
[762] NELGs Response to Comments, Part 4 of 10 at 4-324 (emphasis added).

EPA Response: During the 2015 rulemaking to revise the Steam Electric Effluent Limitations Guidelines (Steam Electric ELGs), EPA determined that it did not have sufficient information on a national basis to establish Best Available Technology (BAT) requirements for non-chemical metal cleaning wastes for the entire industrial category. 80 Fed. Reg. 67,838, 67,863; *see also Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category: EPA's Response to Public Comments*, at 7-179. The final rule, therefore, continues to ''reserve'' BAT standards for non-chemical metal cleaning wastes, as the previously promulgated 1982 regulations did. The 2015 Steam Electric ELGs explicitly state that by reserving BAT standards for non-chemical metal cleaning wastes in the final rule, permitting authorities are left to continue establishing such requirements based on Best Professional Judgement (BPJ) for any steam electric power plant discharging this waste stream. 80 Fed. Reg. at 67,863.[8] Region 1, as the permitting authority, has followed the regulatory requirements and made the required BPJ-based determination with regard to non-chemical metal cleaning wastes in the Merrimack Station Final Permit. Region 1 determined that BAT limits for non-chemical metal cleaning wastes are equivalent to BAT limits for chemical metal cleaning wastes and, thus, include effluent limits for total copper and iron applied at Outfall 003B.

[8] The limits for NCMCW are unaffected by the 2017 Reconsideration as well as the 2019 Fifth Circuit Opinion vacating and remanding other specific provisions of the 2015 Rule.

However, the commenter maintains that dischargers are entitled to continue to rely on EPA's 1975 guidance, the Jordan Memorandum, suggesting that metal cleaning wastes are those where chemical additives, not just water, are used for washing, and that non-chemical metal cleaning wastes should "continue to be classified as a low volume waste if they have been historically." EPA has carefully considered these comments, but, as explained below, in EPA's view, these comments and the assumptions upon which they are based do not provide a reasonable basis for EPA to regulate Merrimack Station's non-chemical metal cleaning wastes as low volume wastes not subject to effluent limits for total copper and iron in the Final Permit.

EPA first promulgated national ELG regulations for the Steam Electric Generating Point Source Category in 1974. 39 Fed. Reg. 36186 (Oct. 8, 1974). These regulations identified numerous distinct wastestreams, including "metal cleaning wastes." "Metal cleaning wastes" were defined as:

> … any cleaning compounds, rinse waters, or any other waterborne residues derived from cleaning any metal process equipment including, but not limited to, boiler tube cleaning, boiler fireside cleaning and air preheater cleaning.

39 Fed. Reg. 36,199 (*see* former version of 40 CFR § 423.11(d)). On its face, this regulatory definition encompasses both chemical and non-chemical metal cleaning wastes, as it covers any cleaning compounds and any rinse waters or other waterborne residues from cleaning metal process equipment. Furthermore, the above-cited definition in no way excludes non-chemical metal cleaning waste. The 1974 ELG regulations also identify "low volume wastes" as a distinct wastestream and define this wastestream as follows:

> …taken collectively, as if from one source, wastewater from all sources except those for which specific limitations are otherwise established in this subpart. Low volume waste sources would include but are not limited to waste waters from wet scrubber air pollution control systems, ion exchange water treatment systems, water treatment evaporator blowdown, laboratory and sampling streams, floor drainage, cooling tower basin cleaning wastes and blowdown from recirculating house service water systems.

39 Fed. Reg. 36,199 (*see* former version of 40 CFR § 423.11(b)). This regulatory definition does not include metal cleaning wastes and, in fact, explicitly notes that wastewater from sources governed by separate, specific limitations in 40 CFR Part 423, are not considered low volume wastes. As stated above, metal cleaning waste, which encompasses both chemical and non-chemical metal cleaning wastes, is a separate wastestream specifically identified and regulated under Part 423 and, therefore, excluded from the definition of low volume wastes. Taken together, the two definitions identify a clear distinction between metal cleaning wastes (whether chemically or non-chemically based) and low volume wastes. *See also* Response to Comment IV.1.1 above.

Nevertheless, in 1975, just after the first Steam Electric ELGs were promulgated, a biologist in EPA's Region 3 Office wrote to an engineer in EPA Headquarters' Office of Enforcement seeking clarification regarding, among other things, whether "effluent streams that result exclusively from water washing of ash found on boiler fireside, air preheater, etc. should be considered in the low volume or ash transport waste source categories," as opposed to the metal cleaning waste category, and whether only chemical cleaning wastewaters should be categorized as "metal cleaning wastes." *See* Letter from Bruce P. Smith, Delmarva-D.C. Section, EPA Region 3, to Mr. Bill Jordan, EPA Headquarters (May 21, 1975), p. 2 (AR-313, Exhibit 3). In posing the question, Mr. Smith acknowledged that the ELG regulations clearly do not exclude non-chemical waste streams from the definition of metal cleaning waste but indicated that some ambiguity was suggested by text in EPA's technical "Development Document" for the Steam Electric ELGs.

Mr. Jordan responded to Mr. Smith with a memorandum stating as follows:

> [i]n regard to the question on distinguishing between metal cleaning wastes and low volume wastes, the following clarification is offered. All water washing operations are 'low volume' while any discharge from an operation involving chemical cleaning should be included in the metal cleaning category.

See Memorandum from J. William Jordan, Chemical Engineer, Permit Assistance & Evaluation Section, Office of Enforcement, EPA Headquarters, to Bruce P. Smith, Biologist, Enforcement Division, EPA Region III (June 17, 1973) (the Jordan Memorandum), p. 2 (AR-313, Exhibit 3).[9] Thus, with no explanation or analysis provided, Engineer Jordan appears to propose, contrary to the text of the ELG regulations, that wastes from non-chemical washing of metal equipment (i.e., "water washing operations") should be treated as "low volume waste" (and not subject to BPT effluent limitations for total copper and total iron in metal cleaning waste).

In 1977, EPA promulgated new pretreatment standards for the Steam Electric ELGs. *See* 42 Fed. Reg. 15,690 (Mar. 23, 1977) (Interim Regulations, Pretreatment Standards for Existing Sources, Steam Electric Generating Point Source Category). In the preamble to the Final Rule, EPA identified five categories of wastewater produced by steam electric power plants, including metal cleaning wastes, cooling system wastes, boiler blowdown, ash transport water, and low volume wastes. *Id*. at 15693. In its discussion, EPA again did not distinguish between chemical and non-chemical metal cleaning wastes and gave no suggestion that that latter should be regarded as low volume waste. EPA's discussion, instead, indicated that non-chemical metal cleaning wastes would be included within the metal cleaning waste category. *See id*. ("Metal cleaning wastes are those wastes which are derived from cleaning of metal process equipments."); *see also id*. (list of examples of metal equipment the cleaning of which would yield metal cleaning wastes and discussion of what constitutes low volume wastes).

[9] The bulk of the Jordan Memorandum addresses a question other than the one about how to categorize non-chemical metal cleaning waste. Specifically, Mr. Smith's letter had also asked how effluent limits should be applied when non-similar waste streams such as metal cleaning waste, low volume waste, and ash sluice water are all discharged to an ash pond prior to discharge. The Jordan Memorandum, at pp. 1-2, focuses largely on responding to that question and outlined several possible different approaches.

In 1980, EPA proposed amendments to the Steam Electric ELGs. 45 Fed. Reg. 68,328 (October 14, 1980). One particular area of focus in the proposed rule was EPA's effort to "clarify an issue of applicability for the 'metal cleaning wastes' stream limitations." *Id*. at 68,328. In essence, EPA expressly confronted the definition of metal cleaning waste and how the regulations outlining corresponding effluent limits must be read and applied. As part of this assessment, EPA reconsidered and rejected the Jordan Memorandum's exclusion of non-chemical metal cleaning waste from the metal cleaning waste category, noting that a distinction between the chemical and non-chemical wastes was contradicted by the existing regulations. The Agency explained that the existing requirements applied to all metal cleaning wastes, regardless of whether they resulted from cleaning with chemical solutions or water only. *Id*. at 68,333. EPA further indicated that its decision to reject the Jordan Memorandum's conclusion was supported by (a) cost and technology data supporting the original copper and iron limits, which were based on all metal cleaning wastes, not just the chemically-based ones, and (b) the presence of "toxic pollutants in these waste streams even where only water is used for washing." *Id*. EPA concluded that "the regulations proposed below make clear that the 'metal cleaning waste' definition will apply according to its terms, and the question of whether washing is done with water only will be irrelevant." *Id*.

Nevertheless, EPA went on to propose that, "[b]ecause many dischargers may have relied on EPA's memorandum of June 1975, however, the regulations proposed below adopt the memorandum's position for purposes of BPT only." *Id*. EPA proposed to implement this apparently equity-based approach by taking the following steps:

> 1. Revising the definition of "metal cleaning wastes" to even more explicitly *include both chemical and non-chemical metal cleaning wastes*. The new proposed definition was subsequently retained in the final regulations and remains in the current regulations. It is quoted above in this response. *Id.* at 68,350 (proposed 40 CFR § 423.11(d)).
>
> 2. Adding a definition of "chemical metal cleaning waste." *Id*. at 68,350 (proposed 40 CFR § 423.11(c)). The proposed new definition was subsequently retained in the final regulations and remains in the current regulations. It is quoted above in this response.
>
> 3. Changing the BPT ELGs so that they would only apply to "chemical metal cleaning wastes," rather than to "metal cleaning wastes" generally. *Id*. at 68,351 (proposed 40 CFR § 423.12(b)(5)).
>
> 4. Promulgating new BAT ELGs applicable to "metal cleaning wastes" generally, which imposed effluent limits for copper and total iron. *Id*. at 68,352 (proposed 40 CFR § 423.13(g)).

EPA's approach would have amended the Steam Electric ELGs to correctly categorize non-chemical metal cleaning wastes as "metal cleaning wastes," while legally exempting them from the application of the BPT ELGs for copper and iron. This result would have been consistent with the effect of the Jordan Memorandum, while at the same time would have corrected its mistaken underlying conclusion. It also would have correctly applied BAT ELGs to both chemical and non-chemical metal cleaning wastes going forward.

In the Final Rule, however, EPA shifted course somewhat in response to public comments received on the proposal. 47 Fed. Reg. 52,290 (Nov. 19, 1982). EPA retained the clarified definition of "metal cleaning waste" and the new definition of "chemical metal cleaning waste," id. at 52,305 (40 CFR §§ 423.11(c) and (d)) but dropped the regulatory language that applied the BPT limitations only to chemical metal cleaning wastes. Id. at 52,297, 52,306 (40 CFR § 423.12(b)(5)). Thus, the regulations applied the BPT limits to *all* metal cleaning waste. With regard to BAT limitations, however, EPA decided to promulgate effluent limitations only for the chemical metal cleaning wastes and to "reserve" development of the limitations for the non-chemical metal cleaning wastes. *Id*. at 52,297, 52,307 (40 CFR §§ 423.13(3) and (f)). EPA explained that while the BAT standard applied to non-chemical metal cleaning wastes, certain issues raised in the public comments, as discussed above, required further investigation. Id. at 52,297. *See also id*. at 52307-08 (40 CFR §§ 423.15(e), 423.16(c), 423.17(c)). Specifically, EPA explained that it had insufficient information to determine whether the waste streams from oil-burning and coal-burning facilities had significant differences and whether compliance costs would be excessive on a national, industry-wide basis. *Id*. at 52,297.

In addition, EPA once more addressed its apparent equitable concern about the Jordan Memorandum by stating in the preamble that "until the Agency promulgates new limitations and standards, the previous guidance policy *may* continue to be applied in those cases in which it was applied in the past." *Id.* (emphasis added). Thus, although it had concluded that the Jordan Memorandum was inconsistent with the regulations and its conclusion was fundamentally flawed, EPA indicated that it could apply it on a discretionary basis in cases where it had been applied in the past.

For the November 2015 revised Steam Electric ELGs, the Agency again "decided that it does not have enough information on a national basis to establish BAT/NSPS/PSES/PSNS requirements for non-chemical metal cleaning wastes. The final rule, therefore, continues to 'reserve' BAT/NSPS/PSES/PSNS for non-chemical metal cleaning wastes, as the previously promulgated regulations did." 80 Fed. Reg. 67,863. In the preamble to the 2015 Steam Electric ELGs, the Agency explains that:

> …the permitting authority must continue to establish such requirements based on BPJ for any steam electric power plant discharging this wastestream. As explained in Section VIII.I, in permitting this wastestream, some permitting authorities have classified it as non-chemical metal cleaning wastes (a subset of metal cleaning wastes), while others have classified it as a low volume waste source; NPDES permit limitations for this wastestream thus reflect that classification. In making future BPJ BAT determinations, EPA recommends that the permitting authority examine the historical permitting record for the particular plant to determine how discharges of non-chemical metal cleaning wastes have been permitted in the past. Using historical information and its best professional judgment, *the permitting authority could determine that the BPJ BAT limitations*

> *should be set equal to existing BPT limitations or it could determine that more stringent BPJ BAT limitations should apply.* In making a BPJ determination for new sources, EPA recommends that the permitting authority consider whether it would be appropriate to base standards on BPT limitations for metal cleaning wastes or on a technology that achieves greater pollutant reductions.

80 Fed. Reg. 67,884 (emphasis added). The 2015 preamble language makes three things clear: 1) moving forward, permitting authorities are expected to examine the historical classification of non-chemical metal cleaning wastes and method of regulation for a particular plant; 2) permitting authorities should use this historical information as one of several components in their BPJ BAT analysis; and 3) permitting authorities may establish BPJ BAT limitations for non-chemical metal cleaning wastes that are equal to existing BPT limitations or are more stringent.

In early 2017, EPA received administrative petitions requesting that the Agency reconsider the November 2015 Steam Electric ELGs. After considering the petitions, EPA decided that it would be appropriate and in the public interest to conduct a rulemaking to potentially revise the BAT limitations and PSES established by the 2015 Rule for FGD wastewater and bottom ash transport water. As a result of this decision, EPA issued a Final Rule, *Postponement of Certain Compliance Dates for the Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category*, 82 Fed. Reg. 43,494 (Sept. 18, 2017), in which EPA postponed the earliest compliance dates for the new, more stringent, BAT effluent limitations and PSES for bottom ash transport water and flue gas desulfurization (FGD) wastewater that were included in the 2015 Rule for a period of two years. EPA explained that it:

> "does not intend to conduct a rulemaking that would potentially revise the new, more stringent BAT effluent limitations and pretreatment standards in the 2015 Rule for fly ash transport water, flue gas mercury control wastewater, and gasification wastewater, or *any of the other requirements in the 2015 Rule*.

82 Fed. Reg. at 43,494 (emphasis added) Ultimately, EPA's September 2017 Final Rule "does not otherwise amend the effluent limitations guidelines and standards for the steam electric power generating point source category." 82 Fed. Reg. at 43,495. The rule, therefore, does not amend or affect the effluent limitations for metal cleaning wastes. The analysis and language included in the 2015 preamble related to NCMCWs, as mentioned above and discussed at length throughout EPA's responses to comments, remains effective, and is not subject to postponement or amendment.

As a result of the its reconsideration, the Agency began developing a revised rule to address BAT and PSES limits for FGD wastewater and bottom ash transport water. *See* Chapters V and VIII of this document. On November 22, 2019, EPA published a Proposed Rule in the Federal Register. 84 Fed. Reg. 64620 (Nov. 22, 2019). Again, this 2019 Proposed Rule did not address metal cleaning wastes. Thus, metal cleaning wastes are not affected or implicated by the 2017 reconsideration, 2017 Final Postponement Rule, or the 2019 Proposed Rule.

Having considered all of the above, EPA concludes that it would be unreasonable to exempt Merrimack Station's non-chemical metal cleaning waste streams from effluent limits for copper and iron. EPA reaches this conclusion for a number of independently sufficient reasons.

First, issuing an NPDES permit to Merrimack Station without copper or iron limits applicable to its "gas side (or fire side) ash washes" (non-chemical metal cleaning wastes), based on treating them as low volume wastes, would be inconsistent with the plain language of the regulations, which treats non-chemical metal cleaning wastes as a type of metal cleaning waste subject to copper and iron limits. The June 1975 Jordan Memorandum was a later-in-time opinion about how the terms from the October 1974 regulations should be applied, and it included no analysis of the regulations whatsoever. Rather than interpreting the regulations, the Jordan Memorandum contradicts the regulations, as EPA indicated in the 1980 preamble to the proposed Steam Electric Power Plant ELG's.

Second, as EPA stated in the preamble to the revised Steam Electric Power Plant ELG's proposed in 1980, the Jordan Memorandum was not only inconsistent with the regulations, and provided no analysis to support its conclusion, but it was incorrect as a matter of fact and inadvisable as matter of policy. The technology and cost data upon which EPA had based the BPT limitations for copper and iron in metal cleaning waste were based on both chemical and non-chemical metal cleaning wastes, and not just on the former. Furthermore, EPA pointed out that like chemical metal cleaning wastes, non-chemical metal cleaning wastes can contain toxic pollutants. At the same time, Merrimack Station has not provided a description of its operations or any monitoring data to indicate that its non-chemical metal cleaning wastes are free from toxic pollutants. Subjecting non-chemical metal cleaning wastes to BAT standards is thus reasonable from the standpoint of environmental protection as well.

Third, while it is unclear to EPA that it would have the authority to issue Merrimack Station an NPDES permit inconsistent with the statute and regulations based on the equitable concern noted in the Steam Electric ELG preambles (*i.e.*, past reliance on the Jordan Memorandum), EPA does not believe it would be appropriate to exercise any such authority in this case. EPA's stated equitable concern about parties who may have relied on the Jordan Memorandum is best understood as a concern about the application of BPT limits, which were the limits for which compliance was required at the time of the Jordan Memorandum and the 1980 and 1982 preambles. In 1980, EPA proposed changing the ELG's to specify that *BPT* limits would not apply to non-chemical metal cleaning wastes because of past reliance on the Jordan Memorandum, though it later dropped that idea in the final ELG's. EPA never suggested, however, that non-chemical metal cleaning wastes should also potentially be exempted from the BAT standards. While EPA ended up *reserving* the development of national, categorical BAT limitations because of insufficient information on certain issues, the Agency did not suggest *BAT* limits should not be applied because of the Jordan Memorandum. Thus, it is appropriate, and required by the 2015 ELGs, that EPA's new NPDES permit for Merrimack Station apply BAT limits on a BPJ basis to the facility's non-chemical metal cleaning waste discharges. *See* 80 Fed. Reg. at 67863 ("By reserving limitations and standards for non-chemical metal cleaning waste in the final rule, the permitting authority must establish such [BAT] requirements based on BPJ for any steam electric power plant discharged non-chemical metal cleaning wastes.").

Fourth, while the Agency suggests that permitting authorities consider historical information when using its best professional judgment in determining BAT limitations (80 Fed. Reg. 67884), it is not clear to EPA that the Jordan Memorandum was ever applied to Merrimack Station in the past. Neither the 1992 Permit nor the Fact Sheet for that permit state that the non-chemical metal cleaning wastes (or "gas side ash washes") were being treated as low volume wastes or that they were not subject to effluent limits for copper and iron.

Instead, EPA's permit applied copper and iron limits[10] at Outfall 003B (slag/ash settling pond) during chemical cleaning to a combined discharge of chemical metal cleaning wastes,[11] non-chemical metal cleaning wastes, bottom ash transport water, low volume waste (LVW), and stormwater. As discussed above, it was incorrect for EPA to apply the limits to these commingled wastestreams, but EPA's approach does not equate to a conclusion that the limits were not also necessary for non-chemical metal cleaning waste, nor is it an indication that non-chemical metal cleaning waste was classified a low volume waste. Indeed, the 1991 Fact Sheet at page B-3 specifies that the discharge from Outfall 003B consist of "[n]on-routine ash settling pond discharge *including gas-side and water-side metal cleaning wastes*." (emphasis added). These particular non-chemical metal cleaning wastes were specifically called out. Further, in the 1992 Permit, limits for copper and iron[12] are also applied to Outfall 003A, the slag/ash settling pond, during "routine operation" when chemical cleaning is not taking place. Again, the permit does not specify that non-chemical metal cleaning waste is or is not a low volume waste, and during all operations (routine or during chemical cleaning), non-chemical metal cleaning waste is currently subject to iron and copper limits.

Finally, even as an equitable matter it does not make sense to exempt Merrimack Station from BPT or BAT effluent limits in a 2020 NPDES permit based on an unsubstantiated (and often questioned) memorandum from 45 years ago. To the extent that the Jordan Memorandum was ever applied to Merrimack Station in the past – and it is not clear to EPA that it was – the facility would already have received many years of benefit to the detriment of a public resource. Moreover, continuing to misapply the law and regulations could arguably give an unfair competitive advantage to Merrimack Station over other facilities not excused from complying with permit limits based on the ELG's or based on a BAT limit determined on a BPJ basis.

Comment IV.1.3	**AR-1548, PSNH, pp. 202-204**

Comment: EPA attempts to define "non-chemical metal cleaning waste" in its Fact Sheet as "any wastewater resulting from the cleaning of metal process equipment without using chemical cleaning compounds."[789] This definition lacks clarity and is overbroad. For instance, must an operator be intending to actually clean a given piece of metal process equipment for the water that comes in contact with it to constitute NCMCWs? If so, is water that incidentally contacts

[10] Iron limits are technology/ELG-based limits and the calculated copper limits are based on the more stringent NH Water Quality Standards.
[11] Samples from the discharge of the slag settling pond were to be taken when chemical cleaning wastewater was being discharged to the pond.
[12] Iron limits are technology/ELG-based limits and the calculated copper limits are based on the more stringent acute (versus chronic) NH Water Quality Standards.

metal process equipment still considered a low volume waste? Furthermore, what all is included in the definition of "metal process equipment?" Will water intended to clean an electrical junction box associated with operation of the CWISs or water from an intake screen backwash constitute NCMCWs—requiring segregation and isolated chemical precipitation treatment? Interjecting subjective intent into the definition of NCMCWs is problematic and will create unnecessary confusion at the facility. Without clarity on these issues, it is not possible for PSNH to know what process changes and/or retrofits will be required to comply with the new permit.

In crafting this bloated definition of NCMCWs, EPA has ignored EPA's historical management of this waste stream and disregarded the instructive list of pieces of metal process equipment specifically referenced in the definition of "metal cleaning wastes" to serve as a guide for determining the scope of regulation for metal cleaning wastes (chemical and nonchemical) at a given facility. "Metal cleaning wastes" were first defined in the 1974 ELGs as "any cleaning compounds, rinse waters, or any other waterborne residues derived from cleaning any metal process equipment including, but not limited to, boiler tube cleaning, boiler fireside cleaning and air preheater cleaning."[790] For decades, EPA focused on developing data limited to chemical boiler cleaning wastes and NCMCWs associated with water washing of ash on boiler firesides and air preheaters. This makes perfect sense, given these pieces of metal process equipment are specifically referenced in EPA's definition for the waste stream. This list was presumably included in the definition for a reason. Although it is not exclusive, inclusion of a representative list such as this one should be interpreted to clarify that the agency never intended for all water that comes in contact with any metal process equipment to be interpreted as metal cleaning waste. To do so renders the representative list of metal process equipment included in the "metal cleaning waste" definition semantic and meaningless.

Only recently, as a part of the 2015 ELGs, did EPA attempt to better ascertain the potential breadth of the metal cleaning waste stream and gather corresponding additional data beyond water washing of ash on boiler firesides and air preheaters. And, this effort proved fruitless, as the agency itself provided that "plants refer to the same [NCMCW] operation using different terminology" and that results of EPA's data collection efforts are "skewed" and insufficient.[791] EPA has not concerned itself with understanding the wastewater management issues that will arise at Merrimack Station by the expansive definition of NCMCWs advanced in the Draft Permit. Nor has the agency heeded the specific list of metal process equipment included in the definition of "metal cleaning wastes" and attempted to extrapolate a reasonable list of additional metal process equipment that may be included in the definition of NCMCWs at Merrimack Station. Despite the agency's lack of action, it claims in the Fact Sheet of the Draft Permit that "the annual volume of [NCMCW] water [at Merrimack Station will be] considerabl[y] less than the chemical metal cleaning wastewater already generated at the site."[792] Based on EPA's broad definition of NCMCW, this statement is unjustified.[793]

EPA's seemingly all-inclusive definition of NCMCWs is not supported by the administrative record and cannot pass muster without additional analysis or discussion of the costs (including infrastructure needs) and expected pollutant reductions associated with such an expansive definition. In actual fact, expanding the meaning of "NCMCWs" to water washing of process equipment other than gas-side ash removal will be expensive and of limited environmental benefit, especially if comingling is prohibited and iron and copper limits imposed. Any definition of NCMCWs should therefore be restricted to the gas-side removal of ash without chemicals. A suitable definition of "NCMCWs" would be "any wastewater from the cleaning of ash from gas-side process equipment from the boiler to the stack without chemical cleaning compounds, including boiler fireside cleaning and air preheater cleaning."

789 AR-608 at 28. Notably, the actual 2011 Draft Permit for the facility does not utilize this broad definition. Instead, it defines NCMCW effluent as "boilers water side boiler cleaning, gas side equipment ash wash, and precipitators" from Units 1 and 2 at Merrimack Station. AR-609 at 5.
790 39 Fed. Reg. at 36,205.
791 *See* 80 Fed. Reg. at 67,863
792 AR-608 at 32.
793 This statement is not true even utilizing a more narrow definition for NCMCW. PSNH and others within the industry generate significantly greater volumes of NCMCWs than they do chemical metal cleaning wastewater, which may be generated only one or two times during a permit cycle (at most).

EPA's Response: In general, EPA disagrees with the comment that the definition for NCMCW in the Fact Sheet is vague and too broad. At the beginning of this comment, the commenter asks "must an operator be intending to actually clean a given piece of metal process equipment for the water that comes in contact with it to constitute NCMCWs?" To this, the Region replies "Yes." It is not the Region's intent to broaden the scope of non-chemical metal cleaning waste beyond that defined for metal cleaning waste or to necessarily include any water that incidentally, or accidentally, comes into contact with any metal equipment within the facility. However, neither does the Region intend to narrow the scope as suggested to limit it only to "wastewater from the cleaning of ash from gas-side process equipment from the boiler to the stack without chemical cleaning compounds, including boiler fireside cleaning and air preheater cleaning." This would be inconsistent with the definition of metal cleaning waste in EPA's regulations, as has been discussed already herein.

The plain language of section 423.11(d) in EPA's regulations defines metal cleaning waste to include any wastewater generated from *either the chemical or non-chemical cleaning of metal process equipment*. *See also* 40 CFR §§ 423.11(c), 423.13(f). These definitions for *metal cleaning waste* and *chemical metal cleaning waste* make clear that *non-chemical metal cleaning waste* is any wastewater resulting from the cleaning of any metal process equipment without chemical cleaning compounds. *See* EPA Response to Comment IV.1.1 and IV1.2. above.

Finally, the 2011 Fact Sheet specifically identifies the known waste streams that are considered metal cleaning wastes (both chemical and non-chemical), pursuant to 40 CFR Part 423: MK(Unit)-1 and MK-2 water side boiler cleaning, MK-1 and MK-2 gas side boiler cleaning, MK-1 air heater wash, and precipitator wash. *See* 2011 Fact Sheet, p. 14 and 16. To the extent that the commenter suggests that the definition of metal cleaning wastes in this permit is vague, expansive, or "all-inclusive," the 2011 Fact Sheet contradicts any such suggestion. The Permittee has been provided a list of known sources of metal cleaning waste at the facility. In addition, this commenter, PSNH (the previous owner of Merrimack Station), provides in a Comment IV.2.1 below, that the Station's metal cleaning wastewater occurs during the following activities: cleaning Unit 1's air heater, boiler, precipitators, and stack; and cleaning Unit 2's air heater, boiler, precipitators, and stack. This is consistent with EPA's list of metal cleaning waste at Merrimack Station identified above and the description included at Outfall 003B in the Final Permit. However, if the Permittee is unable to determine whether a particular waste stream should be classified as NCMCW, it may, as always, contact the Region for additional clarity.

2.0 Commingling of Metal Cleaning and Low Volume Wastestreams

Comment IV.2.1	AR-846, PSNH, p. 211-214

Comment: Merrimack Station generates metal cleaning wastewater during the following activities: (1) cleaning the Unit 1 air heater, typically 4 or 5 times each year, producing, in the range of 200,000 to 400,000 gallons of wastewater each time; (2) cleaning Unit 1's air heater, boiler, precipitators, and stack once every 18 to 24 months, producing in the range of 400,000 to 600,000 gallons of wastewater; and (3) cleaning Unit 2's air heater, boiler, precipitators, and stack once a year, producing upwards of a million gallons of wastewater. Based on these numbers, PSNH's permit renewal application provided the average flow of metal cleaning wastewater for Unit 1 was 6850 gpd (500,000 gallons 5 times a year) and Unit 2 was 2900 gpd (1,058,500 gallons 1 time per year).

Prior to major maintenance outages, daily discharges of low volume wastewater (LVW) are collected after treatment until two of the three basins are mostly filled. This LVW is then used as the supply to start the metal cleaning wash. Once the water is used to wash ash from equipment, it drains back to Basin 1 where it is chemically treated to enhance settling. The treated LVW is then pumped to Basin 3 where primary settling occurs before being transferred to Basin 2. From Basin 2, the wastewater is recycled back to be used as a continuing source for ongoing fireside wash. Limited volumes of treated wastewater are intermittently discharged during this process as necessary to maintain capacity in the treatment facility. Once the waterwash is finished, the wastewater is treated and the basins are sequentially discharged as the iron concentrations drop below 1.0 mg/L. This process is dependent upon the ability to blend the routine LVW with nonchemical metal cleaning wastes.

EPA Response: As discussed in Response to Comment IV.3.1 below, blending or combining of different waste streams prior to discharge is acceptable and encouraged in certain cases. One such case is the *reuse* of industrial process wastewater or other previously used water in an industrial process, provided the reused water has equal or less stringent limitations than the wastestream-generated wastewater. In this case, PSNH describes a process which uses LVW as the wash water for the metal cleaning processes. This scenario is not considered commingling of different waste streams prior to discharge, where an adjusted pretreatment limit would need to be calculated in accordance with 40 CFR § 403.6(e). Instead, the procedure explained by the Permittee is an acceptable method of reusing process water, without diluting the resulting discharge stream for the purpose of compliance with the copper and iron ELG limitations, because the resulting wastewater itself becomes metal cleaning wastewater and is treated as such. All of the resulting discharge wastewater, therefore, is treated as metal cleaning waste and would be subject to the limits applicable to metal cleaning waste (*i.e.*, TSS, oil and grease, copper, and iron).

In fact, EPA encourages, where appropriate, onsite industrial wastewater reduction and reuse projects. EPA understands that the reuse of process wastewater has several benefits, including but not limited to conservation of potable water supplies, decreasing wastewater discharges, reduction in entrainment/impingement impacts (when source water is used as the supply), lower energy consumption and utility costs, and enhanced public image.

The Permittee currently collects, treats and discharges chemical metal cleaning wastes (*i.e.*, "boiler water side chemical cleanings" 1997 Permit Application) separately from other wastewaters once every 7 years at Merrimack Station. EPA is unaware of any reasons why the Permittee could not do the same for the non-chemical metal cleaning wastestreams, knowing now that reuse of LVW is acceptable as process water. Compliance with copper and iron limits at Outfall 003B would occur five to six times per year for the non-chemical metal cleaning wastes, without any change in current process operations as described in this comment. Although with limited "peaking facility" operations, as explained in Chapter II of this document, EPA expects that the occurrence would be far less. Further, compliance with the same copper and iron limits at Outfall 003B for chemical metal cleaning wastes would occur approximately every seven years. Both chemical and non-chemical metal cleaning wastes will be subject to the same BAT limits on copper and iron, and, therefore, commingling of the two related wastestreams is permitted and expected

3.0 Feasibility of the Outfall 003B Requirements

Comment IV.3.1	AR-841, UWAG, p. 33

Comment: While the existing facility might be able to isolate boiler chemical cleanings, it is physically impossible to do this for all ash washwater.

Fireside washes occur more frequently than chemical cleanings and often involve larger volumes of water. A Unit 2 annual outage might generate a million gallons or more of ash-related washwater. It is not possible to segregate and treat such large volumes of water in a system that consists of three 250,000-gallon basins.

Prohibiting the discharge of other (low volume) wastestreams to the treatment plant while metal cleaning wastes are being managed is also impossible. The flow of wastewater from an operating unit cannot be stopped with the simple turn of a valve. Floor drains continue to flow, demineralizers must be regenerated, and rain will fall. Wastewater management at a power plant is a full-time business.

EPA Response: EPA agrees that there may be feasibility issues with managing non-chemical cleaning wastes separately from low volume and other waste streams. However, as described by the Permittee above, LVW is used as process water for metal cleaning operations. EPA has explained that this does not constitute "commingling" or "dilution" and the resulting wastewater is considered metal cleaning wastewater with regard to compliance with the permitted copper and iron technology-based limits. Further, as delineated in the 2011 Fact Sheet, pages 14-15, almost half the total amount that is reported to be discharged through WTP#1 each day is from intermittent sources. WTP#1 discharges approximately 83,000 gpd; nearly 39,000 gpd is from intermittent sources that may discharge, for example, once per day, 25 times per year or as is the case with water-side metal cleaning – once every 7 years. The intermittent nature of these discharges will aid in the facility's ability to coordinate segregation of metal cleaning wastes.

EPA notes that other power plants throughout New England are required to manage their waste separately, as required for Merrimack Station. The NPDES permit for the Mystic Station power plant in Everett, Massachusetts, for instance, requires non-chemical metal cleaning wastes to receive the same level of treatment as chemical metal cleaning wastes, and both must meet mass-based limits equivalent to concentration-based limits of 1.0 mg/L for total copper and total iron. *See* Mystic Station NPDES Permit No. MA0004740. The 2008 final Canal Station NPDES Permit (withdrawn and re-noticed for unrelated reasons) also requires that non-chemical metal cleaning wastewater meet copper and iron limits prior to dilution with other wastestreams (except for chemical metal cleaning). And notably, Schiller Station, also owned by GSP, is required, pursuant to their 2018 NPDES Permit (No. NH0001473), to segregate from other waste streams, treat, and meet concentration-based copper and iron limits for chemical and non-chemical metal cleaning waste. Although, PSNH made many of the same comments about the inability to segregate nonchemical metal cleaning waste in response to the Schiller Draft Permit, the facility has been segregating this waste at Schiller Station. *See* AR-1679. These similar facilities further suggest that segregation of metal cleaning wastes is feasible at Merrimack Station.

Furthermore, in the 2011 Fact Sheet, the option of using a combined wastestream formula to develop limits was also presented as an alternative to segregation of metal cleaning wastes prior to entering the slag settling pond. EPA explained in 2011 that it did not have sufficient information to derive a combined waste stream limit. Therefore, the Permittee would have been responsible for submitting such information if a CWF approach to compliance was desired.

Comment IV.3.2	**AR-846, PSNH, pp. 211-214**

Comment: During all outages, the station floor drains are routinely exposed to fireside wastewater or some other nonchemical metal cleaning operation, e.g., condenser and heat exchanger cleanings. Therefore, the floor drain system routinely transfers a combination of LVW and nonchemical metal cleaning wastes from Merrimack Station to the treatment facility during every significant outage. A Unit 2 annual outage might generate a million gallons or more of ash-related washwater. EPA's draft permit would prohibit the commingling of these two wastestreams and would prevent the discharge of LVW to the WTP#1 during the treatment of metal cleaning waste. As explained above, these actions are not physically possible at Merrimack Station since the WTP#1 was designed to centrally treat all wastewaters. EPA's draft permit would prevent the use of the washwater recycling system and increase both the consumption of potable or river water and the generation of significantly more wastewater.

EPA Response: As explained above, Merrimack's NPDES Final Permit does not prevent the use of the washwater recycling system, and in fact, this type of reuse is encouraged by EPA. The use of LVW as washwater for metal cleaning operations is not considered "commingling" or "dilution" of the resulting metal cleaning wastewater. Instead, reuse of LVW for metal cleaning, in effect, transforms LVW into metal cleaning waste. Therefore, the permitting requirements for Outfall 003B can, at least in part, be achieved using the Station's current "washwater recycling system."

In addition, it is EPA's understanding that the Permittee rents Frac tanks during major outages to manage the high volume of metal cleaning wastewater generated. *See* 2011 Fact Sheet, p. 14. EPA also understands that the Station's floor drain system is routinely used to transfer both LVW and nonchemical metal cleaning wastes to WTP#1. Given the reduction in operations at the facility in recent years, the Region believes that with the "washwater recycling system," the use of Frac tanks during major outages, and other scheduling and management techniques, the Permittee should be able to segregate and treat chemical and non-chemical wastewater separately from LVW and other wastestreams. However, EPA acknowledges that if there are still feasibility issues with managing NCMCWs separately from other waste streams, other options may also be explored including but not limited to: 1) the use of boilers to evaporate NCMCW (similar to that done for chemical metal cleaning waste at Schiller Station); 2) the direct piping for NCMCW within the same floor drain system, so as not to occupy additional space; and 3) the use of an alternate holding tank (similar to that which was used at Schiller Station). *See* EPA *Response to Comments Draft National Pollutant Discharge Elimination System Permit No. NH0001473 Schiller Station, Portsmouth, New Hampshire,* April 2018, Response to PSNH Comment V.C.3.c.

If there are instances when the Permittee determines it may not be able to separate these wastestreams prior to treatment, EPA could possibly develop limits based on the use of a combined wastestream formula (CWF). *See* 40 CFR 403.6(e). As previously discussed, this option was made known in the 2011 Fact Sheet. *See* 2011 Fact Sheet, p. 27. Based on some of the practical considerations raised in Comment IV.3.5 and IV.3.6 below, it may be the case that neither a complete segregation of NCMCW nor the direct application of a CWF are complete solutions. If so, EPA suggests the following hybrid approach that may be a simpler and more affordable option.

First, while not all dissimilar flows may be easily segregated from NCMCWs, certainly some of the flows could be segregated simply through schedule changes, as suggested in the Fact Sheet. Next, the remaining dissimilar flows could be sampled (for copper, iron, flow, etc.) and the results used to develop a simplified CWF which only includes those waste streams that cannot be reasonably segregated from NCMCW (and chemical metal cleaning waste). EPA acknowledges that this subset of waste streams may still have highly variable flows and concentrations of copper and iron, but expects that a robust dataset along with some conservative assumptions for volumes and frequencies of certain waste streams could adequately approximate the level of treatment required to comply with the copper and iron effluent limits. Given the complex nature of this facility, EPA is open to assist the Permittee in developing such an approach, if requested.

EPA understands that the volumes of certain waste streams may need to be estimated in order to develop a reasonable CWF. EPA also acknowledges that these waste streams may vary over time as processes within the facility change. One possible way to develop a CWF is to use the historical flow results from Outfall 003B in order to provide a baseline flow. Assuming the only source of copper and iron are from the metal cleaning waste (a conservative assumption), then the only other necessary information to develop a reasonable CWF would be a comprehensive accounting of flow rates, volume and timing for each wastewater source that is routed to WTP#1. The analysis would also benefit from having specific metals data for each stream (not including the LVW that is reused as metal cleaning wash water) and a detailed flow diagram. Again, LVW used as wash water in any chemical or non-chemical metal cleaning process is no longer considered low volume waste; after reuse, it is considered metal cleaning waste. This data would provide a somewhat conservative baseline dilution factor which could then be modified by implementing schedule changes to segregate certain waste streams and/or by reusing certain waste streams as metal cleaning waste and/or by accounting for other sources of copper and iron from alternate waste streams which do not have copper and iron limits. EPA expects that this type CWF development would not be unnecessarily burdensome to the Permittee and would comply with the relevant regulatory requirements. If the Permittee wishes to apply a CWF in order to comply with the permit, EPA requires that the Permittee provide the above data and work with EPA to develop an accurate CWF. Should EPA approve the CWF, limits may be developed, and the permit modified to include these limits.

Comment IV.3.3	**AR-841, UWAG, pp. 33-36**

Comment: Region 1's purported legal basis for forbidding metal cleaning wastes from being combined with ash and low volume wastes before monitoring is a misreading of EPA's own regulations, as follows:

> It is not acceptable to determine compliance for different wastewater streams after they have been mixed (or diluted) with each other, unless the effluent limits applicable to them are the same…The metal cleaning wastes may not be combined with the ash and low volume wastes prior to compliance monitoring because the metal cleaning wastes are subject to additional effluent limitations for copper and iron.

Fact Sheet at 20. Region 1 relies largely on 40 C.F.R. § 125.3(f), a general provision that says technology-based requirements cannot be met by flow augmentation or in-stream mechanical aerators.

EPA's rules do prohibit "dilution" in lieu of treatment; but they clearly do *not* forbid commingling wastestreams *for* treatment, even if the wastestreams have different limits. The correct rule is the "combined wastestream" rule in the BAT requirements for the steam electric industry:

> In the event that waste streams from various sources are combined for treatment or discharge, the quantity of each pollutant or pollutant property controlled in paragraphs (a) through (g) of this section attributable to each controlled waste source shall not exceed the specified limitation for that waste source.

40 C.F.R. § 423.13(h); *see also* 40 C.F.R. § 423.12(b)(12) (BPT).

Indeed, EPA *encourages* centralized treatment. Its 1980 Steam Electric Development Document says "[c]onsolidation of waste streams to a centralized treatment system is permitted and encouraged." Dev. Doc. at 470. The 1974 preamble to the steam electric guidelines says much the same thing:

> It is also recognized by EPA that, due to the economies of scale, combining similar waste streams for treatment to remove the same pollutants is generally less costly than separate treatment of these waste streams. The employment of cost-saving alternatives in meeting the effluent limitations should not be discouraged.

39 Fed. Reg. 36,186, 36,196 col. 3 (Oct. 8, 1974).

Clearly, 40 C.F.R. Part 423 does not prohibit commingling. Rather, it explains what to do when commingling occurs. Section 423.13(h) prescribes how to apply limits "(i)n the event that waste streams from various sources are combined for treatment or discharge…."

The regulation Region 1 relies on, 40 C.F.R. § 125.3(f), says "[t]echnology-based treatment requirements cannot be satisfied through the use of 'non-treatment' techniques such as flow augmentation…." In the case of Merrimack, the plant and ancillary components were specifically designed to incorporate the maintenance-related waters with routine operational wastewater. The current practice of blending streams is not a "non-treatment" technique that relies on dilution, but part of the original treatment plan and design. In fact, without the ability to mix, Merrimack Station will be forced to abandon the washwater return system that allows ash waters to be recycled back to the cleaning process to reduce overall volume.

EPA also cites the internal limits rule, 40 C.F.R. § 122.45(h), as a reason to prohibit the mixing of wastestreams. But this rule says that internal monitoring points should be imposed only when the final discharge location is inaccessible or the wastes become "so diluted as to make monitoring impracticable":

> **122.45(h) Internal waste streams.**
>
> 40 C.F.R. § 122.45(h)(1)

> When permit effluent limitations or standards imposed at the point of discharge are impractical or infeasible, effluent limitations or standards for discharges of pollutants may be imposed on internal waste streams before mixing with other waste streams or cooling water streams. In those instances, the monitoring required by Sec. 122.48 shall also be applied to the internal waste streams.
>
> 40 C.F.R. § 122.45(h)(2)
>
> Limits on internal waste streams will be imposed only when the fact sheet under Sec. 124.56 sets forth the exceptional circumstances which make such limitations necessary, such as when the final discharge point is inaccessible (for example, under 10 meters of water), the wastes at the point of discharge are so diluted as to make monitoring impracticable, or the interferences among pollutants at the point of discharge would make detection or analysis impracticable.

Region 1 has failed to document the "exceptional circumstances" that it believes exist at Merrimack.

Indeed, at Merrimack Station the final discharge point (003) *is* accessible. If EPA contends that the canal and treatment pond waters dilute the metal cleaning wastes to make monitoring "impracticable," then the new 003B outfall can serve as an internal monitoring location of the combined flow from the existing treatment plant when metal cleaning wastes are being discharged. At times when they are produced, the metal cleaning wastes dominate the facility and are the most prevalent wastestream. As such, the dilution from low volume wastes is minor and plainly does *not* make monitoring the metal cleaning wastes impracticable.

EPA Response: EPA disagrees with the commenter's assessment of whether and how commingling of distinct wastestreams is allowed under the regulations and law. Both the 2011 Fact Sheet (p. 27) as well as EPA's Response to Comment IV.1.1. above, explain that commingling distinct wastestreams subject to distinct limits is inappropriate in certain circumstances. EPA never stated, as the commenter suggests, that commingling of distinct wastestreams, here metal cleaning wastes and low volume (and other) wastes, is "forbidden." In fact, as EPA's response to the previous comment makes clear, commingling may be allowed through application of a CWF. *See* Response to Comment IV.3.2. EPA relies on its recitation of the relevant regulations (2011 Fact Sheet, p. 27) and how, collectively, these regulations require segregation of metal cleaning waste from other waste sources for treatment and monitoring at Merrimack Station, unless an EPA-approved CWF is developed and applied. As described in Comment IV.2.1 for LVW, ash water used as wash water in any chemical or non-chemical metal cleaning process would no longer constitute dilution; after reuse, it is considered metal cleaning waste.

The commenter claims that the 1974 Steam Electric ELGs encourage commingling of dissimilar wastestreams with dissimilar limits. This is simply inaccurate as the language quoted itself demonstrates:

> It is also recognized by EPA that, due to the economies of scale, combining similar waste streams *for treatment to remove the same pollutants* is generally less costly than separate treatment of these waste streams. The employment of cost-saving alternatives in meeting the effluent limitations should not be discouraged.

39 Fed. Reg. 36,186, 36,196 col. 3 (Oct. 8, 1974) (emphasis added). While the 1974 preamble may have encouraged combining similar wastestreams, it did so for treatment to "remove the *same* pollutants" (emphasis added). Here, NCMCW and chemical metal cleaning waste are subject to limits for copper and iron, and low volume and other wastes are not. The above language, therefore, does not support combining these dissimilar wastestreams for treatment of *different* pollutants.

In fact, the subsequent revisions to the Steam Electric Guidelines make clear that internal monitoring and segregation of separate wastestreams is appropriate to effectuate the Clean Water Act and its regulations. The 1982 ELGs state, in relevant part,

> where the permit contains concentration based limits at the outfall for a combined waste treatment facility (e.g. ash ponds), the permit writer may establish numerical limits and monitoring on the individual, regulated waste stream *prior* to their mixing. *See* 40 CFR 122.63(i). The use of concentration based limits may necessitate the internal monitoring of several waste streams (i.e., cooling tower blowdown, metal cleaning wastes) to ensure that the pollutants of concern are not diluted by other waste streams where commingling occurs.

47 Fed. Reg. 52290, 52300 (Nov. 19, 1982). Additionally, in the 2015 Rulemaking, the Agency stated that in such cases where the CWF is impracticable or infeasible, "the permitting authority should establish internal limitations on the regulated wastestream, prior to mixing of the wastestream with others, as authorized pursuant to 40 CFR 122.45(h) and 40 CFR 403.6.62." 80 Fed. Reg. at 67884. The NPDES Permit Writers' Manual further bolsters this approach. NPDES Manual, p. 5-37, 8-4.[13]

Additionally, in an attempt to argue that 40 CFR § 125.3(f) is inapplicable or irrelevant, the commenter asserts that the Merrimack Station facility was designed to incorporate commingling

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[13] The NPDES Manual provides:

- "If a wastewater stream that does not contain a pollutant is combined with another wastewater stream that contains the pollutant (and has applicable requirements in the effluent guidelines or requirements determined by the permit writer using BPJ), the permit writer must ensure that the non-regulated waste stream does not dilute the regulated waste stream to the point where the pollutant is not analytically detectable. If that occurs, the permit writer will most likely need to establish internal outfalls, as allowed under § 122.45(h) and in Step 7 below." p. 5-37.
- "Examples of reasons for requiring designation of internal monitoring locations include the following:
  • Ensuring compliance with effluent guidelines (at non-POTW facilities): When non-process wastewaters dilute process wastewaters subject to effluent guidelines, monitoring the combined discharge might not accurately allow determination of whether the facility is complying with the effluent guidelines. Under such circumstances, the permit writer might consider requiring monitoring for compliance with TBELs before the process wastewater is combined with nonprocess wastewater." p. 8-4.

as a treatment method. The fact that the facility may have intended for dilution to be a part of its treatment process does nothing to negate the regulatory requirement set forth in section 125.3(f) that "Technology-based treatment requirements cannot be satisfied through the use of 'non-treatment' techniques such as flow augmentation." That Merrimack would categorize its dilution as "treatment" is without legal import. Dilution of metal cleaning wastes through commingling with low volume and other wastes, a form of flow augmentation, does not satisfy technology-based treatment requirements at Merrimack Station, without the application of a CWF.

Importantly, EPA agrees that when combining wastestreams from various sources for treatment and discharge "the quantity of each pollutant … attributable to each controlled waste source shall not exceed the specified limitation for that waste source." 40 CFR § 423.13(n). For the 2011 Draft Permit, limits derived using the CWF was offered as an alternative to segregating different waste streams. However, the Region did not have sufficient information to develop limits at that time. *See* 2011 Fact Sheet. If and when the Permittee provides the necessary information, the Region can modify the permit to include copper and iron limits determined using the CWF.

Furthermore, as explained in the 2011 Fact Sheet and Response to Comment IV.1.1 above, the compliance point for 003B in the 1992 Permit was in error because it allowed technology-based limits for iron found in the Steam Electric ELG's for chemical metal cleaning discharges to be met using dilution provided by the slag settling pond water (the chemical metal cleaning waste is treated upstream at WTP#1 and is reported to amount to only a tiny fraction of the total flow from the pond). The 2011 Fact Sheet explains that the error must be corrected for the renewed permit because "[a]pplying the copper and iron limit of 1.0 mg/L to the combined waste streams from the Slag Settling Pond would potentially allow the Permittee to 1) comply by diluting the metal cleaning waste stream rather than treating it, and 2) discharge a total mass of copper and iron in excess of that authorized by the NELGs." 2011 Fact Sheet, p. 27. The Region may have neglected to cite the regulation but the implication is the same: "the wastes at the point of discharge are so diluted as to make monitoring impracticable, or the interferences among pollutants at the point of discharge would make detection or analysis impracticable." 40 CFR § 122.45(h)(2). Therefore, the Region did provide the explanation and rationale required to satisfy § 122.45(h)(2).

Regarding the new internal waste stream 003B (after WTP#1) with the commenter states that "[a]t times when they are produced, the metal cleaning wastes dominate the facility and are the most prevalent wastestream. As such, the dilution from low volume wastes is minor and plainly does *not* make monitoring the metal cleaning wastes impracticable." The Region agrees that metal cleaning wastes may be the most prevalent wastestream at times, but this circumstance would likely make it easier for the Permittee to segregate metal cleaning waste.

Comment IV.3.4	AR-846, PSNH, pp. 211-214

Comment: EPA's rationale for prohibiting this requirement is based on 40 C.F.R. § 125.3(f), which prohibits dilution in lieu of treatment. PSNH recognizes that dilution is not an option. However, EPA's regulations do not forbid commingling of wastestreams. Specifically, EPA regulations state:

> In the event that waste streams from various sources are combined for treatment or discharge, the quantity of each pollutant or pollutant property…attributable to each controlled waste source shall not exceed the specified limitations for that waste source.

40 C.F.R. 423.13(h). EPA's guidelines make this point even more clear:

> It is also recognized by EPA that, due to economies of scale, combining similar waste streams for treatment to remove the same pollutants is generally less costly than separate treatment of these waste streams. The employment of cost saving alternatives in meeting the effluent limitations should not be discouraged.

39 Fed. Reg. 36,186, 36,196 (Oct. 8, 1974). Other sections of EPA's regulations explain how EPA will address limits if wastestreams are combined for treatment. See 40 C.F.R. § 423.13(h). This clearly acknowledges that the regulations do not prohibit the commingling of wastestreams.

EPA Response: See Response to Comment IV.3.3 above.

Comment IV.3.5	AR-1548, PSNH, pp. 208-210

Comment: Requiring changes in current plant processes to segregate and treat NCMCWs would be difficult, if not impossible. The processes and engineering modifications suggested in the 2011 Fact Sheet are based on nothing more than unfounded assertions. EPA has not visited nor tried to visit Merrimack Station to determine whether such modifications are even plausible. If it had, it would see that current infrastructure and processes employed would need to be extensively overhauled in order to attempt to segregate and treat NCMCWs from other low volume wastes. Even then, complete segregation from other low volume waste streams prior to treatment may not be possible.[799]

EPA attempts to gloss over these operational realities by proposing that PSNH can monitor chemical and nonchemical metal cleaning wastewater for compliance with copper and iron limitations separate from other waste streams.[800] It is an unrealistic assumption that PSNH can eliminate or divert all other low volume waste streams whenever NCMCWs are being generated and treated or that the facility can divert isolated NCMCWs to another treatment process before commingling the waste stream with other low volume waste streams.[801] These abstract statements ignore the fact that Merrimack Station was specifically designed to handle and treat smaller and less infrequent waste streams, like NCMCWs, in a centralized manner for the sake of efficiency. Attempting to overhaul this decades-long practice does not take place by the push of a button or a change in operational procedure.

As currently proposed, any wash water that comes in contact with any "metal process equipment" constitutes NCMCWs, according to EPA's broad definition.[802] At Merrimack Station, this includes all wash water utilized to pressure wash boilers, air heaters, precipitators, and stacks, among other associated process equipment. Within the industry, the primary treatment system for wastewaters of this kind is designed to operate in a centralized manner, *i.e.*, to mix streams and manage them together in order to be efficient.[803] Merrimack Station is no different.

For instance, wastewaters from boiler blowdown, demineralizer regenerations, and floor drains (collectively considered low volume wastes) are commingled at Merrimack Station, both out of necessity and by design. Even during other shorter outages, Merrimack Station's floor drains are routinely exposed to fireside wastewater or some other nonchemical metal cleaning operation, *e.g.*, condenser and heat exchanger cleanings. Therefore, the floor drain system routinely transfers a combination of low volume wastes and NCMCWs from Merrimack Station to the treatment facility.

A mandate to manage NCMCWs separately is not currently possible at Merrimack Station since the wastewater treatment facilities were designed to centrally treat all wastewaters. Such wash waters necessarily end up in floor drains, where they are unavoidably combined with other low volume wastes. Furthermore, even if possible, segregation of NCMCWs from other low volume waste streams would be labor intensive (e.g., construction of isolated berms or other temporary containment structures so that wash water could be contained and held for treatment) and likely lead to upsets and/or recurring operational issues. Although in theory it seems plausible to operate facilities in a neat and tidy manner and ensure NCMCWs are isolated, this is just simply not feasible. PSNH's facilities are operated within the bounds of reality, which makes it not practicable to completely segregate NCMCWs from other low volume waste streams prior to treatment.

Further complicating matters is that the infrastructure retrofits necessary to isolate NCMCWs are generally very expensive and, once installed, necessarily preclude other technologies from occupying the same space, meaning facilities have limited space in which to achieve the maximum environmental benefit from control technologies. The relative infrequency of nonchemical metal cleaning operations at Merrimack Station, the fact the metals in the waste stream settle out easily with the current wastewater treatment systems, and the substantial volume of water generated during a unit wash down (at least under EPA's expansive definition of what constitutes NCMCWs) that would need to somehow be isolated and retained, lead to only one reasonable conclusion: the investment in retrofit technology for the isolated treatment of NCMCWs cannot be justified given all other environmental regulatory initiatives requiring retrofits that compete for the same space within the facility.

Managing NCMCWs in the manner EPA has proposed in the Draft Permit will likely require the addition of a second storage facility at Merrimack Station. Unless a facility has a substantial existing footprint with copious amounts of unused real estate, which Merrimack

Station does not, the most likely option to fit a storage facility would be to reclaim a section of an existing treatment system to construct new basins. This is a costly proposition and would impact the effectiveness of treatment currently provided by reducing retention time in existing treatment systems.

799 *See* AR-608 at 31.
800 *See id.* at 27-28.
801 *See id.* at 31.
802 *See id.* at 28.
803 *See, e.g.,* EPA, Technical Development Document for the Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category, Dock. ID EPA-821-R-15-007, at 8-19 (Sept. 2015) ("The vast majority of plants combine some of their legacy wastewater with each other and with other wastestreams, including . . . metal cleaning wastes, and low volume waste sources in surface impoundments.").

EPA's Response: To start, see EPA's Response to PSNH Comment IV.1.3 above regarding the definition of NCMCWs not being as "broad" as the commenter suggests. Given this clarification, EPA acknowledges that there still may be feasibility issues with managing NCMCWs separately from low volume and other waste streams. If this is the case, EPA notes that the option of using a combined waste stream formula (CWF) to develop limits was also put forward in the 2011 Fact Sheet. EPA explained in 2011 that it did not have sufficient information to derive a combined waste stream limit. Therefore, the Permittee is responsible for developing a CWF approach to compliance, if desired.

Given some of the practical considerations raised in this comment, EPA also notes that other options may also be explored to properly segregate NCMCW in compliance with this permit. These options include, but not limited to, (1) the managed use of one or more of the three 250,000-gallon basins to hold and subsequently treat NCMCWs separately from other waste streams, or (2) the reuse of low volume wastewater as metal cleaning process water as described above in Comment IV.2.1, or (3) using the boilers to evaporate NCMCW (similar to that done for chemical metal cleaning waste at Schiller Station as described in the Schiller Station Fact Sheet at 21), or (4) direct piping for NCMCW within the same floor drain system, so as not to occupy additional space, or (5) the use of an alternate holding tank or FRAC tank to segregate and treat NCMCW. EPA maintains that, given the various options available to the Permittee presented in the Fact Sheet as well as here, proper segregation of NCMCWs and/or sampling for compliance with the permit is both possible and the costs associated with such segregation should be modest. Indeed, segregation of chemical and non-chemical metal cleaning wastes at the nearby Schiller Station have been achieved, even though nearly identical complaints were made regarding feasibility. *See* AR-1679. Furthermore, EPA expects that limited "peaking" operations at the plant will reduce the amount of wastewater generated from all process operations and will therefore facilitate segregation.

Although EPA visited the facility many years ago, the permit renewal application should include the information necessary to develop permit limits. Generally, EPA also issues CWA Section 308 information requests when more information is necessary. Therefore, EPA concludes that it has all necessary information to develop permit limits for NCMCW and other wastestreams.

Finally, as previously mentioned, EPA notes that other power plants have been able to manage their waste separately, as required for Merrimack Station. *See* Response to Comment IV.3.1.

Comment IV.3.6	**AR-1548, PSNH, pp. 210-212**

Comment: Use of a combined waste stream formula will not work at Merrimack Station. EPA advances the development of a combined waste stream formula as one potential mechanism for handling and treating NCMCWs in the manner it has proposed in the Draft Permit.[804] The agency asserts that electing to comply with the proposed permit limitations utilizing this approach could be less expensive than making engineering modifications at the facility.[805] In reality, use of a combined waste stream for the effective treatment of NCMCWs at Merrimack Station is not practical and would likely result in the use and waste of thousands of dollars of chemical treatments not ultimately necessary to comply with the proposed iron and copper effluent limitations.

This treatment theory is impractical for numerous reasons. For starters, the respective total volumes, frequencies, and concentrations of iron and copper for NCMCWs and each of the current waste streams commingled with NCMCWs are inherently variable. No two volumes of NCMCWs are the same for equipment water washes at Merrimack Station or anywhere in the industry. EPA recognized this as part of its 2015 ELGs rulemaking: "Additionally, some wastestreams have significant variations in flow, such as metal cleaning wastes[.]"[806] Employing EPA's overly-broad definition of NCMCWs, some form of this waste stream may be generated hourly or daily most days and may be continuous for extended periods of time during a planned outage. The generating frequency and volumes of boiler blowdown, demineralizer regenerations, floor drains, and other low volume wastes currently commingled with NCMCWs at Merrimack Station likewise fluctuate a great deal depending upon plant operations and other factors.

Concentrations of iron and copper attributable to each waste stream are likewise impossible to predict or estimate with any degree of certainty and would be further compounded by intake credit issues.[807] PSNH currently has no way of knowing what amount of iron and copper limits are attributable to each isolated low volume waste stream, and given the aforementioned variables, PSNH has serious doubts the concentrations of iron and copper within these isolated low volume waste streams remain consistent. Instead, it is more likely the amount of iron and copper in, for instance, NCMCWs and wastewater entering floor drains fluctuates a great deal depending upon plant and/or personnel operations.

Due to the aforementioned myriad of variables and unknowns, establishing a preset formula to effectively treat NCMCWs at Merrimack Station and ensure compliance with the proposed iron and copper effluent limitations utilizing the combined waste stream theory is not possible. Attempting to rely upon a formula such as this would cause PSNH to either over-treat the combined waste stream with excessive amounts of chemicals to precipitate out the iron and copper constituents at a significant annual cost or, conversely, subject the facility to frequent and repeated exceedances of the proposed effluent limitations due to the great degree of variability in the makeup of the combined waste stream. Neither scenario is a sensible one. The combined waste stream formula approach should therefore be disregarded as impractical for the regulation of NCMCWs at Merrimack Station.

804 *See* AR-608 at 27.
805 *Id.* at 32.
806 80 Fed. Reg. at 67,855.
807 *See* 40 C.F.R. § 122.45(g) (providing that technology-based effluent limitations shall be adjusted to reflect credit for pollutants in the discharger's intake water under certain conditions).

EPA's Response: The commenter broadly concludes that application of a CWF to ensure compliance with copper and iron limits for metal cleaning wastes is impossible and should be disregarded. EPA, on the other hand disagrees. First, the commenter's repeated suggestion that EPA's definition of NCMCW is "overly broad" is without merit, as the Region has explained in Response to Comment IV.1.3 above. Any reliance on this definition is misguided and not relevant. Moreover, with the appropriate assumptions and analysis, a CWF may be possible as an approach or part of a hybrid approach to addressing metal cleaning waste. *See* Response to Comment IV.3.2. above.

4.0 Longstanding EPA Practice for Nonchemical Cleaning Wastes

Comment IV.4.1	**AR-841, UWAG, pp. 36-38**

Comment: EPA has set BAT limitations guidelines for chemical metal cleaning waste (Part 423.13(e)) but has reserved BAT for nonchemical metal cleaning waste, *e.g.*, ash washwaters (Part 423.13(f)). In the draft Merrimack permit, EPA suggested that the BAT standard for chemical metal cleaning waste applies to nonchemical metal cleaning waste. But EPA did *not* do that in the 1982 ELG's. Instead, it reserved judgment until more information was known regarding the cost and economic impact that would result from requiring the entire industrial category to ensure that nonchemical metal cleaning wastes satisfy the same limits that had been set for chemical metal cleaning wastes. 47 Fed. Reg. 52,290, 52,297 (Nov. 19, 1982). Nonchemical waste is not to have BAT limits applied until more is known about the financial impact.

Moreover, until EPA addresses the question, dischargers are entitled to continue to rely on EPA's 1975 guidance that metal cleaning wastes are those where chemical additives, not just water, are used for washing. In 1975, EPA issued the "Jordan Memorandum," which said that wastestreams produced by metal cleaning without chemical additives would *not* be regulated as "metal cleaning wastes" but rather as low volume wastes. Pursuant to the Jordan Memorandum, wastestreams produced by metal cleaning with only water were not subject to the 1 mg/L iron and copper limitations that apply to metal cleaning wastes.

In 1980, EPA proposed to revise the steam electric guidelines. 45 Fed. Reg. 68,328 (Oct. 14, 1980). In the preamble, EPA renounced future adherence to the Jordan Memorandum (*id*. at 68,333 col. 2), stating that "metal cleaning wastes" are defined broadly enough to include wastes derived from cleaning any metal process equipment.

However, the final regulations tempered this extreme position. Although nonchemical metal cleaning wastes were explicitly regulated under BPT, they remained reserved for future regulation under BAT and NSPS. Furthermore, the preamble to the final guidelines stated that "until the Agency promulgates new limitations and standards, the previous [Jordan Memorandum] guidance policy may continue to be applied in those cases in which it was applied in the past." 47 Fed. Reg. at 52,297 col. 3. Thus, a permit writer may allow those companies that followed the Jordan Memorandum in the past to continue without BPT limits for iron and copper in nonchemical metal cleaning wastestreams.

Nonchemical metal cleaning waste (fireside ash washwater) is similar in quality to other wastewaters that are managed in a power plant on a daily basis. Chemical metal cleaning waste (chemical cleanings), on the other hand, is unique, infrequent, and aggressive. By their nature, chemical cleanings deserve to be in a separate category. Ash washwater needs to be managed like all other wastewater collected at the facility and requires no special provisions.

Just as with closed-cycle cooling and biological treatment, EPA is using its "Best Professional Judgment" to enforce the most stringent controls possible on Merrimack Station with the justification that "PSNH can afford these expenditures given that Merrimack Station is a profitable, baseload power plant." This is an inadequate and superficial justification for imposing new costs on PSNH's customers, and it is also incorrect, in that Merrimack is not a baseload" plant but rather one whose power is dispatched based on economics.

EPA makes a token comment that, "from an engineering standpoint," the ash washwaters can be segregated and treated with some "scheduling adjustments." This conclusion appears to be unfounded. PSNH will be required to make a significant investment to comply with this requirement, including the addition of at least 100-percent more storage capacity. The most unfortunate consequence is that there is no question that the existing technology and practices treat the wastestream to below the copper and iron limits of 1.0 mg/L – the conflict is simply over when the various wastestreams are allowed to mix.

For the above reasons, the nonchemical metal cleaning wastes should continue to be grouped together and monitored with other low volume wastes.

The 003B conditions should continue to only apply to chemical cleanings.

If EPA insists on regulating nonchemical metal cleaning wastes as "chemical," PSNH requests a compliance schedule be established so that sufficient information can be gathered to allow for a combined wastestream formula to be created so that the wastestreams may continue to be commingled and monitored together.

EPA Response: See Response to Comment IV.1.2 above for the Region's discussion of the definition of non-chemical metal cleaning waste, its rationale and approach for regulating this wastestream as a metal cleaning waste rather than a low volume waste, its BPJ-based BAT determination, and the inapplicability of the Jordan Memorandum at Merrimack Station.

The commenter also incorrectly suggests that the Region's site-specific determination of BAT limits for NCMCW was based solely on misguided cost considerations. Contrary to this suggestion, the Region established BAT limits for NCMCW pursuant to an assessment of numerous regulatory factors set forth in both section 304(b)(2) of the CWA and 40 C.F.R. § 125.3(d)(3). 2011 Fact Sheet, pp. 30-33. The commenter ignores this multifaceted analysis, and instead misinterprets EPA's decision as being based solely on cost. On a related note and as a point of clarification, the Region acknowledges that Merrimack Station no longer operates as a baseload plant, and instead operates and plans to continue to operate as a "peaking facility." *See* Response to Comment IV.1.1 and Chapter II of this document. The reduced operations, in fact, will likely reduce the amount of NCMCWs produced and therefore allow for simpler management and segregation of this wastestream. *See* Response to Comment IV.1.1.

Moreover, in response to commenter's assertion that "scheduling adjustments" will not contribute to the facility's ability to manage segregation of metal cleaning wastes, the Region refers the commenter to Response to Comments IV.3.2 and IV.3.6 above, in which the Region identifies numerous different engineering and other approaches that may be taken alone or in combination to successfully manage metal cleaning wastes. Scheduling adjustments may be part of a broader approach to addressing metal cleaning wastes in conjunction with recycling of low volume wastes and use of a CWF.

See Response to Comment IV.1.2 above for the Region's discussion of the definition of non-chemical metal cleaning waste, its rationale and approach for regulating this wastestream as a metal cleaning waste rather than a low volume waste, its BPJ-based BAT determination, and the inapplicability of the Jordan Memorandum at Merrimack Station.

In regard to the commenters request for "a compliance schedule be established so that sufficient information can be gathered to allow for a combined wastestream formula to be created so that the wastestreams may continue to be commingled and monitored together" EPA declines to include such a compliance schedule. See Response to Comment IV.5.6 below.

Comment IV.4.2	**AR-846, PSNH, pp. 211-214**

Comment: EPA arbitrarily and substantially changed PSNH's requirements for discharges via Outfall 003B and should eliminate these requirements in the final permit for Merrimack Station. Specifically, EPA should only include "chemical cleaning waste discharges" in Outfall 003B. Likewise, fireside washes and/or more routine operations should be allowed to combine prior to monitoring and should continue to be managed through Outfall 003A. Since 1985, EPA has addressed metal cleaning waste at Merrimack Station in this manner.

Response: See Response to Comment IV.4.1 and other responses to comments related to non-chemical metal cleaning wastes above.

Comment IV.4.3	AR-846, PSNH, pp. 211-214

Comment: EPA's prohibition of LVW from mixing with metal cleaning water is unwarranted and not required by EPA regulations. EPA wrongly assumed that Merrimack Station was simply diluting metal cleaning water as a treatment technique. This is wrong. Merrimack Station mixes the wastestreams as part of its overall design and efficient operation of the facility. Further, because Merrimack Station's Outfall 003 is accessible and monitoring is practicable, this requirement is unwarranted. EPA's unsupported assumption that PSNH can engineer the solution or make scheduling adjustments to achieve EPA's unreasonable requirements is arbitrary, capricious, and has no factual basis. This is especially true in light of the fact that EPA's assumption would require PSNH to spend significant resources and attempt to increase its storage capacity by approximately 100 percent in an already tight footprint. Simply put, PSNH does not have the extra capacity or space to segregate the wastestreams and EPA's requirements on this issue are arbitrary. Making PSNH spend money for the sake of spending money is never right.

EPA Response: See Response to Comments IV.1.1., IV.2.1, IV.3.2, IV.3.6, and IV.4.1.

Comment IV.4.4	AR-846, PSNH, pp. 213-214

Comment: Also, Region 1 recently issued the Brayton Point facility a permit that authorizes the combined treated wastestream of metal cleaning wastes and LVW, clearly indicating its regulatory authority to do so. Apparently, EPA reasoned that the LVWs have similar characteristics as nonchemical metal cleaning wastestreams. In fact, EPA is correct on this point. Both streams often have similar concentrations of the same metals and it is impractical, costly, and inefficient to manage the two streams separately. EPA should revise these requirements so that Outfall 003B only regulates the discharge of chemical metal cleaning wastes.

EPA Response: The commenter's assessment of EPA's treatment of low volume wastes and metal cleaning wastes in the Brayton Point NPDES is flawed in a few key respects.

First, the approach for metal cleaning that EPA took with the Brayton Point permit is not inconsistent with that taken with Merrimack Station. The 2002 Fact Sheet for Brayton Point shows that EPA applied the regulations and law in the same manner when determining how to define and regulate metal cleaning wastes versus low volume wastes:

> In the current permit, low volume waste sources and metal cleaning wastes are combined under the term "Wastewater Treatment System (WWTS)", Outfall 004. Low volume waste sources consist of wastes from floor drains, water treatment wastes, boiler blowdown, boiler seal water, and future air pollution control equipment. Metal cleaning wastes consist of wastes from air preheater wash, boiler fireside wash, precipitator wash, boiler chemical cleaning, and feedwater heater chemical cleaning. However, according to the technology-based effluent guidelines at 40 CFR §423, low volume waste sources and metal cleaning wastes are independently named waste streams, with separate limits.
>
> Under the existing permit it is possible for the permittee to dilute the metal cleaning wastes with the low volume waste sources in the wastewater treatment system; thereby

> potentially allowing the metals (copper and iron) to be discharged in excess of the limitations at 40 CFR §423. This is because the existing permit established limits and monitoring for the metals after mixing in the wastewater treatment system. Dilution is not an acceptable means of achieving technology-based limitations. In addition, if the metal cleaning wastes are greatly diluted, removal of the pollutant metals in the metal cleaning wastes becomes more difficult and less efficient because of the dilution. The effluent guidelines at 40 CFR §423 were developed to take advantage of the higher removal efficiencies achievable by treating a concentrated waste stream such as metal cleaning wastes.
>
> In order to fully assure compliance with the effluent guidelines, this draft permit develops mass limits for copper and iron (see sections 4.5.6 and 4.5.7 for calculations and reporting methodologies). The limits apply to outfall 004, prior to mixing with any other waste streams. The draft permit requires that the pollutants in metal cleaning wastes be removed to a standard shown to be economically achievable and technically available. Alternatively, the facility may chose [sic] to cease the discharge of metal cleaning waste and instead contain and transport them to an outside facility for treatment and disposal.

2002 Brayton Point Fact Sheet, p. 8 (AR-1677). Still, similar to Merrimack, the Brayton Point Fact Sheet further explains that "[l]ow volume waste sources (LVW) and metal cleaning wastes (MCW) may be combined for treatment provided the effluent limitations for each are individually met." Consequently, EPA effectively derived mass-based limits for copper and iron, assuming there was no contribution of these metals from the LVW. *Id*. at 17-18. However, EPA explains on page VI-3 of the 2003 Response to Comments document for the Brayton Point NPDES Permit, that "[t]his determination was made in the absence of metal composition and concentration data for the other waste streams entering the wastewater treatment facility… [and] [t]he facility has now submitted information indicating that other waste streams entering the WWTF contain metals, such as copper and iron, that are similar in concentration and composition to the metal cleaning waste stream." Merrimack Station has not provided such data.

Notably, the above language demonstrates that EPA concluded that 1) low volume waste and metal cleaning waste (which includes non-chemical metal cleaning waste) are separate wastestreams; 2) dilution is not an acceptable method of treatment or "means of achieving technology-based limitations"; and 3) separate wastestreams (like low volume waste and metal cleaning wastes) may be combined so long as the effluent limitations for *each* are *individually* met. These three principles are the same as those articulated and relied upon in the Merrimack Station Permit. While the use of mass-based limits developed in Brayton Point is one method of ensuring that these principles are employed, it is not the only method. In Merrimack Station, the Region determined that segregation in combination with or in lieu of a CWF or recycling of low volume wastes is the appropriate method of ensuring those same three principles are employed.

Second, the above discussion demonstrates another key point that the commenter fails to acknowledge in its comment, namely, that each permit it distinct and unique. This is particularly so here, where EPA must make a site-specific assessment of BAT limits for non-chemical metal cleaning waste. As stated above, EPA applied the regulations and law in the same manner, but, given the site-specific information and facts at Merrimack Station, arrived at a different result for how metal cleaning waste shall be regulated.

Finally, the Brayton Point permit identified by the commenter was issued prior to promulgation of the recent 2015 ELGs. As stated throughout EPA's responses above, the 2015 preamble language clarified how the Agency is to assess and determine BAT limits for non-chemical metal cleaning waste, and the Region has been consistent with the preamble language in its regulation of non-chemcial metal cleaning waste at Merrimack Station.

Comment IV.4.5	AR-1548, PSNH, pp. 188-189

Comment: Each unit at Merrimack Station has historically treated NCMCWs as a low volume waste, meaning the wastewater stream is not subject to any iron and copper effluent limitations. This is true despite the fact that iron and copper limits apply to the outfall through which this wastewater discharges (Outfall 003A) in the current NPDES permit for the facility. The iron and copper effluent limitations applicable to Outfall 003A serve only to ensure that metals are not present in any unexpected waste stream. NCMCWs should continue to be classified as a low volume waste in the new Final Permit for Merrimack Station. Indeed, this continued classification is mandatory based on the historical permitting record for the facility, as well as the contents of EPA's administrative record for this permit renewal proceeding.

Classifying and treating NCMCWs as a low volume waste (i.e., not subject to any iron and copper effluent limitations), as Merrimack Station does, is standard practice for most of the industry and is also consistent with long-standing EPA guidance set forth in what is commonly referred to as the "Jordan Memorandum."[736] EPA fails to reference the Jordan Memorandum even once in its 2011 Fact Sheet for the Draft Permit. In omitting the discussion of this important document, EPA has ostensibly simplified its ultimate objective of saddling NCMCW discharges with iron and copper effluent limitations at the facility in the new Final Permit. This failure to adequately consider the historical permitting record at Merrimack Station is arbitrary, capricious, and at odds with EPA's directives set out in the final NELGs.

[736] See Memorandum from J. William Jordan, Chemical Engineer, Permit Assistance & Evaluation Division, Office of Enforcement, EPA Headquarters, to Bruce P. Smith, Biologist, Enforcement Division, EPA Region III (June 17, 1975). Hereinafter, references to this document will be cited as "Jordan Memorandum." The Jordan Memorandum is attached hereto as Exhibit 21.

EPA Response: See EPA's Response to Comments IV.1.1 and IV.1.2 above, and other responses to comments related to non-chemical metal cleaning wastes.

Comment IV.4.6	AR-1548, PSNH, pp. 195-197

Comment: As stated above, each unit at Merrimack Station has historically treated, and continues to treat, NCMCWs as a low volume waste (*i.e.*, not subject to any iron and copper limits that may exist in its current NPDES permit). This long-standing practice is consistent with the principles of the Jordan Memorandum. As explained in detail below, it is also consistent with the operative language—or lack thereof—in the NPDES permit for this facility.

Notably, NCMCWs are not expressly referenced anywhere in Merrimack Station's existing NPDES permit and its associated Fact Sheet and Response to Comments.[763] Instead, NCMCWs are subsumed in the category of low volume wastes, in accordance with applicable regulations and the principles of the Jordan Memorandum. The relevant analysis of Permit No. NH0001465 centers around a single outfall that has been given two designations: one for normal operations at the plant (Outfall 003A) and the other for operations during the time period when chemical waste from cleaning the boiler tubes enters the process waste treatment plant (Outfall 003B). Consistent with EPA's 1982 regulations, Permit No. NH0001465 includes iron and copper discharge limitations with daily monitoring for discharges from the ash settling pond during chemical cleaning operations.[764] Iron and copper discharge limitations with quarterly monitoring requirements also exist for discharges from the ash settling pond during normal operations at the plant.[765] However, the Fact Sheet for Permit No. NH0001465 provides that these limits and monitoring requirements are included solely to protect against the "possibility that copper [and iron] retained in the pond may be released at times other than chemical cleaning periods."[766] Such limits are not meant to, and accordingly do not, apply to any NCMCWs that are also channeled to the ash settling pond. This fact is confirmed by EPA's synopsis of Comment 8 to Permit No. NH0001465 and the agency's corresponding response:

> COMMENT 8
> The permittee requests that the total copper discharge limit at Outfall 003A be eliminated, *since the ELGs regulate copper discharges for chemical cleaning operations only*, and not for routine-low volume discharges from ash settling ponds, for example.
>
> RESPONSE 8
> *The ELGs do not establish copper limitations on low volume wastes*, ash pile runoff, or storm water runoff (components of the ash pond discharge, Outfall 003A). The maximum total copper limitation of 0.2 mg/l is being maintained in accordance with the anti-backsliding provision of 40 CFR 122.44(1). It is to be noted that . . . this discharge has shown an average total copper concentration of 0.0015 mg/l in the past two years.[767]

The fact that Permit No. NH0001465 only requires quarterly monitoring for iron and copper during normal operations further supports the fact that the numeric limits do not apply to discharges of NCMCWs. If these limits did apply, monitoring would likely be required once per discharge—if not more frequently—as Merrimack Station typically generates NCMCWs more often than once every quarter. In actual fact, the numeric iron and copper discharge limitations applicable to discharges during normal operations serve only as a general safeguard to check these surrogates to ensure that metals are not present in any unexpected waste stream. PSNH's historical record of no such unanticipated iron and copper discharges has allowed it to reduce the required monitoring frequency at each of its plants over time.[768]

In the end, it is clear that NCMCWs at Merrimack Station are "currently authorized without iron and copper limits," within the meaning of the Jordan Memorandum. Therefore, the analysis provided above, coupled with a thorough review of the materials provided with these comments, necessitates a conclusion that NCMCWs at Merrimack Station should be treated as low volume waste—not subject to any iron and copper limits.

763 *See* AR-236; AR-242; Permit No. NH0001465, Response to Comments (June 24, 1992). This document is attached hereto as Exhibit 22 and, hereinafter, references to it will be cited as "1992 Response to Comments."
764 AR-236 at 11.
765 *Id.* at 10.
766 AR-242 at 5. The Fact Sheet associated with PSNH's existing NPDES permit for Merrimack Station only expressly explains that numeric copper limitations have been placed on discharges from the ash settling pond during normal operations to address the possibility that copper entering the pond following chemical metal cleaning operations may be released at other times. *See id.* This reasoning must apply equally to the numeric iron limitations applicable to that outfall during normal operations. It would be inconsistent to place numeric iron limits in an NPDES permit to regulate NCMCW discharges and not place such limits on copper discharges—or vice versa. The Fact Sheet substantiates this conclusion. Nowhere in the discussion of the numeric iron discharge limitations are NCMCWs mentioned. *See generally id.* Instead, only chemical metal cleaning wastes, as well as the prevalent background concentration of iron in the Merrimack River, are discussed. In fact, the Fact Sheet identifies these sources as the only two from which iron discharges may originate: "EPA concludes that iron (*whether from intake water or chemical cleaning operations*) in the slag pond discharge . . . ." *Id.* at 5 (emphasis added). Consequently, the only rational conclusion is that numeric iron limitations were included in Permit No. NH0001465 to address the possibility that iron entering the pond following chemical metal cleaning operations may be released at other times. This fact is also confirmed by the initial Fact Sheet drafted by EPA Region 1 in 2009 as a part of the NPDES permit renewal for PSNH's Merrimack Station, which was eventually issued for public notice and comment in September 2011. *See* AR-474. With respect to the 1.0 mg/L total recoverable iron limitation included in PSNH's existing permit, EPA Region 1 provided that "[i]t is surmised the 1.0 mg/L iron limit for Outfall 003A is to limit any iron discharged from WWTP No. 1 to the Slag Settling Pond when treating metal cleaning wastes." *Id.* at 6. In other words, as explained above, a numeric iron limitation was only included for Outfall 003A (*i.e.*, normal operations), to enable PSNH and EPA to detect if and/or when residual iron concentrations originating from chemical metal cleaning wastes are discharged during normal operations. These limits were not imposed to regulate NCMCWs.
767 1992 Response to Comments at 4 (emphases added).
768 *See, e.g.,* U.S. EPA, Region 1, NPDES Permit No. NH0001601 and associated Fact Sheet for Newington Station (Sept. 30, 1993), attached hereto as Exhibit 23, wherein EPA discusses this safeguarding measure and explains the impact of the facility's history of compliance:

> The effluent limits for Outfall 01C are identical with those for 01A; however, the monitoring frequencies differ. For Outfall 01A the monitoring frequency in the current permit is weekly. A review of past permitting-period monitoring data, during normal operation of the wastewater treatment system; indicates treated-wastewater loading levels consistent with an efficient operation of the wastewater treatment facility. Consequently, the sampling frequency for Outfall 01A is being reduced from weekly to monthly in the draft permit.

Id., Fact Sheet at 4.

EPA Response: EPA disagrees that non-chemical metal cleaning waste should be treated as a low volume waste. First, for the reasons identified above in Response to Comment IV.1.1 and IV.1.2, EPA concludes that the historical permitting record does not demonstrate that non-chemical metal cleaning waste has been regulated as a low volume waste in the past and that it would not be appropriate to regulate it as a low volume waste within this Final Permit.

Notably, nowhere in the 1992 Merrimack Station permit does EPA define NCMCW as low volume waste. What the 1992 permit *does* include, however, is copper and iron effluent limitations that are applicable to the outfall through which NCMCWs are discharged. The commenter's reference to Comment-and-Response 8 from the Merrimack permit record does not change this assessment. This colloquy only states that copper limits are not applied to low volume wastes, it does not establish that NCMCWs are classified as low volume wastes.

Additionally, the comment suggests that quarterly monitoring for copper and iron in the existing Merrimack Station permit somehow indicates that these limits must not be based on NCMCWs because such wastes are typically generated more frequently than once per quarter. Yet, the monitoring frequency for effluent limitations is often less frequent than the expected discharge frequency for the target pollutants. For example, the 1992 Merrimack Station permit contains monthly monitoring requirements for oil & grease limits at Outfall 003A, even though the expected discharge frequency at this outfall is greater than once per month.

5.0 EPA's BAT Analysis for Iron and Copper Limitations

Comment IV.5.1	**AR-1548, PSNH, p. 189**

Comment: EPA's BAT analysis for determining iron and copper effluent limitations for NCMCWs in the Draft Permit is arbitrary and capricious, as well. Upon information and belief, the agency has no data of isolated NCMCW discharges generated at Merrimack Station that would allow it to competently complete the required BAT determination. There is certainly no such data in the administrative record EPA has compiled for the Draft Permit. Moreover, EPA declined to establish NCMCW effluent limitations for the entire industry due, at least in part, to the fact there has never been defensible data on the constituents found in NCMCW discharges that are representative of the industry or on the cost industry would incur if more stringent effluent limitations were established for this waste stream. EPA's BAT analysis is further flawed inasmuch as it inadequately evaluates and grossly underestimates the significant costs and/or logistical problems that regulation of NCMCWs in this manner would present at Merrimack Station. Section 304(b)(2)(B) of the CWA and EPA's own regulations require EPA to take these and other factors into consideration when adopting site-specific effluent limitations.

EPA's Response: EPA disagrees with the commenter's claim that its BAT analysis for NCMCWs is arbitrary and capricious. On the contrary, as set forth in the Fact Sheet and expanded upon below, EPA's assessment is consistent with the regulations and the law and supported by available data.

EPA acknowledges that the data available is limited but EPA reviewed the discharge monitoring report (DMR) data available in the record and this data in conjunction with the entire administrative record supports our BAT analysis.

Additionally, EPA notes that this requirement and the underlying ELG are technology-based and not water quality-based effluent limits. Therefore, site-specific water quality data is not necessarily required in setting permit limits (*see Am. Petroleum Inst. V. EPA*, 858 F.2d 261, 265-66 (5th Cir. 1988)), but the regulations instead state that EPA use "all available information" to determine the appropriate BAT technology applicable to the applicant. 40 CFR § 125.3(c)(2)(i).

The 2011 Fact Sheet and the administrative record demonstrate that EPA utilized available data specific to Merrimack Station as well as to the industry to determine that the selected BAT is economically achievable, reasonable, and is consistent with the goals of the Clean Water Act.

EPA uses all available information and determines which of that information is applicable and relevant to the case-specific BPJ determination. The 2011 Fact Sheet makes clear that the Agency based its BPJ analysis on both the site-specific information (as it relates to each of the regulatory and statutory factors) and model technology at similar facilities such as Mystic Station, in Everett, Massachusetts. *See* AR-608 (2011 Fact Sheet), p. 31 (citing to the Mystic Station NPDES Permit No. MA0004740). Moreover, to the extent that EPA relied on the records supporting past ELG rulemakings, EPA acknowledges that some of the past data was incomplete or was not sufficiently robust to support an *industry-wide* BAT determination for NCMCWs.[14] This does not mean that 1) all the data and records supporting past rulemakings are invalid for consideration in this permit proceeding, and 2) that this data and record would be inapplicable or insufficient to inform a *site-specific*—as opposed to an *industry-wide*—BPJ analysis, such as this one for NCMCWs at Merrimack Station.

EPA maintains that its assessment of costs in developing appropriate BAT limits based on its BPJ was both adequate and in accordance with the law and regulations. This assessment took into account the nature and scope of the costs that the Permittee would incur coming into compliance with the proposed limits. EPA is not required to develop a precise calculation of costs as part of its cost assessment. *See BP Expl. & Oil v. EPA*, 66 F.3d 784, 803 (6th Cir. 1995) (citing *Nat. Res. Def. Council, Inc. v. EPA*, 863 F.2d 1420, 1426 (9th Cir. 1988)) ("According to EPA, the CWA not only gives the agency broad discretion in determining BAT, the Act merely requires the agency to consider whether the cost of the technology is reasonable. EPA is correct that the CWA does not require a precise calculation of BAT costs."). Moreover, the commenter, PSNH, did not provide EPA with precise, facility-specific numbers for cost in its Comments to the Draft Permit or throughout the permitting process.

See, also, EPA's Responses to Comments IV.3.1, IV.3.2, IV.3.5, IV.3.6 for further discussion on the logistics and implementation of segregating and/or managing NCMCW and other wastestreams.

Comment IV.5.2	**AR-1548, PSNH, pp. 197-198**

Comment: NCMCWs at Merrimack Station should continue to be treated as low volume wastes. Even if EPA erroneously rejects this regulatory course of action, the agency is authorized to establish effluent limitations for this waste stream only after it completes a thorough BAT

[14] "EPA explained in the preamble to the Steam Electric Power Plant NELGs, promulgated in 1982, that it was 'reserving' the specification of BAT standards for nonchemical metal cleaning wastes because it felt that it had insufficient information regarding (a) the potential for differences between the inorganic pollutant concentrations found in the nonchemical metal cleaning wastes of oil-burning and coal-burning power plants, and (b) the cost and economic impact that would result from requiring the *entire industrial category* to ensure that nonchemical metal cleaning wastes satisfy the same limits that had been set for chemical metal cleaning wastes. See 47 Fed. Reg. 52297 (Nov. 19, 1982)." AR-608 (2011 Fact Sheet), p. 29 (citing 47 Fed. Reg. 52297 (Nov. 19, 1982)) (emphasis added).

analysis utilizing its BPJ.[769] The BAT analysis set out in the Fact Sheet for the Draft Permit is deficient and will not pass judicial scrutiny. Indeed, EPA's half-hearted attempt at a BPJ-based BAT analysis is riddled with conclusory statements that lack substantive analysis. The information necessary to complete a defensible BPJ-based BAT analysis is simply not in the administrative record.

EPA lacks essential data regarding the makeup of NCMCW discharges at Merrimack Station necessary to identify the constituents of concern in the waste stream, much less the quantities of each. Furthermore, EPA has failed to adequately consider the changes in current processes employed at Merrimack Station, as well as the costs necessary to achieve these changes, that would be required to comply with new effluent limitations applicable to this waste stream. Thus, the agency has no way of knowing whether its proposed effluent limitations are reasonable and/or cost-effective.

Because the agency's current BPJ-based BAT determination is wholly inadequate, arbitrary, and capricious, EPA cannot legally impose iron and copper effluent limitations on NCMCW discharges at Merrimack Station.

EPA's Response: See Response to Comment IV.5.1 above.

Comment IV.5.3	**AR-1548, PSNH, pp. 198-201**

Comment: To conduct a legally-defensible BAT analysis in accordance with § 304 of the CWA, EPA must first identify "available" technologies by "survey[ing] the practicable or available pollution-control technology for an industry and assess[ing] its effectiveness."[770] Once identified, EPA must evaluate the following factors for each technology to determine which constitutes BAT: the age of equipment and facilities involved; the process employed; the engineering aspects of the application of various types of control techniques; process changes; the cost of achieving such effluent reduction; and non-water quality environmental impacts (including energy requirements).[771] EPA also must consider "[t]he appropriate technology for the category or class of point sources of which the applicant is a member, based upon all available information" and "[a]ny unique factors relating to the applicant."[772] No one factor is determinative; instead, EPA must balance all of the factors in determining BAT.

EPA's analysis of the BAT factors and its determination that the corresponding effluent limitations are economically and technologically achievable must be reasonable.[773] EPA ultimately bears the burden of demonstrating a reasonable basis for its conclusions that the chosen effluent limitations are achievable and a failure to do so renders the limitations arbitrary, capricious, and "not the result of reasoned decisionmaking."[774] Effluent limitations simply will not pass muster if they are "based on a flawed, inaccurate, or misapplied study."[775] Likewise, EPA is required to do more than merely make assumptions without any analysis supporting such claims. A failure to evaluate any one of the aforementioned BAT factors,[776] and/or demonstrate the effectiveness of the chosen BAT,[777] automatically renders EPA's BPJ-based effluent limitations arbitrary and capricious.

Cost of the technology and retrofit is especially important. Indeed, the CWA specifically recognizes that BAT must be economically achievable,[778] and requires the "cost of achieving such effluent reduction"[779] to be similarly evaluated.[780] Therefore, the cost determination is two-fold: cost must be considered in the six-factor BAT analysis, and the resulting effluent limitations must be economically achievable.[781] It makes sense that cost is such an important factor in the BAT analysis because "at some point extremely costly more refined treatment will have a de minimis effect on the receiving waters."[782] Thus, EPA is authorized to "balance factors such as cost against effluent reduction benefits" and, courts have upheld EPA's decision to reject a technology based on high economic impacts that might otherwise have been the most effective pollution control technology.[783]

EPA has repeatedly contended it need not conduct a cost-benefit analysis as part of its BAT determination. Even if EPA's assertion is correct—which PSNH does not concede[784]—this does not mean that cost is not important in the BAT analysis and the establishment of effluent limitations. EPA must implicitly consider the costs of the technology and the corresponding benefits received from the technology because of the duty to consider all of the factors in the BAT analysis. Additionally, the final BAT effluent limitations that are established must be economically achievable for the source.[785] In fact, the BPJ analysis requires a further step: the chosen technology must also be appropriate for point sources like the point source subject to the BPJ, based on all available information.[786] "All available information" certainly includes the costs of implementing the proposed BAT at similar facilities. Furthermore, EPA cannot solely rely on the fact that a facility or the public can "afford" a treatment technology as a basis for determining whether it is cost-effective.[787] The cost-benefit evaluation must be more than pretextual.

Once EPA determines BAT on a case-by-case basis based on its BPJ, EPA takes the technology standards established under the factors described above and applies that BAT to create actual effluent discharge limitations under § 304 of the CWA. It is through the creation of these effluent limitations that EPA imposes technology-based treatment requirements into permits.[788]

769 *See* 80 Fed. Reg. at 67,863.
770 *Nat'l Wildlife Fed'n v. EPA*, 286 F.3d 554, 561 (D.C. Cir. 2002) (quoting *E.I. du Pont de Nemours & Co. v. Train*, 430 U.S. 112, 131 (1977)).
771 40 C.F.R. § 125.3(d)(3)(i)-(vi).
772 40 C.F.R. § 125.3(c)(2)(i)-(ii).
773 *See BP Exp. & Oil v. EPA*, 66 F.3d 784, 794 (6th Cir. 1996).
774 *Ass'n of Pac. Fisheries v. EPA*, 615 F.2d 794, 820 (9th Cir. 1980); *see Chem. Mfr's Ass'n v. EPA*, 885 F.2d 253, 265 (5th Cir. 1989); *Reynolds*, 760 F.2d at 559.
775 *Texas Oil & Gas Ass'n v. EPA*, 161 F.3d 923, 935 (5th Cir. 1998).
776 *See, e.g., id.* at 934-35 (noting that a failure to consider the age of the equipment and the facilities involved when determining BAT would constitute an abuse of discretion); *Am. Iron & Steel Inst. v. EPA*, 526 F.2d 1027, 1048 (3d Cir. 1975) (remanding effluent limits because EPA did not consider the age of the facilities involved and the impact that age would have on the cost and feasibility of retrofitting older facilities).
777 *Ass'n of Pac. Fisheries*, 615 F.2d at 819; *Chem. Mfr's Ass'n*, 885 F.2d at 265.
778 33 U.S.C. § 1311(b)(2)(A)(i) (emphasis added).
779 40 C.F.R. § 125.3(d)(3)(v).
780 *See Texas Oil & Gas Ass'n* 161 F.3d at 936 (noting cost refers to a consideration of the cost of the

technology itself).
781 *See Ass'n of Pacific Fisheries,* 615 F.2d at 819-20 (finding that EPA's failure to adequately consider the cost of land acquisition in the determination of whether a technology is an achievable technology is an example of unreasonable decision-making).
782 *Id.* at 818; *see also Am. Petroleum Inst. v. EPA*, 787 F.2d 965, 972 (5th Cir. 1986) (providing that "EPA would disserve its mandate were it to tilt at windmills by imposing BAT limitations which removed de minimis amounts of polluting agents from our nation's waters, while imposing possibly disabling costs upon the regulated industry.") (citing *Alabama Power Co. v. Costle,* 636 F.2d 323, 360-61 (D.C. Cir. 1979) and *Appalachian Power Co. v. Train*, 545 F.2d 1351 (4th Cir. 1976)).
783 *See e.g., BP Exp.*, 66 F.3d at 796 (rejecting a technology as BAT, in part, because of the cost of the technology).
784 Importantly, neither does the Supreme Court. Specifically, in *Entergy,* the Court responded to a petitioner's argument that a "cost-benefit analysis is precluded under the [BAT] test" by stating that "[i]t is not obvious to us that [this] proposition is correct, but we need not pursue that point, since we assuredly [agree with other points]." *Id.* at 221-22. Likewise, Executive Order 13,563 mandates such a cost-benefit consideration on significant regulatory matters. *See* 76 Fed. Reg. 3821 (Jan. 16, 2011) (providing, in relevant part that "[o]ur regulatory system . . . must be based on the best available science . . . must promote predictability and reduce uncertainty. It must identify and use the best, most innovative, and least burdensome tools for achieving regulatory ends. It must take into account benefits and costs, both quantitative and qualitative" and that "each agency must, among other things: (1) propose or adopt a regulation only upon a reasoned determination that its benefits justify itscosts (recognizing that some benefits and costs are difficult to quantify)"). Furthermore, President Trump's Executive Order 13,777 requires that each agency consider repealing, replacing, or modifying existing regulations in which the costs exceed the benefits. *See* 82 Fed. Reg. 12,285, 12,286 (Feb. 24, 2017) (providing that "[e]ach agency shall establish a Regulatory Reform Task Force . . . to evaluate existing regulations . . . and make recommendations to the agency head regarding their repeal, replacement, or modification[.]" The order requires that the Regulatory Reform Task Force at a minimum "attempt to identify regulations that [among other things] impose costs that exceed benefits[.]").
785 *Texas Oil & Gas Ass'n*, 161 F.3d at 934.
786 40 C.F.R. § 125.3(c)(2).
787 *See Seabrook,* 1977 WL 22370, at *7. If this were the case, EPA would be able to forego rigorous analyses of what technology is necessary for a particular site, and just rely on whether the owner of that facility is a Fortune 100, 500, or 1000 company ostensibly with deep pockets.
788 *See* 40 C.F.R. § 125.3(c). EPA does not require the permittee to use this exact technology, and instead the permittee may use whatever technology it desires as long as the technology can achieve the effluent limits. *See, e.g., Nat'l Wildlife*, 286 F.3d at 561. However, application of EPA's chosen technology is generally the only way to achieve the effluent limitations.

EPA's Response: In this subpart of the comment, the commenter, PSNH, presents its view of how EPA should determine BAT limits on a site-specific, BPJ basis. PSNH comments that EPA must consider and balance the multiple factors, including cost, that are specified in the CWA and EPA regulations, that no single factor is determinative in that balancing, and that EPA's determination that a particular technology is technologically and economically available must be reasonable. EPA agrees with the commenter that EPA must consider the variety of factors, including cost, that are specified in the applicable provisions of the statute and regulations, that EPA must balance these factors together in a reasonable way, and, importantly, that the law does not dictate that any particular factor is determinative in all cases.

At the same time, the commenter suggests that cost is an "especially important" factor in the BAT determination. What the commenter intends by this comment is not entirely clear to EPA. As the commenter previously stated, no single factor is necessarily determinative in every case.

Furthermore, CWA case law and legislative history indicates that cost should not necessarily be regarded as the most important factor in determining the BAT in a particular case. As one court explained, "for 'BATEA' [i.e., BAT] standards, cost was to be less important than for the BPCTCA= [i.e., BPT] standards, and that for even the 'BPCTCA' standards, cost was not to be given primary importance." *American Iron & Steel Inst. v. EPA*, 526 F.2d 1027, 1052, n. 51 (3d Cir. 1975), *modified in other part*, 560 F.2d 589 (3d Cir. 1977), *cert. denied*, 435 U.S. 914 (1978) (industry challenge to EPA regulations implementing BAT limits for iron and steel industry point sources). If the commenter's point, however, is simply that cost must be considered, and it could be an important factor in a particular site-specific, BPJ determination of the BAT for a specific facility, then EPA agrees with this comment.

EPA further notes that neither the statute, regulations, nor case law, dictate precisely how EPA must balance the various factors together, and, thus, EPA has the discretion to do so in any reasonable manner. *See BP Expl. & Oil v. EPA*, 66 F.3d 784, 800 (6th Cir. 1995) ("Congress intended that EPA have discretion 'to decide how to account for the consideration factors, and how much weight to give each factor.'"). In site-specific, BPJ determinations of technology standards, the relative importance of the various factors to be considered may vary based on the facts of each case.

At the same time, EPA agrees with the commenter that the technology selected as the BAT (and the effluent limits derived from projected use of that technology) must be economically and technologically achievable. This is apparent from the fact that the CWA's BAT standard calls for the best *available* technology *economically achievable* for making reasonable progress toward the statute's goal of eliminating point source discharges of pollutants. *See* 33 U.S.C. §§ 1311(b)(1)(A), 1314(b)(2)(B). *See also* 40 CFR § 125.3(d)(3).

As set forth in the 2011 Fact Sheet (pp. 29-33), EPA considered the relevant factors, including costs, in a manner consistent with the Clean Water Act and the accompanying regulations. *See* 33 U.S.C. § 1342(a)(1)(B); 40 CFR §§ 125.3(d)(3). EPA has found, and explained in its findings, that the BAT specified for Merrimack Station control of non-chemical metal cleaning waste discharges is technologically and economically achievable. Additionally, the fact that EPA promulgated national effluent BPT limitations for *all* metal cleaning wastes that were equal to Region 1's BAT limits, further supports a finding that these limits are economically achievable.

The commenter notes that EPA stated in the Fact Sheet that it is not legally required to conduct a cost-benefit analysis in support of this BPJ, site-specific BAT determination for the Merrimack Station permit. While the commenter states that it does not concede this point, it does not make a case that cost-benefit analysis *is* required. It only further argues that cost must be considered along with all the other enumerated factors, that cost is an important factor, and that a BAT technology must be technologically and economically feasible. EPA has already addressed these points and has, for the most part, agreed with them. EPA also maintains that it is not required to conduct a cost-benefit analysis in determining BAT limits, notwithstanding the sources cited in the commenter's footnote 784. Neither the Supreme Court's decision in *Entergy Corp. v. Riverkeeper, Inc.*, 556 U.S. 208 (2009) (cost-benefit analysis is permitted for setting CWA § 316(b) standards), nor Executive Order 13,563, 76 Fed. Reg. 3821 (Jan. 16, 2011) (directing agencies to consider cost-benefit analysis in developing *significant* regulations), nor the referenced Executive Order dictate that EPA must include cost-benefit analysis in a site-specific, BPJ determination of the BAT for setting effluent limits for a specific NPDES permit. *See also EPA v. Nat'l Crushed Stone Ass'n*, 449 U.S. 64, 71 (1980); *Tex. Oil & Gas Ass'n v. EPA,* 161 F.3d 923, 936 n.9 (5th Cir. 1998).

The commenter also suggests that EPA is obligated to assess the costs of using the same BAT technology at *other facilities* in the same industrial category. EPA disagrees with this comment to the extent that it suggests that the Agency must determine the costs of a technology at other facilities in the context of a site-specific, BPJ determination for a particular facility. While EPA agrees that it can consider available information about the use of various technologies at other facilities, requiring EPA to conduct an industrial category-wide analysis for a site-specific, BPJ decision would defeat the purpose of providing for BPJ analysis in the absence of national guidelines. In this case, however, EPA did consider the available information regarding technological approaches at several other facilities. *See* 2011 Fact Sheet, p. 31 (discussion of Mystic Station).

Furthermore, it is essential to remember that a site-specific, BPJ determination of BAT limits for a specific facility will not be determinative for or binding upon the industry as a whole in any subsequent rulemaking that sets nationwide standards or in any future BPJ evaluation.

Ultimately, EPA found that compliance with the application of this BAT analysis could be done with existing technology at a "modest" and "relatively insignificant" cost. *See* 2011 Fact Sheet, p. 32. Furthermore, the other options for achieving compliance (*i.e.,* combined wastestream formula and wastewater recycling/reuse), which EPA discusses above (*see* EPA Responses to Comments IV.1.1, IV.3.2, IV.3.3, IV.3.5, and IV.3.6) and outlines in the Final Permit, are even less costly than the anticipated costs associated with segregation of NCMCW through existing infrastructure (with minor engineering modifications) and schedule changes.

Hence, this analysis adequately addresses cost and concludes that the proposed treatment is indeed economically achievable. There is no basis, therefore, to invalidate EPA's BAT analysis based on a lack of consideration of cost or any other necessary factor.

Comment IV.5.4	**AR-1548, PSNH, pp. 204-207**

Comment: There is no NCMCW discharge data in the current administrative record. Central to any BPJ-based BAT determination is a keen understanding of the waste stream to be regulated. Knowledge of both the kind and quantity of constituents found within that waste stream is fundamental inasmuch as it provides the only foundation upon which to assess the costs and economic achievability of any proposed regulation of the wastewater. EPA lacks the necessary information regarding NCMCWs generated at Merrimack Station. This is so regardless of the precise definition of the waste stream advanced by the agency. Specifically, a review of the administrative record for this permit renewal proceeding reveals EPA does not possess any data analyzing isolated discharges of NCMCWs at Merrimack Station. Instead, what EPA does possess is limited data of constituents discharged through Outfall 003A, in accordance with the terms and conditions of the current permit. NCMCWs comprise only a small, relatively infrequent, and varying fraction of the total volume of wastewater discharged through this internal outfall. It is therefore improper for EPA to attempt to rely upon this data as representative of constituents found in isolated NCMCW discharges at Merrimack Station.

The reality is that currently there is no data analyzing isolated NCMCWs generated at Merrimack Station due to the fact that PSNH historically has relied upon the Jordan Memorandum and commingled this waste stream with other low volume waste streams periodically generated at the facility. PSNH never needed to analyze this isolated waste stream due to this longstanding practice; nor has EPA ever requested any analyses of isolated NCMCWs over the 50+ year life of this facility. This is true despite the agency's inexplicable attempt to alter the regulatory requirements applicable to this waste stream in this permit renewal proceeding. This data is indispensable in establishing reasoned BPJ-based BAT effluent limitations. The agency's current BAT analysis is therefore necessarily arbitrary, capricious, and "not the result of reasoned decisionmaking" given it ultimately is EPA's burden to demonstrate a reasonable basis for its conclusions that its chosen effluent limitations are achievable.[794]

Collecting a representative sample of NCMCWs at Merrimack Station could prove difficult, if not impossible, due to the current configuration and operation of the facility. EPA's supposition in the Fact Sheet that PSNH can prospectively monitor chemical and nonchemical metal cleaning wastewater for compliance with copper and iron limitations separate from other waste streams simply does not reflect reality given wastewater treatment at the facility was designed to centrally treat all wastewaters, meaning commingled treatment of NCMCWs with other low volume wastes is unavoidable.[795]

EPA has not, and indeed cannot, adequately evaluate the requisite BAT factors and establish BPJ-based effluent limitations for NCMCW discharges at Merrimack Station without representative data of isolated NCMCWs generated at the facility. The agency's attempt to do so in this permit renewal proceeding is arbitrary, capricious, and a violation of the CWA and EPA's implementing regulations.

Although not mentioned in the Statement, Fact Sheet, or the administrative record, it likewise would be improper, arbitrary, and capricious for EPA to attempt to rely upon any NCMCW data compiled by EPA for use in formulating its NELGs for the industry. This is prohibited when generating site-specific effluent limitations utilizing BPJ.[796] Furthermore, even if reliance on industry data were acceptable, the data EPA has collected over the years is of limited or no utility. EPA admits as much in its latest NELGs:

> EPA based [its 2013 NCMCWs BAT] proposal on EPA's understanding, from industry survey responses, that most steam electric power plants manage their chemical and non-chemical metal cleaning wastes in the same manner. Since then, based in part on public comments submitted by industry groups, the Agency has learned that plants refer to the same operation using different

> terminology; some classify non-chemical metal cleaning waste as such, while others classify it as low volume waste sources. Because the survey responses reflect each plant's individual nomenclature, the survey results for non-chemical metal cleaning wastes are skewed. Furthermore, EPA does not know the nomenclature each plant used in responding to the survey, so it has no way to adjust the results to account for this. Consequently, EPA does not have sufficient information on the extent to which discharges of non-chemical metal cleaning wastes occur, or on the ways that industry manages their non-chemical metal cleaning wastes. Moreover, EPA also does not have information on potential best available technologies or best available demonstrated control technologies, or the potential costs to industry to comply with any new requirements. Due to incomplete data, some public commenters urged EPA not to establish BAT limitations for nonchemical metal cleaning wastes in this final rule. Ultimately, EPA decided that it does not have enough information on a national basis to establish [BAT] requirements for non-chemical metal cleaning wastes. The final rule, therefore, continues to "reserve" [BAT] for non-chemical metal cleaning wastes, as the previously promulgated regulations did.[797]

Data from the agency's 1974 and 1982 rulemakings is also unsuitable. There was no representative or verified data of isolated NCMCW discharges in the record of the 1974 ELG rules. And, the agency's 1982 record contained only limited data on fireside washes that, if anything, demonstrated applying iron and copper limits to NCMCWs is unnecessary and would be extremely expensive, and ultimately led EPA to conclude the available "data were too limited to make a final decision" in that rulemaking initiative.[798]

These collective realities compel the conclusion that EPA lacks sufficient data on the waste characteristics of NCMCWs to adequately assess the feasibility and costs of controlling the waste stream at Merrimack Station by and through the imposition of new BPJ-based effluent limitations. Its attempt to do so in the Draft Permit without this imperative data is arbitrary and capricious. Furthermore, despite the fact that the agency refused to set BAT effluent limitations in the NELGs due to incomplete data and information, EPA is attempting here to impose BPJ-based limitations with no data. This too is arbitrary and capricious.

[794] *See, e.g., Ass'n of Pac. Fisheries*, 615 F.2d at 820.

[795] *See* AR-608 at 27.

[796] *See, e.g.,* AR-746 at 5-44 through 5-47 (listing a facility's NPDES application form and discharge monitoring reports as sources of permissible information about constituents found in a given waste stream and further providing that without such data, "[t]he permit writer might need to establish a monitoring-only requirement in the current NPDES permit to identify pollutants of concern and potential case-by-case limitations for the subsequent NPDES permit renewal.").

[797] 80 Fed. Reg. at 67,863; *see also* NELGs Response to Comments, Part 7 of 10 at 7-179 (providing that "[b]ecause EPA lacks solid baseline information about what the current practices are, which is the foundation for assessing costs and economic achievability, as well as the other factors required to be assessed for BAT the final rule continues to reserve [BAT] for non-chemical metal cleaning wastes, as the previously promulgated regulations

did.”).
798 *See* 47 Fed. Reg. at 52,297.

EPA’s Response: See Response to Comment IV.5.1 above.

As for the commenter’s suggestion that any data used in past Steam Electric ELG rulemakings, including the most recent in 2015, is irrelevant or inappropriate for this BPJ BAT determination, EPA finds it overly broad and incorrect. First, as stated previously, EPA uses all available information, and determines which of that information is applicable and relevant to the case specific BPJ determination. Nowhere in the 2011 Fact Sheet, EPA’s 2017 Statement of Substantial New Questions for Public Comment (2017 Statement), or administrative record does EPA explicitly base this BPJ determination on the data compiled in support of the 2015, 1982, and 1977 national rulemakings, and the commenter even acknowledges this fact. Instead, the 2011 Fact Sheet makes clear that the Agency based its BPJ analysis on both the site-specific information (as it relates to each of the regulatory and statutory factors) and model technology at facilities such as Mystic Station, in Everett, Massachusetts. *See* AR-608 (2011 Fact Sheet), p. 31 (citing to the Mystic Station NPDES Permit No. MA0004740). Moreover, to the extent that EPA did rely on the records supporting past ELG rulemakings, EPA acknowledges that some of the past data was incomplete or was not sufficiently robust to support an *industry-wide* BAT determination for NCMCWs. *See, e.g.,* AR-608, p. 29. Again, this does not mean that all the data and records supporting past rulemakings are invalid for consideration in this permit proceeding, or that this data and record would be inapplicable or insufficient to inform a *site-specific*—as opposed to an *industry-wide*—BPJ analysis, such as this one for NCMCWs at Merrimack Station.

Finally, EPA disagrees with the claim in this comment that PSNH has historically relied on the Jordan Memorandum. This is discussed in more detail in Response to Comment IV.1.2 above.

Comment IV.5.5	**AR-1548, PSNH, pp. 212-217**

Comment: EPA did not even attempt to evaluate the cost of its proposed regulation of NCMCWs. “[R]elatively modest” is the term used within EPA’s fleeting discussion of the anticipated costs to comply with the regulatory requirements applicable to NCMCWs set out in the Draft Permit.[808] The agency’s attempt to convert its cost-effectiveness analysis into a cursory “affordability” determination is impermissible, wholly inadequate, and legally insufficient.[809]

EPA failed to even estimate in its 2011 Fact Sheet or in the administrative record the actual monetary amount required for PSNH to comply with its anticipated regulation of NCMCWs under any of its proposed scenarios.[810] It is the agency’s burden to demonstrate a reasonable basis for its conclusions that the chosen effluent limitations are achievable. More is required than its speculative and conclusory analysis here.[811] For instance, with no data on isolated NCMCWs generated at Merrimack Station and no estimates on the costs to retrofit the plant to adequately isolate and manage the wastewater, how can EPA assess the costs and incremental benefits (*i.e.*, $/TWPE) its proposed regulatory requirements would yield? It cannot.
PSNH has never undertaken to estimate the costs associated with attempting to isolate

NCMCWs at Merrimack Station. Indeed, there has never been a reason to do so given the longstanding classification of this waste stream as a low volume waste, in accordance with the Jordan Memorandum. Even without the benefit of a detailed analysis, PSNH can offer the following comments that adequately demonstrate that the costs required to attempt to reconfigure the facility to separately manage NCMCWs would not be "relatively modest" and, in fact, would be substantial enough to grossly outweigh whatever benefits EPA expects to arise from the isolation of this waste stream.

Ensuring that NCMCWs would never be commingled with boiler blowdown, demineralizer regenerations, floor drains, and other low volume wastes at Merrimack Station could likely require the design and installation of a collection system, supporting pumps and pipes, lined basin, and chemical precipitation treatment system capable of capturing and transporting the maximum quantity of NCMCW produced during a multi-day or multi-week outage and processing NCMCWs within a 30-day period. The estimated capital costs for modifications of this kind at facilities within the industry can range from a few million dollars to in excess of $32 million.[812] And, annual operation and maintenance costs would also likely be substantial.

EPA's belief that "these costs [associated with the required engineering modifications] are relatively modest and that PSNH can afford [them]" is vague and wishful thinking.[813] Admittedly, all things are possible with endless resources and finances. However, since PSNH does not exist in such a reality, EPA should not automatically assume that it is "feasible" for Merrimack Station to bear the total costs to comply with the regulatory requirements applicable to NCMCWs set out in the Draft Permit.

The table below, submitted by Utility Water Act Group ("UWAG") in its comments to EPA's 2013 proposed rule for the NELGs, itemizes costs actually incurred at a facility that installed necessary infrastructure to capture and treat its combine low volume wastes to achieve the 1.0 mg/L copper and iron limits for NCMCW discharges with zero redundancy:[814]

Equipment/Product /Task	**Cost**
Internal & External Engineering Cost	$ 475,235
Exiting Tank Retrofits & Refurbishment - Clarifier Tank & Clean Effluent Tank (Q1emical Clean Tank)	$ 1,148,568
Collection Package Civil - Collect Trenches and Wash Sump Construction; Neutralization Basin Closure	$ 1,615,712
Material & Equipment Purchases - Pump Sumps (Qty-4); Sludge Recycle Pumps (Qty-2) Sludge Disposal Pumps (Qty-2): Clarifier Conversion Internals; Rake Drive Reaction Tank	$ 2,568,508

Electrical & Control & Instrumentation Install VFDs (Qty-8); MCCs; AllenBradley PLC w,HMI; Remote I/O; Chemical Skids (Qty-2); Instrumentation(All); Cable; Conduits; Lighting	$ 1,022,971
Mechanical Install Installation of Interconnecting Piping; Supports; Reaction Tank, Clarifier Tank-Walkways-Rake-Truss	$ 1,735,273
Reaction Tank Foundation - Concrete and Steel Supports	$ 222,204
Metal Wash Startup Support/Training	$ 5,394
Metal Wash Startup Support/Training	$ 2,343
Total of Current Expenditures	$ 8,796,208
Additional Planned Improvements	$ 350,000
Planned Total Expenditures	**$ 9,145,208**

Contrasted with Merrimack Station's two generating units, the facility has three units. The facility's operator installed a metal cleaning wastewater collection system on each unit with piping directing the wastewater to a common treatment system. Solids generated in the system are sent to the facility's existing solid waste processing system. The treated effluent is sampled to demonstrate compliance prior to being piped to and mixed with the facility's low volume wastewater collection/treatment system for discharge.[815] Importantly, some of the infrastructure needed for this project was already available at the facility and only needed to be re-purposed or required repairs or modification. Had the operator not been able to reuse this equipment, use the existing solid waste processing system, and use covered areas for equipment that needed to be indoors, the capital expenditures would have been much greater.[816]

The aforementioned comments demonstrate EPA's current assessment of costs necessary to isolate and treat NCMCWs at Merrimack Station is grossly inadequate. The CWA and EPA's own regulations require a more rigorous analysis that, at a minimum, includes competently comparing the anticipated benefits and the relative cost of achieving those benefits before imposing BPJ-based effluent limitations in a permit. Had the agency undertaken such an analysis, it would have been apparent the costs associated with regulating NCMCWs in this manner grossly outweigh whatever benefits EPA expects to yield by its proposed changes to the permit for the facility.

Collectively, these comments, the administrative record, and a reasoned evaluation of the factors that must be considered in a BAT analysis, demonstrate EPA cannot impose iron and copper effluent limitations on NCMCW discharges at Merrimack Station and the agency's current BPJ-based BAT determination is wholly inadequate, arbitrary, and capricious and must be revisited prior to issuing the Draft Permit as final.

808 *See* AR-608 at 32.
809 *See Seabrook,* 1977 WL 22370, at *7.
810 Again, EPA cannot attempt to rely upon any data or information EPA has collected or generated as part of its recent NELGs rulemaking because the agency has stated time and again that the data pertaining to NCMCWs it has collected is insufficient and does not accurately reflect how this waste stream is handled within the industry:

> At the time of the final rule, EPA acknowledge[d] not having sufficient information to perform a nationwide BAT evaluation for non-chemical metal cleaning wastes. Information such as:
>
> - identification of potential treatment systems that represent BAT for non-chemical metal cleaning wastes;
> - cost information for BAT technologies;
> - wastewater characterization data for untreated non-chemical metal cleaning wastes; and
> - treatment system performance data for the treatment of non-chemical metal cleaning wastes.

NELGs Response to Comments, Part 7 of 10 at 7-393.
811 *See Ass'n of Pac. Fisheries*, 615 F.2d at 820 (finding that a failure to explain and justify a BAT determination renders the resulting effluent limitations arbitrary, capricious, and "not the result of reasoned decisionmaking"); *see also* NELGs Response to Comments, Part 7 of 10 at 7-179 (providing that "the CWA requires EPA to make a reasonable assessment of costs. Without a baseline of what is the status quo, it is difficult to make a reasonable assessment of the cost of additional controls.").
812 These monetary figures were compiled by and through a review of public comments submitted by the industry in response to EPA's 2013 proposed rulemaking for the now final NELGs. *See* EPA, Rulemaking for the Steam Electric Power Generating Effluent Limitations Guidelines, Dock. ID EPA–HQ–OW–2009–0819.
813 *See* AR-608 at 32.
814 Utility Water Act Group, Comments of the Utility Water Act Group (UWAG) on EPA's Proposed Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category (40 C.F.R. Part 423), Docket ID Nos. EPA-HQ-OW-2009-0819 and EPA-HQ-RCRA-2013-0209, at 269-270 (Sept. 20, 2013). The relevant excerpt from UWAG's comments is attached hereto as Exhibit 24.
815 *See id.* at 269-70.
816 See *id.* at 270.

EPA's Response: EPA maintains that its assessment of costs in developing appropriate BAT limits based on its BPJ was both adequate and in accordance with the law and regulations.

The commenter first suggests that EPA failed to identify or make any specific cost estimates for coming into compliance with the proposed BAT limits of 1.0 mg/L. EPA did assess, using all information available, the changes and steps necessary for the Permittee to achieve compliance with the proposed BAT limits, and then further assessed whether such changes would require PSNH to incur costs, given the existing infrastructure and historical processes at the facility. This assessment took into account the nature and scope of the costs that the permittee would incur coming into compliance with the proposed limits. EPA is not required to develop a precise calculation of costs as part of its cost assessment, as the commenter suggests. *See BP Expl. & Oil v. EPA*, 66 F.3d 784, 803 (6th Cir. 1995) (citing *Nat. Res. Def. Council, Inc. v. EPA*, 863 F.2d 1420, 1426 (9th Cir. 1988)) ("According to EPA, the CWA not only gives the agency broad discretion in determining BAT, the Act merely requires the agency to consider whether the cost of the technology is reasonable. EPA is correct that the CWA does not require a precise calculation of BAT costs."). Moreover, the commenter, PSNH, has not provided EPA with precise, facility-specific numbers for cost in its Comments to the Draft Permit or throughout the permitting process, as will be discussed in more detail below.

The commenter also seems to again suggest that EPA failed to assess costs and identify "anticipated benefits" in its BAT determination. Please see Responses to Comments IV.5.1 and IV.5.3, above, for a discussion of the factors requiring examination for a BAT analysis.

The drastic process changes and facility upgrades mentioned in this comment are indeed beyond the scope of changes considered necessary in EPA's analysis. It is unclear if PSNH is suggesting that the itemized cost estimate table and accompanying cost assessment presented in this comment is a reasonable cost estimate for Merrimack Station, which already has the technology and ability to segregate and treat or otherwise dispose of chemical metal cleaning wastewater (PSNH has not disputed the existence of such technology). The Permittee points to a cost estimate table and general cost estimates associated with a different facility to demonstrate high costs associated with Region 1's proposed BAT limits. The estimates do not specify where this facility is located, any details (other than that the facility has three generating units and an existing solid waste processing system) about the facility, or when these estimates were developed. The comment does not even provide the name of the facility. The cost estimates identified in this comment are extracted from Utility Water Act Group's (UWAG) 2013 Comments on EPA's Proposed Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category. *See* UWAG Comment, DCN EPA-HQ-OW-2009-0819-4655 (Sept. 20, 2013), pp. 268-71. UWAG, like the commenter here, fails to provide any detail as to where this data came from or how it was compiled. As a result, EPA cannot assess whether and to what extent this cost information[15] is applicable to the Merrimack Station facility. The commenter does not provide any explanation to enable such an assessment, and further does not provide additional documentation *specific* to potential costs that would be incurred at Merrimack Station. Ultimately, EPA does not find this information to be applicable to a site-specific assessment for costs at Merrimack Station.[16]

It is assumed, as stated in the Fact Sheet, that compliance can be achieved using existing treatment systems and either schedule changes or the combined waste stream formula. As described in the previous Response to Comment IV.3.2, EPA also proposes a hybrid approach that utilizes a combination of these relatively inexpensive options as well as the potential for water reuse/recycling. EPA maintains that the cost for complying with these permit requirements would not require significant investment in facility upgrades and would be modest.

EPA recognizes, however, the complex nature of this type of facility and the possibility of some additional expenses as described in the comment. Therefore, EPA recommends that by the

[15] The commenter's estimate of the range of costs associated with the type of upgrades necessary to comply with the proposed BAT limits (*see* footnote 812) is likewise based on information that is not specific to Merrimack Station. Furthermore, the commenter fails to describe or characterize this information in a manner that demonstrates its specific applicability to Merrimack Station.

[16] While this information is not applicable to Region 1's assessment of cost for Merrimack Station, this table does show however that other facilities are meeting the regulatory requirement to segregate metal cleaning waste.

effective date of the permit, the Permittee fully evaluate and begin to implement these low-cost options to the best of its ability in compliance with the permit. If a combined waste stream formula is utilized, the Permittee must submit the details of this formula to EPA for approval and permit modification.

As a final note, footnotes 810 through 812 of the above comment contain references to EPA's Responses to Comments for the 2015 Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category. In the 2015 responses related to NCMCWs, EPA acknowledged that it had insufficient information with respect to several analyses required to evaluate BAT for NCMCWs, cost analysis being one. The commenter wishes to conflate that acknowledgement into the conclusion that information does not exist to support *any* site-specific BAT determination for NCMCWs. Rather, the 2015 rulemaking was a *national* rulemaking. EPA may have been without sufficient information to make a categorical, national standard (*see* Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category: EPA's Response to Public Comments, Part 7 of 10 at 7-393 (Sept. 2015) ("EPA acknowledges not having sufficient information to perform a *nationwide* BAT evaluation for non-chemical metal cleaning wastes.") (emphasis added)), but this insufficiency solely applies to the national rulemaking context. The cost information required for a national rulemaking is not identical to that required for a site-specific BPJ BAT determination. Therefore, the language included in the 2015 Response to Comments does not support a finding that EPA failed to sufficiently analyze cost in its BAT evaluation for NCMCWs at *Merrimack Station*. *See also* EPA Responses to Comments IV.5.1 and IV. 5.3 above.

Comment IV.5.6	**AR-1548, PSNH, p. 217**

Comment: If EPA Erroneously Elects to Impose Iron and Copper Limits on NCMCWs, It Should Allow PSNH Sufficient Time to Comply. The Draft Permit does not specify when PSNH would be required to comply with the proposed iron and copper limits for the NCMCW stream. Should the agency ultimately buck the historical handling of NCMCWs at the facility as low volume waste and impose iron and copper limits, adequate time to comply must be provided. As explained above, to comply with these new effluent limitations PSNH would have to extensively modify pipes, sumps, and treatment systems so as to collect isolated NCMCW discharges and treat them by chemical precipitation for iron and copper. The facility would also likely have to perform extensive excavation of existing sumps and piping and install new pipes and treatment tanks. This work in isolation could take two years or more to complete and could be even further complicated or prolonged due to any approvals and/or permits that may be required.

For the reasons stated above, EPA must not—and indeed cannot based on the current permitting record—impose iron and copper effluent limitations on NCMCW discharges at Merrimack Station and should allow such wastewaters to continue to be classified as a low volume waste stream and commingled with other similar low volume waste streams.

EPA's Response: As mentioned in the previous responses, the Permittee is not expected to perform any significant facilities upgrades in order to comply with the revised NCMCW requirements. If the Permittee elects not to segregate NCMCW fully or in part and instead seeks to utilize a CWF, EPA expects that a formula (as described in EPA Responses to Comments IV.1.1, IV.3.2, IV.3.3, IV.3.5, IV.3.6) could be developed with the assistance of EPA if requested. Subsequently, the Permittee could evaluate and implement the necessary combination of schedule changes, water reuse/recycling options, and other minor process modifications to achieve consistent compliance with the permit beginning on the effective date of the permit.

Given the variety of cost-effective options for compliance described in the responses above, EPA recognizes that the Permittee will need to decide which approach to compliance to pursue. Depending upon the selected approach, the Permittee may potentially find that it is unable to fully comply with the copper and iron limits for a period of time immediately following the effective date of the permit. In anticipation of this possibility, EPA is unable to implement a compliance schedule for a technology-based limit directly in the permit. *See* 40 CFR Part 122.47(a)(1). Rather, EPA would work with the Permittee after the effective date of the permit to develop an appropriate compliance schedule through a mechanism such as an administrative order by consent. This compliance schedule would allow the Permittee to have additional time to achieve proper compliance with the limits without penalty during the agreed to time period for achieving compliance.

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1.0 Bottom Ash Transport Water

Comment V.1.1	AR-1548, PSNH, pp. 177-181

Comment: Much has changed on this regulatory front since EPA issued its 2011 and 2014 Draft Permits. In 2015, the agency issued NELGs establishing uniform, technology-based standards for the steam electric power generating industry.[697] The 2015 NELGs effectively eliminate any BPJ authority the agency may have possessed in this regulatory setting. And, just recently, EPA issued a final rule stating its intent to reconsider certain effluent limitations set out in the 2015 NELGs for the BATW and FGD wastewater streams.[698]

EPA correctly notes in its Statement that it "does not have the discretion to not apply the ELGs" to the final NPDES permit for Merrimack Station.[699] Stated differently, EPA must apply the ELGs to the final permit. PSNH agrees. Set out below is an overview of the latest events pertaining to the 2015 NELGs that impact when and how the BATW and FGD wastewater streams at Merrimack Station should be regulated in the new final NPDES permit for the facility. PSNH then discusses what effluent limitations and other provisions should be included in the Final Permit for the facility for the regulation of the FGD and BATW waste streams. PSNH concludes its comments on this part of the Statement by explaining the myriad reasons why it is arbitrary and capricious for EPA to regulate NCMCWs in the manner proposed in the Statement and in the agency's 2011 Fact Sheet for the Draft Permit.

The Statement's chronology of events since EPA promulgated the ELGs on November 3, 2015, is generally accurate. PSNH limits its discussion to the developments that have occurred since EPA issued its Statement for public notice and comment on August 2, 2017, because these events and actions by the agency dictate the regulation of FGD and BATW in the Final Permit for Merrimack Station.

On June 6, 2017, EPA issued a proposed rule entitled "Postponement of Certain Compliance Dates for the Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Source Category."[700] In it, EPA proposed for public notice and comment the stay of the compliance dates for the BAT limitations and PSES for the following wastewater streams: fly ash transport water, bottom ash transport water, flue gas desulfurization wastewater, flue gas mercury control wastewater, and gasification wastewater.[701] This rulemaking was initiated by the agency to buttress its April 25, 2017 Administrative Procedure Act ("APA") § 705 administrative stay of the same compliance deadlines, a temporary measure meant to preserve the status quo that would only remain in effect "pending judicial review" (*i.e.*, only so long as the Fifth Circuit litigation challenging aspects of the final NELGs remained a viable case and controversy).

EPA published its final version of the June 6, 2017 proposed rule in the Federal Register on September 18, 2017.[702] In it, EPA announced its intention "to conduct further rulemaking to potentially revise the new, more stringent BAT limitations and PSES in the 2015 Rule applicable to two wastestreams[:] FGD wastewater and bottom ash transport water[.]"[703] "[T]o preserve the status quo for FGD wastewater and bottom ash transport water until EPA completes its next rulemaking concerning those wastestreams," EPA postponed the earliest compliance dates for the BAT effluent limitations and PSES for these wastewater streams for a period of two years (*i.e.*, moved the earliest compliance date from November 1, 2018 to November 1, 2020).[704] EPA also withdrew its APA § 705 administrative stay of all of the compliance dates that had not yet passed, explaining "there is no longer any need for the Agency to maintain its prior action," given it was a temporary measure to provide EPA time to reconsider the NELGs rulemaking—and that reconsideration process is now complete.[705]

EPA postponed the earliest BAT and PSES compliance date for BATW and FGD wastewater to November 1, 2020, because the agency intends to initiate a new rulemaking to potentially revise the effluent limitations for these wastewater streams and "projects it will take approximately three years to propose and finalize a new rule (Fall 2020)."[706] The agency took this interim action in light of "the substantial investments required by the steam electric power industry to comply with the BAT limitations and PSES" for BATW and FGD wastewaters, recognizing "that certainty regarding the limitations and standards deserves prominent consideration by the Agency when these limitations and standards may change."[707] EPA further noted that "[i]f [it] does not complete a new rulemaking by November, 2020, it plans to further postpone the compliance dates such that the earliest compliance date is not prior to completion of a new rulemaking."[708] EPA did not change the "'no later than' date of December 31, 2023, because EPA is not aware that the 2023 date is an immediate driver for expenditures by plants . . . and EPA plans to take up the appropriate compliance period in its next rulemaking."[709]

Nevertheless, it is clear from the text of the September 18, 2017 final rule that EPA does not intend for the steam electric power industry to dedicate additional resources to planning, designing, procuring, and/or installing any retrofit technologies to comply with the effluent limitations set out in the 2015 NELGs for BATW and FGD wastewaters until the agency issues its revised rulemaking in Fall 2020.

Notably, the BAT "legacy wastewater" provisions in the 2015 NELGs are not stayed or otherwise impacted by EPA's latest regulatory actions and therefore remain in full effect. This means EPA continues to be precluded from developing any BPJ-based effluent limitations for

BATW and/or FGD wastewaters and "does not have the discretion to not apply the ELGs," as EPA aptly notes in the Statement.[710] The 2015 NELGs define "legacy wastewater" as "FGD wastewater, fly ash transport water, bottom ash transport water, [flue gas mercury control ("FGMC")] wastewater, and gasification wastewater generated prior to the date established by the permitting authority that is as soon as possible beginning November 1, 2018 [(now November 1, 2020 for BATW and FGD wastewaters)], but no later than December 31, 2023."[711]

The 2015 NELGs specify that these BAT legacy wastewater limits apply until the applicability date set by the permit writer for the waste stream in question to meet the new, more stringent BAT limits set out in the final rule.[712] And, since the applicability dates for the BATW and FGD wastewater streams now may not apply to any dischargers prior to November 1, 2020, the legacy wastewater BAT limits should be included in any final NPDES permits issued prior to EPA's forthcoming rulemaking to consider the BAT effluent limitations associated with these two waste streams.[713]

The 2015 NELGs provide that "the quantity of pollutants discharged in bottom ash transport [legacy] water shall not exceed the quantity determined by multiplying the flow of bottom ash transport water times the concentration for [Total Suspended Solids ("TSS")] listed in" the following table:[714]

Pollutant or pollutant property	BPT effluent limitations	
	Maximum for any 1 day (mg/l)	Average of daily values for 30 consecutive days shall not exceed (mg/l)
TSS	100.0	30.0

697 *See* 80 Fed. Reg. at 67,838.
698 *See* 82 Fed. Reg. at 43,494.
699 *See, e.g.*, AR-1534 at 54.
700 *See* 82 Fed. Reg. 26,017.
701 *Id.*
702 *See* 82 Fed. Reg. at 43,494.
703 *Id.* at 43,496.
704 *Id.* at 43,494-95.
705 *See id.* at 43,496.
706 *Id.* at 43,498.
707 *Id.* at 43,497.
708 *Id.* at 43,498, n.6.
709 *Id.* at 43,496.
710 AR-1534 at 54.
711 80 Fed. Reg. at 67,854.
712 *See id.*
713 *See* 40 C.F.R. §§ 423.13(g)(1), (k)(1).
714 *See id.* § 423.13(k)(1)(ii); *id.* at § 423.12(b)(4).

EPA's Response:

Since Merrimack Station submitted its application for a renewal of its NPDES permit in 1997, the regulations governing the Steam Electric Power Generating Point Source Category have changed. EPA will begin by providing some background on the legal developments related to technology-based effluent limitations for the Steam Electric Category over the past several decades. EPA will then briefly summarize limits developed for bottom ash transport water (BATW) at different phases of permit development, and finally identify the current state of the regulations and the application of such regulations to BATW generated at Merrimack Station in the Final Permit.

Legal and Regulatory History

As EPA explained in its 2017 *Statement of Substantial New Questions,* point source discharges of pollutants into waters of the United States are unlawful unless, among other things, the discharges are authorized by an NPDES permit issued under CWA § 402, 33 U.S.C. § 1342. 33 U.S.C. § 1311(a). NPDES permits set effluent limits based on technology-based standards, except that if technology-based limits are insufficiently stringent to satisfy state water quality standards, then water quality-based effluent limits are applied. CWA § 301(b)(1)(C); 33 U.S.C. § 1311(b)(1)(C). To establish technology-based limitations, the CWA authorizes EPA to promulgate effluent limitations guidelines (ELGs) and new source performance standards pursuant to CWA §§ 301, 304, and 306, 33 U.S.C. §§ 1311, 1314, and 1316. In addition, where EPA has not promulgated national technology-based standards, technology-based effluent limits may be developed for individual permits based on a best professional judgment (BPJ), site-specific application of the pertinent technology standard. *See* 33 U.S.C. § 1342(a)(1)(B); 40 CFR. §§ 125.3(a)(2) and (3).

ELGs are established by EPA regulation for categories of industrial dischargers and are based on the degree of control that can be achieved using two increasingly stringent levels of control. In the first level, the Act requires effluent limits based on application of the best practicable control technology currently available (BPT). 33 U.S.C. § 1311(b)(1)(A); *see also* 40 CFR § 125.3(a)(2)(i). In the second level, the statute requires effluent limits for toxic and non-conventional pollutants that reflect the best available technology economically achievable (BAT). 33 U.S.C. §§ 1311(b)(2)(A) and (F); 40 CFR § 125.3(a)(2)(iii) – (v). For conventional pollutants, the Act requires effluent limits based on the best conventional pollutant control technology (BCT). *See* 33 U.S.C. §1311 (b)(2)(E); 40 CFR § 125.3(a)(2)(ii).

EPA first promulgated ELGs for the Steam Electric Power Generating category of point sources in 1974. *See* 40 CFR Part 423. *See also* 39 Fed. Reg. 36186, *as amended at* 40 Fed. Reg. 7095 (February 19, 1975); 40 Fed. Reg. 23987 (June 4, 1975) (previously codified at 40 CFR Part 423). EPA subsequently amended the regulations in 1977 and 1982. *See* 80 Fed. Reg. 67838; 78 Fed. Reg. at 34438-39 (describing the history of EPA's ELG rulemaking actions). Before 2015 EPA had not promulgated ELGs specifically regulating any toxic pollutants discharged by the electric power industry and the Agency was considering updates to the standards to reflect advancements in wastewater treatment processes.

On November 3, 2015, EPA promulgated new ELGs, establishing new BAT limits for several wastestreams, which became effective on January 4, 2016 (the 2015 Steam Electric ELGs). 80 Fed. Reg. 67838 (Nov. 3, 2015). Numerous parties then challenged the new regulations, and these challenges were consolidated in the Fifth Circuit Court of Appeals. *See Southwestern Electric Power Co., et al. v. EPA*, No. 15-60821 (*SWEPCO*).

Later, in early 2017, EPA received petitions for reconsideration of the 2015 Steam Electric ELGs from the Utility Water Action Group (UWAG) and the Small Business Administration Office of Advocacy (SBA).[1] After reviewing the petitions, EPA Administrator E. Scott Pruitt granted these petitions for reconsideration of the 2015 Rule. AR-1366 (EPA Response to UWAG & SBA Petitions – 2015 Steam Electric ELG Final Rule (April 12, 2017)), *available at* https://www.epa.gov/sites/production/files/2017-04/documents/steam-electric-elg_uwag-sbapetition_epa-response_04-12-2017.pdf.

Additionally, EPA issued a postponement of certain compliance deadlines related to the reconsideration (*i.e.,* compliance dates from the 2015 Rule that have not yet passed for certain new, more stringent effluent limitations), pursuant to Section 705 of the Administrative Procedure Act (APA). 5 U.S.C. § 705. *Postponement of Certain Compliance Dates for Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category*, 82 Fed. Reg. 19005 (Apr. 25, 2017), available at https://www.federalregister.gov/documents/2017/04/25/2017-07811/postponement-of-certaincompliance-dates-for-effluent-limitations-guidelines-and-standards-for-the.[2] This postponement was initially challenged by numerous environmental groups. *Climate Action Network v. EPA*, No. 17- 00817 (May 3, 2017).[3]

Then, on August 11, 2017, the Administrator signed a letter announcing his decision to conduct a rulemaking to potentially revise the new, more stringent BAT effluent limitations and pretreatment standards for existing sources in the 2015 rule that apply to flue gas desulfurization (FGD) wastewater and bottom ash transport water (BATW). The Fifth Circuit subsequently granted EPA's request to sever and hold in abeyance aspects of the litigation related to those limitations and standards that would be revised in the forthcoming rulemaking.

In September 2017, the EPA finalized a rule, using notice-and-comment procedures, postponing the earliest compliance dates for the new, more stringent BAT effluent limitations and PSES for FGD wastewater and BATW in the 2015 Rule, from November 1, 2018 to November 1, 2020. *Postponement of Certain Compliance Dates for the Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category*, 82 Fed. Reg. 43494

[1] *See* UWAG Petition to Reconsider the Final Rule (March 24, 2017); SBA Petition to Reconsider the Final Rule (April 5, 2017), *available at* https://www.epa.gov/eg/steam-electric-power-generatingeffluent-guidelines-petitions-reconsideration.

[2] The compliance deadlines affected are those identified at 40 CFR §§ 423.11(t), 423.13(g)(1)(i), 423.13(h)(1)(i), 423.13(i)(1)(i), 423.13(j)(1)(i), and 423.13(k)(1)(i), and 40 CFR §§ 423.16(e), 423.16(f) 423.16(g) 423.16(h) 423.16(i), originally published at 80 Fed. Reg. 67838 (Nov. 3, 2015). 82 Fed. Reg. 19006.

[3] Upon final promulgation of the Postponement Rule in 2017, this lawsuit was dismissed.

(Sept. 18, 2017). At the same time, EPA also withdrew its prior action taken pursuant to Section 705 of the APA. The final Postponement Rule received multiple legal challenges, but EPA prevailed, and the courts did not sustain any of them. *See Center for Biological Diversity v. EPA,* No. 18-cv-00050 (D. Ariz. filed Jan. 20, 2018); *see also Clean Water Action. v. EPA*, No. 18-60079 (5th Cir.).

The *SWEPCO* litigation related to provisions of the 2015 Rule that were not subject to the Administrator's reconsideration and were not held in abeyance. The claims that remained active were challenges to the limitations applicable to legacy wastewater and combustion residual leachate (CRL). With respect to these claims, the Fifth Circuit, on April 12, 2019, issued a decision vacating those limitations as arbitrary and capricious under the APA and unlawful under the CWA, respectively. *SWEPCO*, 920 F.3d 999 (5th Cir. 2019). The Court's vacatur and remand impact the regulations applicable to BATW and CRL, which will be discussed in more detail below.

EPA published a proposed regulation to revise the ELGs applicable to FGD wastewater and BATW on November 22, 2019. *Proposed Rule, Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category*, 84 Fed. Reg. 64620 (Nov. 22, 2019) ("2019 Proposed Rule"). The 2019 Proposed Rule revises the BAT limits established for FGD wastewater and BATW; however, it does not address the Fifth Circuit's April 2019 ruling. The Agency stated that it "plans to address this vacatur in a subsequent action." 84 Fed. Reg. at 64625. The public comment period for the 2019 Proposed Rule ended on January 21, 2020, and the Agency is currently reviewing and considering comments received.

Bottom Ash Transport Water (BATW) Limits

The abovementioned regulatory history has affected the manner by which BATW is treated and regulated under the Clean Water Act and within the NPDES permitting program. The following discussion summarizes the regulations and law forming the basis of EPA's permit limits for BATW at each stage of permit development for the renewal of Merrimack Station's NPDES permit.

2011 Draft Permit

In 2011, EPA issued the first Draft Permit for Merrimack Station, and included limits for TSS and oil and grease (O&G) in BATW generated at the facility. These limits were based primarily on the 1982 ELGs, which were the most current version of the ELGs at that time. *See* 40 CFR § 423.12(b)(4). In the 2011 draft permit, EPA Region 1 established BCT limits for TSS and O&G in BATW based on a site-specific, BPJ application of the BCT standard, since they are conventional pollutants and the 1982 rule expressly reserved BCT for future development. 2011 Fact Sheet (AR-608), p. 22; *see also* 47 Fed. Reg. at 52293, 52296-97; *see also* 40 CFR § 423.14. EPA determined that BCT limits would be equal to the BPT limits for those pollutants and would apply at Outfall 003A. *Id.*; *see also* 2017 Statement (AR-1534), pp. 54-55.

2014 Revised Draft Permit

In 2014, EPA opened the public comment period and issued a Revised Draft Permit due to new information indicating that Merrimack Station had installed and was operating evaporation technology to treat its FGD wastewater. Because the regulations remained the same and no new information related to BATW, the effluent limits for BATW at Outfall 003A remained the same for TSS and O&G, based on 40 C.F.R. § 423.12(b)(3) and (4), as those included in the 2011 Draft Permit.

2017 Statement

In 2017, following promulgation of the 2015 Rule, EPA Region 1 reopened the public comment period to accept comment on a number of issues including the applicability and effect of the new ELGs. EPA's 2017 *Statement of Substantial New Questions for Public Comment* (AR-1534) outlined the new BAT limits established for BATW:

> The first (or interim) set of limits place numeric effluent limitations on TSS in bottom ash transport water equal to the TSS limitations in the previous BPT regulations. 80 Fed. Reg. 67837, 67841; 40 C.F.R. §§ 423.13(k)(1)(ii), 423.12(b)(4). These interim BAT limitations apply to any discharge of bottom ash transport water that occurs prior to the final compliance deadline determined by the permitting authority (see discussion of compliance dates below). The second (or final) set of limits applies after the final compliance date that has been set by the permitting authority. 40 C.F.R. § 423.13(k)(1)(i).
> . . .
> The final set of BAT limitations are based on a determination that dry-handling or closed-loop technology is the BAT for treating bottom ash transport water, resulting in a zero discharge effluent limitation for all pollutants in bottom ash transport water. 80 Fed. Reg. 67837, 67841, 67846, 67849 (promulgated at 40 C.F.R. 423.13(k)(1)(i)). The zero discharge limitation must be met by a compliance date determined by the permitting authority that is as soon as possible between November 1, 2018, and December 31, 2023, and applies only to bottom ash discharges generated beginning on the determined compliance date.

2017 Statement, pp. 56-57. The "interim" limits apply to BATW generated prior to the compliance date, also called "legacy wastewater." 84 Fed. Reg. at 67854 ("[T]his preamble uses the term ''legacy wastewater'' to refer to . . . bottom ash transport water . . . generated prior to the date determined by the permitting authority that is as soon as possible . . .."). And, the final or "long-term" limits apply to BATW generated after the compliance date. As mentioned above, EPA has since promulgated a rule that postponed the earliest compliance date, or the "as soon as possible" date, from November 1, 2018 to November 1, 2020. 82 Fed. Reg. 43494. The rule also continues to provide that the compliance date may be no later than December 31, 2023.

In 2017, EPA Region 1 anticipated applying limitations for BATW and legacy BATW consistent with the 2015 ELGs. Specifically, EPA proposed applying the ELG-based TSS and O&G limits for legacy BATW[4] and then zero-discharge long-term limits for BATW as soon as possible beginning at the earliest compliance date. EPA further stated that it was considering establishing a compliance date of December 31, 2022 or later, based upon information received from the facility and its preliminary analysis of the factors set forth in 40 CFR § 423.11(t). 2017 Statement (AR-1534), pp. 56-61.

2020 Final Permit

As stated above, there have been legal developments since EPA last reopened its public comment period in 2017, which impact the limits applied to BATW in Merrimack Station's Final Permit. In particular, in *SWEPCO*, the Fifth Circuit vacated and remanded to the Agency the BAT limits applicable to legacy BATW, previously codified as 40 CFR § 423.13(k)(1)(ii). *SWEPCO*, 920 F.3d at 1004, 1019. As a result, there is a question as to whether the regulations prior to 2015 required no additional controls on BATW beyond the BPT level of control or whether BATW limits are subject to BPJ decision-making.

The 2015 ELGs' long-term, or final BAT limits applicable to BATW, however, were not affected by the Fifth Circuit's ruling. Therefore, BAT zero-discharge limits will be applied in accordance with the currently effective 2015 ELGs. *See* 40 CFR § 423.13(k)(i). EPA has determined that the appropriate compliance date or "as soon as possible" date, at which time these zero-discharge limits will be required, is December 31, 2023, based on material in the administrative record and assessment of the required factors set forth in 40 CFR § 423.11(t). For EPA's full evaluation of the regulatory factors supporting this determination, see Response to Comment V.1.3 below.

As for the vacated legacy BATW limits, EPA's Final Permit includes limitations for TSS and O&G in legacy BATW. These interim limits, which apply only prior to the compliance date for the long-term limits, December 31, 2023, are consistent with ELGs currently in effect and are equal to limits proposed in previous drafts of the Merrimack Station permit, prior to promulgation of the 2015 ELGs, as well as the limits proposed in the 2017 public notice period.[5]

While EPA Region 1 notes that the question arises as to whether the regulations prior to 2015 required no additional controls on BATW beyond the BPT level of control or whether BATW limits are subject to BPJ decision-making, the Region need not answer this question. The limits included in the Final Permit are both consistent with ELGs currently in effect and would also be consistent with a BPJ determination of BAT limits, if the Agency conducted such BPJ analysis.

In fact, an assessment of the factors required for conducting a case-by-case BPJ analysis for legacy BATW would result in the same TSS and O&G limits based on a determination that BAT is equal to the facility's current practices (i.e., treatment of BATW based on impoundments). *See*

[4] The 2015 ELG-based TSS limits for legacy BATW are equal to the existing BPT limits on TSS, from the 1982 Rule. *Compare* 40 CFR § 423.12(b)(4) *with* 40 CFR § 423.13(k)(1)(ii).
[5] The limits on TSS and O&G include in this Final Permit are also equal to the BCT limits developed pursuant to a site-specific, BPJ assessment and presented in the Region's 2011 Draft Permit and Fact Sheet. 2011 Fact Sheet (AR-608), p. 22.

33 U.S.C. § 1314(b)(2)(B) ("Factors relating to the assessment of best available technology shall take into account the age of equipment and facilities involved, the process employed, the engineering aspects of the application of various types of control techniques, process changes, the cost of achieving such effluent reduction, non-water quality environmental impact (including energy requirements), and such other factors as the Administrator deems appropriate"); 40 CFR §§ 125.3(c)(2) and 125.3(d)(3).

Specifically, the Merrimack Station's facility and equipment for treating BATW were installed over four decades ago. 2011 Fact Sheet, p. 4. In order to meet the long-term, zero-discharge limits for BATW by December 31, 2023, GSP will be constructing new infrastructure and implementing many upgrades. AR-1699. The potential treatment technologies applicable to BATW to meet the zero-discharge limits are dry handling and closed-loop technology. Requiring process changes, additional treatment technology, and associated upgrades to address legacy BATW during the temporary period in which *legacy* wastewater is generated could conflict with and hinder these efforts to achieve zero-discharge. Imposing costs associated with implementing anything other than maintaining the status quo for the relatively brief interim period ending in December 2023, would be unreasonable. In this case, it would be unreasonable to require the Permittee to design, construct and install a technology to be used temporarily (i.e., less than three years) while at the same time designing, constructing and installing the closed-looped technology that has been proposed by the Permittee to meet ELG limits by 2023, which could cost up to 14.9 million dollars, as documented by EPRI (AR-1600, p 3). *See* Comment V.1.4 below.

Moreover, requiring additional treatment to address legacy BATW would create challenges and potential conflicts with management and treatment of other wastestreams at the facility since BATW is commingled with low volume waste, metal cleaning waste, and other wastestreams in the slag settling pond. The former owner of Merrimack Station, PSNH, explored viable options and developed a compliance plan involving the modification to a closed-loop recycle system that utilizes a remotely located inclined drag conveyor (or submerged flight conveyor) to separate the boiler's bottom slag solids from the recycled sluice water. Given the complexity and magnitude of the plan, PSNH could not commit to complying with the "no discharge" based limitations any earlier than December 31, 2022, nearly six years from the time the plan was presented to EPA. AR-1699. Other factors considered by PSNH include potential contingencies, intermittent operation of the plant, likely transition time needed by the new owners, as well as other uncertainties described by PSNH. *Id*. Further, PSNH explains that "an overwhelming majority of process wastewater effluent generated at the facility is BATW…" which a considerable volume is "currently recycled elsewhere in the plant. Removing this wastewater stream from Merrimack Station therefore will significantly disrupt current operations. One or more sources of makeup water may need to be utilized to replace the BATW currently recycled elsewhere in the plant." *Id.*, p 7. This process is involved and complex. EPA concludes that requiring the facility to do more work and expend additional resources to achieve competing, temporary, and incremental treatment improvements, at the same time as it is coordinating and executing the work described above, is not reasonable or appropriate.

Finally, the situation facing Merrimack Station is particularly unique due to the two-stage nature of the regulations, the facility's efforts to achieve zero-discharge in the near term, the absence of only the interim, legacy ELG limits for BATW, and the Agency's forthcoming action to address the vacated legacy BATW provision. *See* 2019 Proposed Rule, 84 Fed. Reg. at 64625 ("The EPA plans to address this vacatur in a subsequent action.").[6]

The limits applied to BATW in the Final Permit are as follows:

- From the <u>effective date of the Final Permit until December 31, 2023 (Outfall 003A):</u>
    - TSS limits (Daily Maximum: 100 mg/l; Monthly average: 30 mg/l) and O&G limits (Daily Maximum: 20 mg/l; Monthly Average: 15 mg/l)
- Beginning on <u>December 31, 2023 (Outfall 003A):</u>
    - Zero discharge limits based on closed-loop or dry handling technology (40 CFR § 423.13(k)(1)(i)).

Comment V.1.2	AR-1548, PSNH, pp. 186-188

Comment: EPA correctly concludes in its Statement that it "will apply the [BATW] technology based requirements that are in effect at the time of Final Permit issuance. . . . [and] anticipates including the interim BAT limits for TSS in the Final Permit for Merrimack Station's [BATW] discharges."730 The agency should include the "legacy wastewater" BAT limits for TSS in the Final Permit for the facility due to the regulatory uncertainty with the more stringent BAT standards set out in EPA's 2015 NELGs. As explained in EPA's September 18, 2017 final rule, the agency intends to revise these more stringent BAT limitations from the 2015 Rule in a rulemaking it intends to complete within the next three years (Fall 2020).731 EPA postponed the earliest possible compliance date of November 1, 2018, to November 1, 2020, "to preserve the status quo for . . . bottom ash transport water until EPA completes its next rulemaking.[]"732 EPA explicitly provided in this latest rulemaking it did not change the "'no later than' date of December 31, 2023, because EPA is not aware that the 2023 date is an immediate driver for expenditures by plants . . . and EPA plans to take up the appropriate compliance period in its next rulemaking."733 The only reasonable interpretation of these collective statements is that EPA does not intend for the steam electric power industry to dedicate additional resources to attempt to comply with the more stringent effluent limitations set out in the 2015 NELGs for BATW at this time or for the BATW "dry handling" BAT effluent limitations to be included in any NPDES permits issued prior to completion of EPA's revised rulemaking.734 Instead, regulated entities should wait to design, procure, and install whatever appropriate BATW retrofit technologies are necessary once the agency issues its revised rulemaking. Furthermore, permit writers should include only the "legacy wastewater" TSS BAT effluent limitations for BATW set out in the 2015 NELGs in any permits issued prior to EPA's promulgation of its new final rule.735

[6] Even if EPA determined that the current or previous ELGs were inapplicable, EPA would exercise its discretion and decline to do a site-specific BPJ analysis to establish BAT limits for legacy BATW at this time. It is appropriate to await a national response to the Fifth Circuit's remand and vacatur before imposing any more stringent requirements in this Permit. EPA notes that the Ninth Circuit has previously upheld EPA's decision not to impose BPJ limits in the case of an anticipated promulgation of a national guideline. *Nat. Res. Def. Council v. EPA*, 863 F.2d 1420, 1424-25 (9th Cir. 1988). EPA would like to have this permit conform to national standards, which are developed using industry-wide cost, availability, and other data.

728 *See* 40 C.F.R. § 423.13(g)(3)(ii).
729 *See* 40 C.F.R. § 423.13(g)(3)(i).
730 AR-1534 at 61.
731 82 Fed. Reg. at 43,498.
732 *Id.* at 43,494-95.
733 *Id.* at 43,496.
734 To the extent EPA believes, based on the current state of the 2015 NELGs, that a justification is required because PSNH seeks a compliance date beyond November 1, 2020 (*i.e.*, the earliest "as soon as possible" date), for the incorporation of the more stringent BATW BAT effluent limitations in the 2015 rulemaking despite EPA's stated intent to overhaul these standards in the foreseeable future, the discussions and points set out in PSNH's February 17, 2017 correspondence to EPA (AR-1378) explain why the Station should be permitted until December 31, 2023 to comply with those effluent limitations. PSNH's February 17, 2017 letter requested a December 31, 2022 deadline to comply with these discharge standards based on the criteria set out in 40 C.F.R. § 423.11(t). However, as explained in April 20, 2017 correspondence, PSNH has suspended work on this compliance initiative due to EPA's decision to reconsider the rulemaking and no additional work will occur on this issue until EPA finalizes its anticipated rulemaking. *See* AR-1362. This lengthy hiatus in PSNH's work was not contemplated in its projected December 31, 2022 compliance schedule and the disruption will result in the need for an additional year (if not longer) if it is ultimately required to comply with the "dry handling" BATW effluent limitations.
One of the issues with the "dry handling" BAT determination in EPA's 2015 ELGs is the disparate costs associated with the technologies capable of eliminating the wastewater discharge compared to the toxic-weighted pound-equivalents removed from the wastewater stream. This issue is particularly relevant to Merrimack Station due to its wet bottom cyclone-fired boilers that produce slag as an end product. Slag, a stable, inert, glass-like solid compound, is created when the molten ash leaving the boiler is quenched in a tank. The associated wastewater contains few pollutants of concern compared to the sluice wastewater utilized in systems with the typical bottom ash targeted in the 2015 NELGs, which means the already disproportionate cost-benefit ratio for the industry as a whole is even worse for the slag wastewater generated at Merrimack Station. Comments will likely be submitted on this issue during the public comment period for EPA's reconsideration of the FGD and BATW effluent limitations to encourage the agency to either exempt wastewater associated with boilers that produce slag from the new BAT effluent limitation or establish a separate BAT standard for such facilities that accounts for the few pollutants of concern in the associated wastewater. Should EPA fail to address this issue, a fundamentally different factors variance (*see* 40 C.F.R. Part 125, Subpart D) for Merrimack Station will likely be sought at the appropriate time due to these unique issues.
735 Although, EPA could again consider use of a "reopener clause" in the Final Permit for Merrimack Station for this BATW regulatory issue to provide it flexibility to modify the Final Permit to address and/or incorporate the requirements of the rulemaking EPA intends to finalize in 2020.

EPA's Response:

See EPA Response V.1 above for a discussion of the regulatory history and the limits applicable to BATW.

EPA additionally notes that while it recognizes that the Steam Electric ELGs are undergoing revisions (*see* 84 Fed. Reg. 64620), the final or long-term limits applicable to BATW (40 CFR § 423.13(k)(1)(i)) are currently in effect. As EPA has consistently stated, EPA must develop permits based on current regulations. *See* 40 CFR § 122.43(b)(1) ("an applicable requirement is a statutory or regulatory requirement (including any interim final regulation) which takes effect prior to the issuance of the permit."); *see also* 2017 Statement (AR-1534), pp. 48, 58, 61. In this case, the current regulations from 2015 require zero-discharge by the compliance date, beginning November 1, 2020 and no later than December 31, 2023. If the limits applicable to BATW change as a result of the ongoing rulemaking action, the permittee may request a permit modification in accordance with 40 CFR § § 122.62.

Comment V.1.3	AR-1573, CLF, pp. 21-25

Comment: ***EPA Must Impose a Compliance Date of November 1, 2020 for Elimination of Bottom Ash Transport Water Discharges at Merrimack Station***

Merrimack Station also discharges bottom ash transport water, which the ELGs require to be eliminated as soon as possible beginning November 1, 2020 and no later than December 31, 2023.[8] The compliance date for any particular facility is to be determined by the permitting authority. As Region 1 correctly explains, the 2015 Rule set out the basic procedure for permitting authorities in determining that compliance date.

First, the presumptive compliance date (or "as soon as possible" date) is November 1, 2018. Next, the permitting authority may determine a later compliance date, but no later than December 31, 2023, and only if it receives information from the discharger justifying the later date. Finally, after receipt of such justification, the permitting authority may set a compliance date later than the presumptive date only after considering the factors set forth above.[9]
The factors that a permitting authority is required to consider include:

(a) Time to expeditiously plan (including to raise capital), design, procure, and install equipment to comply with the requirements of the final rule; (b) Changes being made or planned at the plant in response to greenhouse gas regulations for new or existing fossil fuel-fired power plants under the Clean Air Act, as well as regulations for the disposal of coal combustion residuals under subtitle D of the Resource Conservation and Recovery Act; (c) For FGD wastewater requirements only, an initial commissioning period to optimize the installed equipment; and (d) Other factors as appropriate.[10]

EPA seeks comment on the deadline for Merrimack Station to comply with the bottom ash ELG and notes that the current owner and operator of the plant, Eversource, has proposed a compliance date of December 31, 2022. Critically, Eversource's justification for this deadline, contained in a February 17, 2017 letter (AR-1378), is withheld from the public administrative record in this matter as confidential business information.[11]

EPA does not propose a particular compliance deadline nor provide any reasoning as to why any particular compliance date is appropriate, other than to indicate, noncommittally, that "EPA was considering th[e] information [submitted by Eversource] and was contemplating whether to set December 31, 2022, as the final compliance date, taking into account the listed factors."[12]

Eversource's proposed December 31, 2022 compliance date should be rejected by EPA. First, it is more than two full years after the presumptive "as soon as possible" date in the current regulations (and more than four years after the presumptive "as soon as possible" date at the time that Eversource submitted the information). EPA has cited no reason that Eversource cannot comply by November 1, 2020, much less a justification that stands up to scrutiny. EPA must make an independent determination as to the appropriate compliance date based on an examination of the validity of the information submitted by the permittee and exercising its own judgment.

Even more fundamentally, EPA cannot make a bottom ash compliance date determination based on information withheld from the public. EPA's approach to Eversource's proprietary submission regarding the status of its secondary wastewater treatment system for FGD wastewater was to provide a redacted version in the administrative record, which allows for public review to the greatest extent possible. However, EPA has made no similar attempt to summarize or redact Eversource's justification regarding the bottom ash compliance date justification. The undersigned organizations have collectively reviewed dozens of NPDES permit applications concerning the appropriate ELG compliance dates for various facilities and have never encountered a justification submitted by a permittee being withheld from the public as confidential business information. EPA cannot base a decision on the bottom ash compliance date for Merrimack without any rationale and without publicly disclosing the basis for its decision. As a legal matter, on the present record there is no basis to impose any compliance deadline other than November 1, 2020.

Moreover, there is compelling evidence that Eversource can, in fact, comply by November 1, 2020. As shown in the table below, in 24 other NPDES permit renewals, permitting authorities have proposed or finalized earlier compliance deadlines for bottom ash limits, demonstrating that it is, as a general matter, feasible for plants to achieve earlier compliance.[13]

State	Facility	Permit Number	Status	Date	Bottom Ash Compliance Date
FL	Crystal River North Station Units 4 & 5	FL0036366	Draft	8/26/2016	2/1/2020
IA	George Neal	IA0004103	Draft	10/5/2017	121/1/2020
IA	Ottumwa Generating Station (IP&L)	IA9000101	Draft	9/27/2017	6/1/2021
IA	IPL Lansing Generating Station	IA0300100	Final	6/1/2016	12/31/2021
IL	Hennepin Power Station	IL0001554	Draft	11/9/2016	4/1/2019
IN	A.B. Brown Generating Station	IN0052191	Final	2/28/2017	11/1/2018
IN	Clifty Creek Station	IN0001759	Final	3/28/2017	4/1/2022
IN	Merom Generating Station	IN0050296	Final	8/5/2016	11/1/2018
IN	Michigan City Generating Station	IN0000116	Final	3/30/2016	11/1/2018
IN	Petersburg Generating Station	IN0002887	Final	8/25/2016	11/1/2018
IN	F.B. Culley Generating Station	IN0002259	Draft	1/12/2017	11/1/2018
MI	Belle River Power Plant	MI0038172	Final	1/27/2017	12/31/2021
MO	Sioux	MO0000353	Final	4/1/2017	5/1/2021
NC	Allen Steam Station	NC0004979	Draft	10/28/2016	2/28/2021
NC	Belews Creek Steam Station	NC0024406	Draft	1/15/2017	5/31/2021
NC	Marshall Steam Station	NC0004987	Final	9/9/2016	1/31/2021
NC	Mayo Steam Electric Generating Plant	NC0038377	Draft	8/25/2016	11/1/2018
NC	Rogers Energy Complex (aka Cliffside)	NC0005088	Draft	9/21/2016	12/31/2020
NC	Roxboro Steam Electric Generating Plant	NC0003425	Draft	1/21/2017	4/30/2021
ND	Leland Olds Station	ND-0025232	Final	3/31/2017	11/1/2018
PA	Brunner Island	PA0008281	Draft	4/5/2017	1/1/2022
SC	A.M. Williams Station	SC0003883	Final	11/16/2016	11/1/2018
VA	Chesterfield Power Station	VA0004146	Final	9/23/2016	11/1/2018
WI	Alma Site	WI0040223-08-0	Final	4/1/2017	1/1/2021

In addition, the Statement of Substantial New Questions reveals that Eversource already recycles wastewater from the slag settling pond, which primarily consists of bottom ash transport water, as make-up water in the Facility's FGD scrubber.[14] Because the 2015 Steam Electric ELGs allows for the discharge of bottom ash transport water when it is used in an FGD scrubber,[15] Eversource could potentially capture bottom ash transport water before it is sent to the slag settling pond and use it as FGD makeup water. This potentially provides a pathway for earlier compliance with the bottom ash ELGs compared to installation of a dry or closed-loop handling system for bottom ash. This change in operation could affect the characteristics of the FGD wastewater and, in turn, the need for water-quality based effluent limits on that wastewater, as noted above.

EPA's Statement of Substantial New Questions also reveals that in a letter dated April 20, 2017, Eversource "indicated to EPA that it will hold off on pursuing that plan [to comply by December 2022] in light of the postponement of the compliance deadline" and that it "plans to wait for the results of EPA's reconsideration of the ELGs before deciding on how to proceed."[16] That letter refers to the April 12, 2017 announcement by Administrator Pruitt that he would administratively stay the deadlines for an indefinite period of time,[17] which EPA has now withdrawn and replaced with a two-year postponement of the deadlines for the FGD and bottom ash standards.[18] In its rulemaking finalizing the two-year postponement, EPA emphasized that the standards for which it delayed the compliance deadlines remain in effect, despite the agency's ongoing reconsideration process.[19] Because the December 31, 2022 deadline that Eversource had already requested is more than two years after the new presumptive "as soon as possible" date of November 1, 2020, that two-year postponement of the compliance deadline does not justify any later compliance date than what Eversource has already proposed, which as we noted above, EPA cannot accept based on the current state of the record.

In the April 20 letter, Eversource asserts that it will delay work toward compliance with the bottom ash standard so long as EPA is reconsidering that standard. EPA must not condone any cessation of efforts to comply with the bottom ash standard, which remains in effect, albeit with a delayed compliance date. To stop work on compliance with a standard that remains in effect, merely because it is being reconsidered, would effectively eliminate that standard before any evidentiary record has been put forward to justify doing so. Moreover, EPA has made clear that the bottom ash and FGD standards may not change at all as a result of the reconsideration process,[20] consistent with its obligation not to predetermine the outcome of its rulemaking process.

[8] EPA's final rule to postpone certain ELG compliance dates moves the presumptive "as soon as possible" date from November 1, 2018 to November 1, 2020. *Postponement of Certain Compliance Dates for the Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category*, 82 Fed. Reg. 43,494 (Sept. 18, 2017). Several of the undersigned parties have challenged this postponement in federal district court. *See Clean Water Action v. Pruitt*, D.D.C. Civil Action No. 17-cv-00817, Proposed Am. Compl. ¶¶ 104-11.
[9] Statement of Substantial New Questions at 58.
[10] Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category, 80 Fed. Reg. 67,837, 67,883 (Nov. 3, 2015) (internal footnotes omitted).
[11] Statement of Substantial New Questions at 59.
[12] Statement of Substantial New Questions at 59.
[13] The information in this table is based on data compiled by the Sierra Club.
[14] Statement of Substantial New Questions at 59, n.16.
[15] 40 C.F.R. § 423.13(k)(1)(i).
[16] *See* Statement of Substantial New Questions at 60, citing AR-1362 (Letter from Linda T. Landis, Senior Counsel, Eversource Energy, to Mark Stein, Senior Assistant Regional Counsel, EPA Region 1).
[17] *See Postponement of Certain Compliance Dates for Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category*, 82 Fed. Reg. 19,005 (Apr. 25, 2017) (notice signed by the Administrator on April 12).
[18] 82 Fed. Reg. at 43,496.
[19] 82 Fed. Reg. at 43,496 ("This maintains the 2015 Rule as a whole at this time, with the only change being to postpone specific compliance deadlines for two wastestreams."); see also U.S. EPA, Response to Comment

Document, EPA-HQ-OW-2009-0819, SE06669, at 8 (The only thing the Postponement Rule does is revise the 2015 ELG Rule's new, more stringent compliance dates for two wastestreams discharged from existing sources (bottom ash transport water and flue gas desulfurization wastewater). Otherwise, it leaves the Rule unchanged."); *id.* at 12 ("EPA's action to postpone certain compliance dates in the 2015 rule . . . does not otherwise amend the effluent limitations guidelines and standards for the steam electric power generating point source category.")
[20] *See* Response to Comment Document, *supra*, at 6 ("It is possible that the costs, impacts and benefits of the rule may be unchanged after EPA completes its new rulemaking."); *id.* at 18 (dismissing concerns about negative water quality impacts of the delay as "speculative at this point in time as EPA has yet to alter any of the effluent limitations in the 2015 Rule").

EPA's Response:

The 2015 Rule provides that the long-term zero-discharge limits for BATW must be met "by a date determined by the permitting authority that is as soon as possible beginning November 1, 2020, but no later than December 31, 2023." 40 CFR § 423.13(k)(1)(i). Section 423.11(t) further explains that the phrase "as soon as possible" means November 1, 2020, "unless the permitting authority establishes a later date, after receiving information from the discharger," which reflects a consideration of several factors:

- Time to expeditiously plan (including to raise capital), design, procure, and install equipment to comply with the requirements of this part. 40 CFR § 423.11(t)(1).
- Changes being made or planned at the plant in response to new source performance standards for greenhouse gases from new fossil fuel-fired electric generating units, emission guidelines for greenhouse gases from existing fossil fuel-fired electric generating units, or regulations that address the disposal of coal combustion residuals as solid waste. § 423.11(t)(2).
- Other factors as appropriate. § 423.11(t)(3).

As explained in EPA's 2017 Statement,

> On February 17, 2017, PSNH sent EPA a letter outlining its plan for achieving compliance with the new zero discharge limit for bottom ash transport water through installation of closed-loop recycling technology. AR-1378. PSNH's letter presents information regarding anticipated challenges related to construction and other matters and ultimately suggests December 31, 2022, as the appropriate date for compliance with the zero discharge limitation. . . . PSNH's letter provides information relevant to EPA's determination of the "as soon as possible" date for compliance.

2017 Statement (AR-1534), p. 59. EPA then further noted,

> While PSNH had developed a plan for meeting the zero discharge standard by December 31, 2022, it has now indicated to EPA that it will hold off on pursuing that plan in light of the postponement of the compliance deadline. PSNH indicated that it plans to wait for the results of EPA's reconsideration of the ELGs before deciding on how to proceed. *See* AR-1362 (Letter from Linda T. Landis, Senior

> Counsel, Eversource Energy, to Mark Stein, Senior Assistant Regional Counsel, EPA Region 1 [dated April 20, 2017]).

Id. at 60. Since receiving this letter from PSNH, Merrimack Station transferred its ownership to GSP. This divestiture occurred on January 10, 2018, *see AR-1642*, and the current NPDES permit was transferred to the new owners by letter dated on January 18, 2018. AR-1701. The new owners of the facility met with EPA on several occasions to discuss the NPDES permit process and several Steam Electric ELG and other issues. On November 13, 2018, EPA and GSP discussed the information received from the former owner, PSNH, related to installation of zero-discharge technology and the appropriate compliance date. *See* AR-1705. GSP stated that it assumed PSNH's obligations and choices related to implementing new technology to treat BATW. *Id.* at 3.

With this and other information in mind, EPA is establishing the "as soon as possible" date as December 31, 2023. Compliance with zero-discharge limitations must be achieved by this date. EPA's determination is supported by the following assessment of the regulatory factors set forth in 40 CFR § 423.11(t). As a preliminary note, commenters claim that EPA cannot assess the appropriate compliance date based on confidential business information (CBI) that is withheld from the public and not included in the public record. EPA has since coordinated with PSNH, the author of the CBI letter from February 2017, and received a version of this letter with minimal redactions. This letter is now included as AR-1699 ("February 2017 Letter"). All information assessed in EPA's analysis below is visible and unredacted, thereby resolving any issues the commenters may have had.

<u>Time to expeditiously plan, design, procure, and install equipment</u>

The letter submitted by PSNH, and affirmed by GSP, identifies several important facts that impact the time needed to plan and ultimately be in a position to install and implement a closed-loop system at Merrimack Station. First, the letter explains that the facility (in 2017) was undergoing a divestiture process. PSNH would not be the owner of the facility for much longer (estimated transfer date at the end of 2017), and any new buyer would need time to familiarize itself with the facility, make a financial assessment, and decide whether the approach proposed by PSNH for BATW treatment was the appropriate and desired path forward. *Id*. at 6.

Additionally, the February 2017 Letter explains that the facility's efforts to procure the materials and equipment needed to install a closed-loop system will be affected by "competition within the industry to limited materials and available vendors." *Id.* at 7. EPA agrees that in the years since promulgation of the 2015 Rule, many facilities will have been working toward achieving zero-discharge and installing similar systems, competing to obtain materials and services from the same set of vendors. As noted by PSNH, these supply schedule delays could be up to 17 months for certain materials and equipment. *Id.* at 6-7.

Next, PSNH points to potential interactions between its plan to comply with the BATW limits and other limitations and conditions included in the Final Permit. *Id.* Until the permit is finalized, the Permittee will not be able to fully develop and coordinate its financial planning and scheduling for all process changes and upgrades needed at the facility. In the same vein, PSNH explains the importance of completing an up-to-date water balance study, and one that accounts for the elimination of BATW as well as all other limits and conditions included in this Final Permit. *I*. PSNH correctly notes that elimination of BATW will be significant because it comprises a majority of the process wastewater at the facility. Moreover, EPA acknowledges that prior to transferring ownership of Merrimack Station, PSNH began conducting the water balance study. *Id.*

Another factor identified in the February 2017 Letter is the impact that Merrimack Station's reduced and intermittent operations has on planning. *See also* Chapter II of this Response to Comment document. Contractor and vendor sampling and data gathering takes longer with reduced operations, and therefore creates longer timelines for engineering plans, designs, and installation plans for the anticipated closed-loop system. AR-1699, p. 7. Additionally, optimizing the new system, once installed, may take longer due to the sporadic, and much more limited operations.

Finally, PSNH identifies the impact that ISO-New England (NE) limitations and requirements will have on the timeline for installing a closed-loop system. The Letter explains that installation of the new system for BATW will require "both units to be offline and unavailable for some periods." *Id.* at 8. Any planned outages to incorporate installation must be coordinated with ISO-NE, and ultimately approved through the organization. This approval process may take time and is subject to some uncertainty in that ISO-NE may not always be able or willing to approve planned outages due to risks to grid reliability and its responsibility to meet regional demand. However, since Merrimack Station has rarely operated during the shoulder months in recent years, it may be easier to coordinate necessary outages with ISO-NE during these months.

Other Regulatory Changes

Information in the administrative record and received in PSNH's February 2017 Letter does not indicate that Merrimack Station has any conflicting obligations under the Clean Air Act (CAA), the Resource Conservation and Recovery Act (RCRA), or their implementing regulations.

EPA has considered the information submitted by PSNH, and reasonably concludes that these facts support a compliance date of at least December 31, 2022. However, the other factors, as discussed below, also affect EPA's assessment and determination of whether this 2022 deadline is still appropriate.

Other Factors

The EPA also considered two other important factors. First, the information submitted by PSNH projected that compliance could be achieved by December 31, 2022. However, as noted above, the company later stated in April of 2017 that, due to the Administrator's decision to reconsider the BAT limits for BATW and FGD wastewater, the company was pausing its efforts to plan for achieving zero-discharge for BATW until the reconsideration was resolved. AR-1362. PSNH's halting of planning and implementation lasted until it transferred ownership of the facility

January 10, 2018. Additionally, the NPDES permit was transferred to the new owner, GSP, who needed time to get up to speed on the issues facing permit development, including the BATW issues. It was not until November of 2018 that GSP confirmed that it was adopting the plan and rationale set forth in PSNH's February 2017 Letter to address BATW. AR-1705. Thus, over a year passed where the facility was pausing its efforts until the new owner adopted a plan for coming into compliance with zero discharge limits. This delay is relevant, and EPA has accounted for such delay in its evaluation of an appropriate compliance date. PSNH's initial estimate of December 31, 2022 is no longer accurate based on the time needed to comply given the transfer of ownership. Additional time added to the timeframe for compliance is therefore reasonable.

Second, while the Agency's reconsideration of the BAT limits applicable to BATW may affect the ELGs applicable to this wastestream, when EPA issues permit limitations it must apply the regulations that are currently in effect. Until the reconsideration and new rulemaking (*see* 2019 Proposed Rule, 84 Fed. Reg. 64620) result in a final rule with effective, applicable limits, EPA will apply the current, effective limits. These limits include zero-discharge limits for BATW to be achieved no later than December 31, 2023. The reconsideration, while it may lead to some uncertainty to the industry, does not impact EPA's assessment of an appropriate compliance date. Furthermore, the facility would like to begin operating under its new permit as soon as possible. AR-1676, 1678.

Ultimately, the above analysis supports December 21, 2023 as the appropriate compliance date or "as soon as possible" date for compliance with the zero-discharge limits for BATW (40 CFR § 423.13(k)(1)(i)) at Merrimack Station.

The commenter, above, makes two additional points in support of its request that EPA require compliance by November 1, 2020. First, the commenter points to numerous other facilities' compliance dates, and concludes that because some of these facilities have compliance dates earlier than November of 2020, then this amounts to a finding that Merrimack Station can achieve compliance in 2020 as well. However, the commenter fails to provide any additional information about these facilities—*e.g.*, existing infrastructure, whether the facilities had already been planning to install closed-loop or dry handling prior to permit issuance, interactions between other outfalls, etc. Without any additional facts, EPA cannot meaningfully compare the compliance dates at these facilities to the compliance date determined for Merrimack Station.[7] Furthermore, the regulations make clear that EPA's determination of a compliance date is a site-specific assessment, based on information and facts specific to each individual facility. Therefore, unless these other power plants are identical to Merrimack, their site-specific compliance deadlines are not relevant to EPA's assessment here. *See* 80 Fed. Reg. at 67854 (articulating the facility-specific assessment of factors).

Second, the commenter suggests that because Merrimack Station recycles some BATW for use as make-up water for its FGD system, that the facility "could potentially capture bottom ash

[7] Even if EPA were to examine dates assigned to these other facilities, many of the compliance dates are included only in *draft*, not final, permits, and EPA has no information about the deadlines included in the final permits.

transport water before it is sent to the slag settling pond and use it as FGD makeup water. This potentially provides a pathway for earlier compliance with the bottom ash ELGs compared to installation of a dry or closed-loop handling system for bottom ash." This, however, is not a viable option at Merrimack Station. At full capacity, upwards of 14 million gallons per day of BATW can be generated while only approximately 1 million gallons per day is needed for FGD system make-up water. Even if the FGD system used only BATW as make-up water, that would leave millions of gallons of BATW to be treated or addressed by other means.

Comment V.1.4	**AR-1600, EPRI, p. 3**

EPRI also conducted an evaluation of the cost effectiveness of bottom ash transport water treatment using remote settling of bottom ash and a closed-loop reuse of the ash/slag transport water. The cost effectiveness calculations were performed by estimating the pollutant removals for each technology and comparing these removals with the costs of the technologies.
The pollutant removals and costs for the closed-loop bottom ash transport water system are included in Table 2.

Table 2. Merrimack Cost Effectiveness for Closed-Loop Bottom Ash Handling System

	Removal (TWPE per year)	Capital Cost (Million dollars in 2017 dollars)	O&M Cost (Million dollars per year)	Total Annualized Cost (Million dollars per year)	Cost Effectiveness Ratio (Dollars per TWPE)	Capital Cost (Million 1981 dollars)	O&M Cost (Million 1981 dollars per year)	Total Annualized Cost (Million 1981 dollars per year)	Cost Effectiveness Ratio (1981 Dollars per TWPE)
Closed-loop bottom ash	192	14.9	0.2	1.6	8,333	5.0	0.06	0.5	2,797

O&M costs estimated by EPRI; all other costs are from PSNH.

The supporting calculation details for bottom ash are provided in Appendix B. The cost/TWPE ratio of closed-loop bottom ash handling system is $2,724 /TWPE (in 1981 dollars). The following table compares this Merrimack site-specific, wastestream specific cost per TWPE to various EPA cost effectiveness values.

Cost Effectiveness Analysis	Cost Effectiveness Ratio (1981 Dollars per TWPE)
EPRI: Merrimack Bottom Ash Closed-Loop System	$2,797
EPA: Electrical and Electronic Components[3]	$404
EPA: 2015 Steam Electric ELG Rule[4]	$136
EPA: 2015 ELG Bottom Ash Closed-Loop, Zero Discharge [5]	$314

The Merrimack site-specific cost effectiveness ratio is more than eight times the cost effectiveness ratio EPA estimated for treatment of the bottom ash transport water wastestream in the 2015 rule. These numbers should be comparable, but because of Merrimack's low pollutant loadings and high costs, retrofitting a closed-loop bottom ash transport water system at Merrimack is not at all cost effective.

[3] Regulatory Impact Analysis for the Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category, USEPA, 2015. Page F-10.
[4] Regulatory Impact Analysis for the Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category, USEPA, 2015. Page F-12.

[5] Regulatory Impact Analysis for the Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category, USEPA, 2015. Page F-12.

EPA Response:

The commenter suggests that retrofitting a closed-loop BATW system at Merrimack Station is not cost effective. Whether EPA-Region 1 agrees or not with this assessment or the underlying calculations and assumptions is of no consequence here because the Region has no authority to not apply the limitations of the current 2015 Steam Electric ELGs, which require that for electric generating units having a capacity greater than 50 MW and that are not oil-fired, such as Merrimack Station, there shall be no discharge of pollutants in bottom ash transport water after a certain compliance date. 40 CFR § 423.13(k)(1)(i).

Comment V.1.5	**AR-1600, EPRI, pp. 4-5**

Comment: ***Bottom Ash Transport Water-Challenges of Closed-Loop Operation***

The term 'bottom ash' is used herein although the type of boiler at Merrimack (cyclone coal-fired boiler) produces a bottom ash material more commonly referred to as slag.
EPRI research at sites that have attempted to operate closed-loop bottom ash handling systems has identified several challenges to implementation and operation. Challenges include balancing the water flows into and out to keep the water balance neutral and maintaining water quality in the closed-loop.

Challenges with closing the water balance to eliminate discharge (i.e., having more flow into a closed-loop bottom ash handling system than flows out) stem from the inclusion of non-transport waters in the closed-loop system, including water from storm events. Several non-transport process waters around the hopper or dewatering system come into contact with ash transport water, forcing these waters to be managed in the closed-loop system. Some of these waters (such as hopper cooling water or hopper seal trough water) can be supplied with recirculated ash transport water, but it may not be feasible for others because of water quality or other reasons.

Examples include pump seal water, which may not be able to use the recirculated ash water due to solids content abrading the pump seals. Rain water entering the loop through floor drains and uncovered tanks also increase the flows into the overall water balance.

Some water uses in the recirculated ash loop may require additional equipment or modifications, such as:

- Heat exchangers if the recirculated water temperature is too high for equipment limitations and personnel safety
- Storage tanks to store excess water from boiler tube leaks, large maintenance events, or stormwater

Going to closed loop typically requires capturing any significant transport water loss to building sumps by modifying and rerouting sumps near the boiler or modifying the ash hopper design. Additionally, modifications typically are needed to prevent non-transport wastewaters from mixing with the ash transport water to prevent further adding of water to the closed-loop bottom ash handling system.

As each transport of ash leads to contaminants from the ash partitioning into the water, and clean water evaporates from the closed loop, the water quality in the loop can worsen. This is partially offset by contaminants leaving the loop in water entrained in the ash, but EPRI has noted through research at numerous sites that there are challenges in controlling water quality conditions, such as:

- Small and/or less-dense particles not removed by the remote dewatering system can cause plugging in pipes and nozzles, or accumulating in sumps and tanks, which increases cleaning and maintenance requirements.
- Scaling can be caused by ion concentrations increasing in the loop.
- Acidity and/or corrosion has been observed in some recirculated systems, which in one instance was attributed to pipe corrosion and failure.

The 2015 Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category allowed for purges from a closed-loop bottom ash handling system only to an FGD scrubber. However, such a purge may not be feasible if the purge volume required is higher than the FGD make-up demand (due to excess water or water quality control), especially if a plant has an evaporative FGD treatment technology that requires all distillate to be returned to the scrubber. Additionally, ash transport water could require storage (i.e., multiple surge tanks) during plant outages (i.e., scrubber is offline) if maintenance is required on the ash dewatering equipment. Further, purge water from a closed-loop system could have negative impacts on a FGD scrubber's gypsum crystallization and gypsum marketability. In some cases, additional treatment may be required for the transport water for it to be used in a FGD scrubber.

EPA's Response:

As previously stated, Region 1, as the permitting authority for New Hampshire, must apply any applicable ELGs that are currently in effect. The Region does not have discretion to not apply effective ELGs.

Furthermore, and while not necessary to the decision for the reason stated above, EPA Region 1 notes that the previous owner of Merrimack Station, PSNH undertook an effort to study and identify the most feasible option for the Station to come into compliance with the no discharge limitations. PSNH determined, after consultation with a number of engineering firms and equipment manufacturers, that the existing boilers' current slag sluice system could be retrofitted with a closed-loop recycle system that utilizes a remotely located inclined drag conveyor (or submerged flight conveyor). *See* AR-1699.

Comment V.1.6	AR-1600, EPRI, Appendix B

Comment: Appendix B - Bottom Ash Sluice Water Treatment Cost-Effectiveness Analysis

Introduction

This appendix provides details on how EPRI estimated cost-effectiveness for a closed-loop bottom ash handling system. Cost estimates are based on information provided by PSNH Merrimack Station.

Pollutant Removals Calculation Methodology

Pollutant removals for bottom ash transport water were defined as the pollutants in bottom ash transport water minus the pollutants in the source water. The estimated contaminants removed were calculated both as concentrations and toxic-weighted pound equivalents (TWPE). TWPE factors are used by the U.S. Environmental Protection Agency (EPA) to express the relative toxicity of pollutants. Calculations use the concentration of contaminants in the water, wastewater flow, and toxic weighting factors (TWF). Data from PSNH Merrimack sampling were used in the calculations.

Summary of Available Data

EPRI's evaluation used data from two sampling episodes at PSNH Merrimack. The bottom ash transport water data were based on one sample taken in July 2013 and an additional sample taken in July 2017. These two data sets were averaged before subtracting out the source water pollutants. The source water data were based on a sample taken in July 2013 corresponding to the bottom ash sample. Analytes that were not included as part of the plant PSNH sampling episodes were estimated with data for source water and bottom ash water based on the following document:

- EPRI Comments on Proposed Effluent Limitations Guidelines Rule (EPRI, 2013)

The source water data was subtracted from the bottom ash transport water and multiplied by the average flow rate on days the plant is operating at Merrimack Station (4 million gallons per day) and TWF to calculate TWPE per year. The flow per year was based on PSNH's estimate of operating roughly 40 percent of the time. The available data are summarized in Table B-1 and Table B-2 summarizes bottom ash transport water minus the source water.

The pollutant removal calculation followed the methodology outlined in the EPRI Comments on Proposed Effluent Guidelines Rule (EPRI, 2013) pollutant removal calculations.

A summary of the estimated benefit calculation for PSNH Merrimack Station is presented in Table B-3.

APPENDIX B – BOTTOM ASH SLUICE WATER TREATMENT COST-EFFECTIVENESS ANALYSIS

Table B-1. Merrimack Station Source Water and Bottom Ash Transport Water Concentrations

Analyte	Source Water 07/22/2013 (mg/L)	Bottom Ash Transport Water 07/22/2013 (mg/L)	Bottom Ash Transport Water 07/19/2017 (mg/L)	Bottom Ash Transport Water Average (mg/L)
Aluminum	0.08	0.23	0.67	0.45
Antimony	0.0005	0.0005	0.0005	0.0005
Arsenic	0.0005	0.0005	0.002	0.00125
Barium	0.008	0.009	0.015	0.012
Beryllium	0.0005	0.0005	0.0005	0.0005
Boron	0.025	0.025	0.025	0.025
Cadmium	0.0005	0.0005	0.0005	0.0005
Calcium	4.2	4.6	4.4	4.5
Chromium	0.0005	0.0005	0.002	0.00125
Cobalt	0.0005	0.0005	0.0005	0.0005
Copper	0.03	0.001	0.005	0.003
Iron	0.42	0.66	1.1	0.88
Lead	0.004	0.0005	0.002	0.00125
Magnesium	0.68	0.73	0.75	0.74
Manganese	0.031	0.03	0.047	0.0385
Mercury	0.000002	3.3E-06	0.00005	2.67E-05
Molybdenum	0.0005	0.0005	0.001	0.00075
Nickel	0.0005	0.0005	0.002	0.00125
Selenium	0.0005	0.0005	0.0005	0.0005
Silver	0.0005	0.0005	0.0005	0.0005
Sodium	9	10	12	11
Thallium	0.0005	0.0005	0.0005	0.0005
Tin	0.005	0.005	0.0025	0.00375
Titanium	0.0025	0.01	0.032	0.021
Vanadium				
Zinc	0.013	0.0025	0.01	0.00625
Chloride				
Sulfate	4	9	8	8.5
Nitrate/Nitrite			0.25	0.25
Ammonia-N				
Fluoride				
Cyanide				
Hexavalent Chromium				

Table B-2. Merrimack Station Bottom Ash Transport Water Minus Source Water

Analyte	TWF	Bottom Ash Water Minus Source Water	
		mg/L	mg/L * TWF
Aluminum	0.0647	0.370	0.0239
Antimony	0.0123	-	-
Arsenic	3.47	0.000750	0.00260
Barium	0.00199	0.00400	7.96E-06
Beryllium	1.057	-	-
Boron	0.00834	-	-
Cadmium	22.8	-	-
Calcium	0.000028	0.300	8.40E-06
Chromium	0.0757	0.000750	5.68E-05
Cobalt	0.1143	-	-
Copper	0.623	-	-
Iron	0.0056	0.460	0.00258
Lead	2.24	-	-
Magnesium	0.000866	0.0600	5.19E-05
Manganese	0.103	0.00750	0.000770
Mercury	110	2.47E-05	0.00271
Molybdenum	0.201	0.000250	5.04E-05
Nickel	0.109	0.000750	8.17E-05
Selenium	1.12	-	-
Silver	16.5	-	-
Sodium	5.49E-06	2	1.1E-05
Thallium	2.85	-	-
Tin	0.301	-	-
Titanium	0.0293	0.0185	0.000542
Vanadium	0.28	0.0199[a]	0.005569
Zinc	0.0469	-	-
Chloride	2.43E-05	1.81[a]	4.39E-05
Sulfate	5.6E-06	4.5	2.52E-05
Nitrate/Nitrite	0.0032	6.25E-03[a]	2.00E-05
Ammonia-N	0.00111	0.00[a]	-
Fluoride	0.035	0.01018[a]	0.000356
Cyanide	1.12	NA[a]	0
Hexavalent Chromium	0.517	NA[a]	0
Total			**0.0394**

[a] Gap filled with *EPRI Comments on Proposed Effluent Limitations Guidelines Rule*

- Represents no removal, as source water was equal to or greater than bottom ash water data.

Table B-3. Merrimack Station Bottom Ash Treatment System Benefits

	Flow (gpy)	Removal (mg/L * TWF)	Removal (TWPE per year)
Bottom Ash Transport Water Minus Source Water	584,000,000	0.0394	192

TWPE = Toxic Weight Pound Equivalent

Cost Estimate

Capital costs and operating costs were estimated by CH2M. CH2M's estimate was developed using equipment cost quotes, and then adding parametric factors such as piping, contractor profit and engineering. The equipment is primarily the remote submerged flight conveyor (SFC). PSNH has designed a system with one remote SFC. Therefore, the cost is lower than it would be for sites that choose to include redundant systems for reliability. Costs were annualized based on a 20•year plant life span at a 7 percent interest rate. Table B·4 summarizes the annualized cost in current dollars and 1981 dollars.

Table B-4. Merrimack Station Cost for Closed-Loop Bottom Ash Handling System

	Capital Cost, [million dollars]	Operation & Maintenance, [million dollars per year]	Total Annualized, [million dollars per year]	Capital Cost, [1981 million dollars]	Operation & Maintenance, [1981 million dollars per year]	Total Annualized, [1981 million dollars per year]
Bottom Ash Sluice	14.9	0.2	1.6	5.0	0.06	0.5

Note: Capital costs and operating costs estimated assuming one remote submerged flight conveyor needed.

EPA's Response:

See Response to Comment V.1.4 above. While EPA has considered and reviewed the cost estimates and pollutant reductions resulting from the implementation of closed-loop or dry handling technology to treat BATW, this information has no effect on the Agency's application of the current, effective ELGs, which require zero-discharge by the compliance date. 40 CFR § 423.13.(k)(1)(i).

Comment V.1.7	**AR-851, CLF, pp. 50-52**

Comment: ***EPA Must Conduct a BPJ Analysis and Set Technology-Based Effluent Limits for Discharges of Coal Ash Wastewater from Outfall 003A***

EPA failed to conduct a BPJ analysis and set technology-based effluent limits for toxic pollutants in ash landfill leachate and ash wash (i.e. coal ash wastewater) even though EPA has advised state permit writers that this is required under the CWA.[263] The slag settling pond that discharges to the River from Outfall 003A receives a number of waste streams, including coal ash landfill leachate and slag (bottom ash) transport wastewater.[264]

Based on an extensive multi-year review of power plant discharges, EPA found that power plants discharge toxic pollutants at high levels, and that "most of the toxic pollutant loadings for this category are associated with metals and certain other elements present in wastewater discharges ... associated with ash handling and wet flue gas desulfurization (FGD) systems."[265]According to EPA, the discharge of coal ash wastewater poses a risk to public health and the environment.[266]

EPA has stated that:

> [m]any of the common pollutants found in coal combustion wastewater (e.g., selenium, mercury, and arsenic) are known to cause environmental harm and can potentially represent a human health risk. Pollutants in coal combustion wastewater are of particular concern because they can occur in large quantities (i.e., total pounds) and at high concentrations (i.e., exceeding Maximum Contaminant Levels (MCLs)) in discharges and leachate to groundwater and surface waters.[267]

Even relatively small amounts of coal ash pollutants can pose a threat to aquatic ecosystems and human health due to the persistent and bioaccumulative nature of these pollutants.[268] EPA notes that

> [n]umerous studies have shown that the pollutants found in wastewater associated with coal combustion wastes can impact aquatic organisms and wildlife, and can result in lasting environmental impacts on local habitats and ecosystems. Many of these impacts may not be realized for years due to the persistent and bioaccumulative nature of the pollutants released.[269]

EPA recently has confirmed that the existing NELGs do not address discharges of coal ash wastewater.[270] EPA must conduct the BPJ analysis and set technology-based limits for discharges of toxic pollutants in coal ash wastewater discharged from Outfalls 003A.

[263] EPA Letter to Tennessee Dep't of Env't & Conservation regarding TVA Kingston Fossil Plant (Aug. 8, 2011) and EPA Letter to Tennessee Dep't of Env't & Conservation regarding TVA Gallatin Fossil Plant (Aug. 8, 2011) [hereinafter TVA Letters], attached hereto as Exhibits 08 and 09.
[264]AR 608, Draft Permit Fact Sheet at 14-15, 26.
[265] 74 Fed. Reg. 68,599, 68,606 (Dec. 28, 2009).
266 U.S. Envtl. Prot. Agency, Steam Electric Power Generating Point Source Category: Final Detailed Study Report (821-R-09-008) 6-1-6-2 (Oct. 2009), http://water.epa.gov/lawsregs/guidance/cwa/304m/archive/upload/2009 _10 _ 26 _guide_ steam_ finalreport.pdf.
[267] Id. at 6-2.
[268] Id. at 6-1.
[269] Id.
[270] See Exhibits 10 and 11.

EPA Response:

As a preliminary note, much of this comment relates to events and the regulations prior to the 2015 Rule and subsequent legal developments. As described in other parts of this document, EPA is required to apply all applicable ELGs and, in such circumstances where there are applicable ELGs, has no discretion to conduct site-specific BPJ assessments. For the Region's application of technology-based effluent limits for BATW, see Response to Comment V.1.1; for FGD wastewater, see Chapter VIII of this document; for combustion residual leachate, see Introductory Response to Section V.2 below; and for coal pile runoff, see Response to Comment V.3.1 below.

2.0 Combustion Residual Leachate

EPA Introductory Response V.2

Combustion Residual Leachate (CRL), or "leachate from landfills or surface impoundments containing combustion residuals" (40 CFR § 423.11(r)), is another category of waste produced at Steam Electric Generating facilities. The technology-based ELGs which govern the treatment of this waste, like BATW, have evolved over the past decade. The evolution of the applicable ELGs, as outlined above in EPA Response V.1, has impacted how Region 1 has addressed this waste throughout the Merrimack Station permit renewal process. The following discussion summarizes the regulations and law forming the basis of EPA's permit limits for CRL at each stage of permit development for the renewal of Merrimack Station's NPDES permit.

<u>2011 Draft Permit</u>

In 2011, the applicable national technology-based standards for the Steam Electric Power Generating Category were the 1982 ELGs. In 1982, however, CRL was not identified or defined as its own, separate wastestream. Instead, CRL fell within the definition of "low volume wastes":

> The term "low volume waste sources" means, taken collectively as if from one source, *wastewater from all sources except those for which specific limitations are otherwise established in this part*. Low volume wastes sources include, but are not limited to: wastewaters from wet scrubber air pollution control systems, ion exchange water treatment system, water treatment evaporator blowdown, laboratory and sampling streams, boiler blowdown, floor drains, cooling tower basin cleaning wastes, and recirculating house service water systems. Sanitary and air conditioning wastes are not included.

47 Fed. Reg. at 52305 (codified, at that time, as 40 CFR § 423.11(b)) (emphasis added). Because CRL was not a source for which other, specific limitations were established, it was, by the above definition, a low volume waste.

In the 2011 Draft Permit, the Region applied the TSS and O&G limits, based on the limitations established in the 1982 Rule, to all low volume wastes, including CRL.[8] CRL was listed as one of the wastestreams that discharges from Waste Treatment Plant #1 into Outfall 003A with all other sources of low volume wastes:

> Waste Treatment Plant No. 1 treated effluent consists of low volume waste (equipment and floor drains, chemical drains, coal pile runoff from a collection sump, stormwater from a pipe trench, flow from various tank maintenance drains, demineralizer regeneration discharges, polisher regeneration discharges, ***ash landfill leachate***, and flows from the hydrostatic relief line; chemical and non-chemical metal cleaning effluent (MK-1 and MK-2 boilers water side boiler cleaning, gas side equipment ash wash, and precipitators) . . .

2011 Draft Permit (AR-609), p. 5 (emphasis added); *see also* 2011 Fact Sheet (AR-608), pp. 4, 11, 21. EPA also established site-specific BPJ-based BCT limits that were equal to the 1982 BPT limits for low volume wastes, just as it did for BATW. 2011 Fact Sheet (AR-608), p. 22 ("EPA considered all the relevant factors and determined that the most appropriate BCT limits for low volume and ash transport waste streams are the existing BPT limits in 40 C.F.R. 423.12."); *see also* Response to Comment V.1.1 above.

2014 Revised Draft Permit

As stated in Response to Comment V.1.1 above, the 2014 Draft Permit was triggered by information related to the facility's treatment of FGD wastewater. Because the national regulations remained the same and no new information related to CRL or low volume wastes, the effluent limits for CRL remained the same for TSS and O&G as those included in the 2011 Draft Permit.

2017 Statement

In 2015, the Agency promulgated new ELGs applicable to the Steam Electric Generating Category. As part of the 2015 Rule, EPA established "combustion residual leachate" or CRL as a new wastestream, 80 Fed. Reg. at 67848; *see* 40 CFR §§ 423.11(r) (definition of CRL). EPA also promulgated BAT limits, as well as new BPT limits, applicable to the CRL wastestream. The 2015 BAT and BPT limits were equal to each other and both were based on surface impoundment technology and included TSS limits equal to those previously established as BPT limits for low volume wastes. 40 CFR § 423.13(l); 80 Fed. Reg. at 67854.

[8] Merrimack Station's existing, 1992 Permit also treats CRL as a low volume waste. It proceeds through Waste Treatment Plant #1 and discharges into the slag settling pond, where the 1982 BPT limits are applied to all low volume wastes. 1992 Permit (AR-236), p. 10. Water-quality based limits on copper and technology-based limits on iron are also applied to all low volume wastes in the current permit, but, as discussed in Chapter IV of this document, those technology-based limits were incorrectly applied at this location and the water-quality based limit is no longer required.

In 2017, as a result of the 2015 rule and the other information received, EPA Region 1 reopened the public comment period, specifically requesting comment on the implications of the 2015 rule on BATW, FGD wastewater, non-chemical metal cleaning waste, and combustion residual leachate. 2017 Statement (AR-1534), p. 44. At the time, EPA anticipated applying any new ELG that was in effect, as it is required to do under the CWA and its regulations. 40 CFR §122.43(b)(1). Thus, EPA planned to apply 40 CFR § 423.13(l) to CRL in the Merrimack Station permit. Those limits would have been the same as the limits proposed in the previous Draft Permits, though would have been based not in 1982 low volume waste limitations, but instead in new, CRL-specific BAT limits from the 2015 Rule.

2020 Final Permit

After the 2017 public comment period closed, the Fifth Circuit Court of Appeals rendered its decision in *SWEPCO.* Specifically, the Fifth Circuit vacated and remanded to the Agency the BAT limits applicable to CRL, previously codified as 40 CFR § 423.13(l). *SWEPCO*, 920 F.3d 999, 1033 (5th Cir. 2019). As a result there is a question as to whether, for CRL, the steam electric effluent guidelines regulations prior to 2015 required no additional controls beyond the BPT level or whether limits to control CRL are subject to BPJ decision-making.

Until EPA takes action to address the Court's vacatur or propose new national BAT limit(s) for CRL, the Region must determine what limit(s) apply and are appropriate to regulate this wastestream. In this final permit, the Region has applied the CRL limits based on the regulations prior to, or in the absence of, the 2015 Rule. As stated above, these limits are based on the 1982 Rule, which applied TSS and O&G limits to low volume wastes (including CRL). In 1982, EPA *considered* setting BAT limits for low volume wastes but ultimately determined not to establish BAT limits because toxic metals in the wastestream "are present in amounts too small to be effectively reduced by technologies known to the Administrator." 47 Fed. Reg. at 52303; *see also id.* at 52299 ("The remaining 119 pollutants are excluded from regulation.").

BAT requirements for low volume waste are, therefore, no further control beyond BPT. Stated differently, the Agency's decision not to establish BAT limits for low volume wastes in 1982 occupies the field. To the extent that any commenter would suggest the Region conduct a site-specific assessment of BAT limits for CRL, this practice is foreclosed by the existence of applicable ELGs.[9] Thus, the final permit limits are the same as those TSS and O&G limits applied to low volume wastes (including CRL) from the 2011 Draft Permit.

[9] As explained in the NPDES Permit Writer's Manual, site-specific, BPJ-based assessments are appropriate when ELGs are inapplicable. In assessing "applicability," a permit writer "should make sure that the pollutant of concern is not already controlled by the effluent guidelines and *was not considered by EPA* when the Agency developed the effluent guidelines." NPDES Permit Writer's Manual (AR-746), p. 5-46 (emphasis added).

Comment V.2.1	AR-1218, Southern Company, pp. 20-24

Comment: Solids from the VCE/crystallizer system are another concern, since the salts are naturally hygroscopic and will readily absorb moisture from the air. Due to softening, the salts are primarily sodium chloride, which is hygroscopic and soluble. Moreover, due to the fact that softening is incomplete, a fraction of the salt will also be calcium chloride, which is extremely hygroscopic to the point of being deliquescent. These salts will re-liquefy to landfill leachate as rainwater encounters the material in the landfill, thereby creating a situation where pollutants in the salts, such as selenium and mercury, may be released back into the environment. Also, high ionic strength leachate could pose risks to clays in existing landfill liners and jeopardize the integrity of the landfill system. The problem with soluble and hygroscopic salts in the VCE/crystallizer solids is that they may not be allowed in landfills (because they are not able to pass the paint filter test), and even if they are, chlorides and other constituents from the solids may end up in leachate and run-off, causing further environmental problems. Importantly, unlike other wastewater treatment technologies, no chemical transformation of constituents to less harmful forms takes place in the VCE/crystallizer process; it is strictly a volume reduction tool. As a result, any constituents that were in the water entering the VCE/crystallizer system will still be present in the materials exiting the system in the same form, albeit more concentrated. We note that for the systems in operation at the Brindisi and Monfalcone power plants in Italy, the solids have to be bagged and transported out of country to Germany for disposal in a hazardous waste facility.

Comment V.2.2	AR-1222, UWAG, pp. 28-29

Comment: ***Solid Waste Disposal Problems***

VCE system wastes can be challenging to manage for disposal at some sites. *See generally* Ellison (2013), Merrimack No. 981. For instance, some VCE system designs produce a hygroscopic salt that is mainly calcium chloride and magnesium chloride hydrate (Nebrig et al. 2011 at 7-8). Because these salts are hygroscopic, they tend to melt down in a short time (minutes to hours) and, if they are landfilled, the chlorides and other substances may end up in the landfill leachate and runoff. *Id.* While Merrimack apparently avoids the solids stability issues through a full softening step, it is not clear that all plants would be able to stabilize solids through adding softening.

Due to the softening process, the salts produced from the crystallizer are primarily sodium chloride which are also hygroscopic. Some of the salt cake will be made up of calcium chloride due to incomplete softening, as well as other salts such as magnesium chloride and nitrates. These salts have the potential to liquefy in landfills due to rainfall, potentially releasing any of the pollutants in the salts, such as selenium and mercury. Also, high ionic strength leachates could potentially pose risks to clays in existing landfill liners and jeopardize the integrity of the landfill. VCE-plus-crystallization systems do not chemically precipitate constituents like other wastewater treatment technologies. These thermal systems are strictly a volume reduction process. As a result, the constituents entering the system will still be present in the materials exiting the system in the same form but more concentrated. Very little pollutants are removed with the salts.

Containing the salt-laden leachate may necessitate special equipment or procedures at landfills receiving these wastes. Even with special equipment or procedures, the ability to stabilize chloride salts in a landfill for the long term is questionable. We understand that the VCE wastes generated at the Brindisi and Monfalcone plants in Italy have to be transported to Germany for disposal in a hazardous waste facility.

Assuming that the material can be cost-effectively transported and placed in a landfill, when considering disposal of VCE wastes, the largest unanswered question is the long-term fate of the material. There are few data on whether the VCE solids will remain in place or leach out. This potential environmental impact deserves proper consideration whenever a regulator considers VCE plus crystallizer technology.

Comment V.2.3	**AR-1220, Environmental Organizations, pp. 10-11**

Comment: ***EPA Should Prohibit PSNH from Discharging Leachate Containing Pollutants from Its FGD Wastewater Used to Condition Fly Ash***

Under the draft permit, PSNH could circumvent a zero-liquid discharge limit for FGD wastewater not only by sending the wastewater to a POTW after treatment by its physical/chemical treatment system, but also by using the brine concentrate to condition fly ash rather than running the concentrate through the crystallizer that is the second phase of the VCE and crystallizer system. If instead the wastewater is run through both phases of the secondary treatment system, there is no need to dispose of brine concentrate, as the crystallizer produces a salt cake and the distillate can be reused in the FGD system. Put differently, if PSNH operates both phases of the VCE and crystallizer system, no brine concentrate is produced, thereby eliminating the problem of leachate containing pollutants from brine concentrate applied to fly ash.

As the Clean Water Act requires elimination of discharges if economically and technologically achievable, and EPA has found that eliminating FGD wastewater discharges is achievable at Merrimack Station, EPA must set BAT limits that actually eliminate the discharge of FGD wastewater from Merrimack Station. Thus, limits on the discharge of leachate must be based on a zero-liquid discharge limit of Merrimack's FGD wastewater. The leachate limits should be set at a level that prohibits the addition of pollutants from brine concentrate that comes from FGD wastewater.

EPA can achieve this through two means. First, the final revised NPDES permit for Merrimack should expressly prohibit applying brine concentrate to fly ash destined for a landfill. See generally 40 C.F.R. § 122.45(h). Second, EPA should set effluent limits for landfill leachate based on the characteristics of that leachate when the fly ash is not conditioned with brine concentrate. If EPA does not have data on the composition of the leachate in the absence of fly ash treated with brine concentrate, EPA should require PSNH to submit the data necessary for EPA to make such a determination, and then EPA can revise the leachate effluent limits. Setting a leachate effluent limit in this fashion will ensure that any addition to the leachate discharges of pollutants from the fly ash treated with brine concentrate would violate the NPDES permit. This would ensure the elimination of the discharge of Merrimack's FGD wastewater, as required by the Clean Water Act.

Comment V.2.4	**AR-1222, UWAG, p. 10**

Additionally, as Region I notes, disposing of fly ash conditioned with purge water in a landfill may give rise to other hurdles (*see* Fact Sheet at p. 49), including securing permits and managing landfill leachate.

EPA Response:

The commenters are concerned with the practice of reusing FGD wastewater to condition fly ash.

First, the practice of recycling wastewater has been specifically identified by EPA as a method for eliminating FGD wastewater. In the 2015 Rule, EPA noted a variety of approaches that "are used to achieve zero pollutant discharge at these plants, including evaporation ponds, complete recycle, and *processes that combine the FGD wastewater with other materials for landfill disposal*." 80 Fed. Reg. at 67850 n.21 (emphasis added); *see also* Technical Development Document (AR-1702), p. 7-2 ("EPA identified several design/operating practices that have been used at some plants to eliminate the discharge of FGD wastewater: . . . conditioning dry fly ash . . .."); *id.* at 7-19 (discussing dry ash conditioning prior to on-site landfill disposal, and noting "[a]nother plant . . . uses an evaporation system to reduce the volume of FGD wastewater and then mixes the concentrated brine slurry with dry fly ash and disposes of it in a landfill to prevent discharging FGD wastewater."); Response to Comments on the 2015 Rule (AR-1706), p. 5-263 Thus, reuse of FGD wastewater to condition fly ash eliminates FGD wastewater and results instead, in a solid material appropriate for deposit in an on-site or off-site landfill.

Since Merrimack Station began operating its FGD VCE system in 2012, the facility has lawfully operated without a permitted discharge of FGD wastewater due, in part, to its reuse to condition its fly ash, and then subsequently depositing this solid into a landfill. AR-1708. Specifically, Merrimack Station generally hauls the conditioned fly ash solids to an off-site landfill. GSP has explained that the facility has only deposited these solids into the *on-site* landfill during one event which occurred within the past year. AR-1708. GSP does not foresee utilizing the on-site landfill in this way very often, if at all, but EPA acknowledges that it remains an option. *See* AR-1708. To the extent that commenters point to potential issues with the on-site landfill containing such solids, this practice is rarely conducted at Merrimack Station.

As explained in Chapter VIII, GSP has withdrawn its request for authorization to discharge FGD wastewater and the final permit does not include discharge limits for FGD wastewater. In order to comply with the CWA's prohibition on unpermitted discharges, the facility must continue to operate its FGD system at zero-discharge, which may include the above practice. If operations at the facility change in the future, the permittee may request a permit modification to address changes in wastewater management or discharges. *See* 40 CFR § 122.62.

Second, the commenters are concerned about the leachate generated at the facility's landfill, which includes combustion residuals such as the reconditioned fly ash. EPA notes the commenters' concern; however, as discussed above in Section V.2 above, CRL is subject to applicable ELGs, which occupy the field and preclude any site-specific assessment of determination of technology-based effluent limits. EPA contemplated that CRL would include leachate from landfills containing a range of combustion residuals including FGD-conditioned fly ash. The Region does not have discretion to not apply effective ELGs. If, however, the CRL discharge exceeded applicable state water quality standards, then EPA must apply WQBELs to address such discharges. EPA assessed the characteristics of effluent in the slag settling pond, which includes CRL, in 2014 and again prior to finalizing this permit and ultimately determined that no WQBELs are necessary at the end of the slag settling pond. *See* AR-1135; AR-1693 to 1696. See Chapter VIII of this document for a discussion of applicable WQBELs.

3.0 Coal Pile Run-off

Comment V.3.1	AR-866, Environmental Groups, p. 2

Comment: As the Clean Water Act makes clear, BAT "effluent limitations shall require the elimination of discharges of all pollutants if the Administrator finds on the basis of information available … that such elimination is technologically and economically achievable." 33 U.S.C. 1311(b)(2)(A) [sic])emphasis added). Here, information provided by PSNH establishes that elimination of all pollutants from the FGD effluent is eminently achievable and may well be feasible for other coal combustion waste waters as well. In this regard, EPA must undertake a BAT analysis for all wastestreams at the plant, particularly ash handling waters and coal pile run-off that are known to be contaminated with significant concentrations of the toxic heavy metals present in coal.

EPA Response:

EPA notes the import of BAT limits under the CWA and the NPDES program. Regarding BAT analysis for BATW, see Section V.1 above, for CRL, see Section V.2 above, and for FGD wastewater, see Chapter VIII, which explains that Merrimack Station is not authorized to discharge FGD wastewater.

The coal pile runoff at the Merrimack Station facility has been reconfigured to drain into a trench system, part of which drains to an old oil tank dike area. This drainage system is not a water of the United States. The coal pile runoff no longer discharges directly to the Merrimack River. AR-1708; AR-1716. The Final Permit does not authorize a discharge of coal pile runoff.

The 2011 and 2014 draft permits had included conditions addressing coal pile runoff based on requirements in the 1992 Permit. *See* 2011 Draft Permit (AR-609).

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1.0 OUTFALL 003 – POINT SOURCE DISCHARGE TO MERRIMACK RIVER

1.1 TRC Monitoring

Comment VI.1.1	AR-846, PSNH, pp. 202 - 203

Comment: Per the NELGs, EPA assigned a daily maximum limit for Free Available Chlorine (FAC) in the cooling tower blowdown (003D) of 0.5 mg/l. Additionally, EPA commented that compliance will be maintained with the Total Residual Chlorine (TRC) water quality standard if the Outfall 003D TRC is maintained below 4.6 mg/l. EPA claims that compliance with a 0.5 mg/l FAC limit does not necessarily ensure compliance with a 4.6 mg/l TRC limit, so TRC monitoring is also established at Outfall 003 along with a water quality based limit of 0.43 mg/l.

This is absurd. Under the current permit (with TRC limits of 0.2 mg/l at Outfalls 001 and 002), PSNH has never been detected TRC at the end of the canal in its 19 years of monitoring. EPA even admits in the Permit Fact Sheet that "based on the analysis and factors discussed above, there is no reasonable potential for an in-stream excursion of chlorine above the water quality standards." There is no compelling reason for PSNH to sample the end of the canal on a weekly basis to ensure that TRC will be less than 0.43 mg/l. In fact, if there was some reason to believe that water quality was at risk—which it clearly is not—it would have at least made sense to impose the TRC monitoring at Outfall 003D alongside the FAC monitoring.

EPA Response: Outfall 003D is no longer included in the Final Permit because the facility is no longer required to install close-cycle cooling. Therefore, the FAC limit has been removed and any concerns related to such limit are no longer relevant.

With respect to the commenter's concerns about TRC (or TRO) monitoring and limits at the end of the discharge canal (Outfall 003), in the 2011 Draft Permit, the water quality-based limit of 0.43 mg/L for total residual chlorine (TRC) was not applied to Outfall 003. TRC monitoring and reporting only was required to ensure that there was no reasonable potential to exceed the 0.43 mg/L calculated water quality-based limit for chlorine at the discharge point to the river. However, the calculations described on pages 43-46 of the 2011 Fact Sheet presume that the Station had already installed closed cycle cooling and was not discharging chlorinated once-through cooling water. In this Final Permit, the Station is no longer required to install closed cycle cooling towers for reasons discussed fully in Chapter II of this document and will be operating once-through cooling water system as it does under its 1992, existing permit. As a result, the existing 1992 Permit's total residual oxidants (TRO) limit of 0.026 mg/L is maintained for Outfall 003 in the Final Permit based on anti-backsliding requirements found at 33 U.S.C. § 1342(o). EPA included the TRO limit in 1992, in lieu of a TRC limit, to regulate not only additions of chlorine as a biocide but also bromine. *See* AR-1570, p. 2 (1992 RTC). Both EPA and New Hampshire Department of Environmental Services- Water Division (NHDES) agree that this limit ensures that the addition of biocides at Merrimack Station do not affect downstream aquatic life and would meet the State's water quality standard for chlorine. *Id.*

Additionally, Outfalls 001 and 002 are now added back into the Final Permit, and technology-based limits for TRO are included at these outfalls as required by the ELGs. *See* RTC Chapter III.5.3.

As with the 1992 Permit, the Final Permit sets a compliance level at the minimum level (ML) for the TRC test method, which is the same method used for TRO, because the minimum level of detection is above the criterion. TRO sampling allows the Permittee to use either chlorine or bromine as a biocide. In 1992, the compliance level was 0.05 mg/L based on EPA-approved Standard Method 4500-Cl-G (the DPD spectrophotometric method (colorimetric)). In accordance with *National Pollutant Discharge Elimination System (NPDES): Use of Sufficiently Sensitive Test Methods for Permit Applications and Reporting Rule*,[1] EPA has set a compliance level equal to the ML of 30 µg/L in the Final Permit. This ML is based on using the lowest method detection limit of the analytical methods approved under 40 CFR Part 136 (MDL of 10 µg/L for Standard Method 4500-Cl-E, low level amperometric direct method (low-level amperometric titration method), times a multiplying factor of 3, consistent with 40 CFR Part 136.

In addition, EPA does not agree that weekly sampling is not necessary to ensure that chlorine levels being discharged to the Merrimack River meet water quality-based limits. EPA has determined that weekly sampling is still appropriate *when discharging*. Given that operations at the facility have been reduced significantly since the Draft Permit was issued in 2011 and therefore the discharge through Outfall 003 may be sporadic, there may be many weeks throughout the permit term when there is no discharge and sampling is not required.

Moreover, similar to footnotes 12 and 13 in the Draft Permit for then Outfall 003D (cooling tower blowdown), new footnote 8 has been added to the Final Permit and applies to Outfalls 001, 002, and 003. This footnote explains and clarifies that TRO sampling occur only when biocides (chlorine and/or bromine) are being used and being discharged and, pursuant to 40 CFR § 423.13(b)(1), TRO "may not be discharged from any single generating unit for more than two hours per day unless the discharger demonstrates to the permitting authority that discharge for more than two hours is required for macroinvertebrate control."

1.2 Daily pH Monitoring

Comment VI.1.2	AR-846, PSNH, p. 203

Comment: The daily pH monitoring requirements [at Outfall 003] are unreasonable and unduly burdensome. PSNH requests a reduction in frequency and, at a minimum, that EPA clarify that pH monitoring be limited to Monday thru Friday, excluding holidays, and only when qualified personnel are readily available.

EPA Response: Monitoring requirements are included in NPDES permits for several purposes, including to ensure compliance with effluent limitations established. The frequency of such monitoring is determined on a case-by-case basis. According to the NPDES Permit Writers' Manual, the intent is to establish a frequency of monitoring that is sufficient to characterize the effluent quality and will detect events of noncompliance, with consideration of data needs and, when appropriate, the cost to the permittee. *See* NPDES Permit Writers' Manual, EPA-833-K-10-001, September 2010, pp. 8-5.

[1] Fed. Reg. 49,001 (Aug. 19, 2014).

In establishing monitoring frequency, the permit writer estimates the variability of the concentration of the parameter by reviewing effluent data for the facility. The higher the variability over time the greater need for more frequent sampling. In the case of the Draft Permit, EPA had reduced the pH monitoring frequency because the draft reflected the use of closed cycle cooling at the Station, which would have greatly reduced the flow from the facility. Because the Station is no longer required to install closed cycle cooling towers, for reasons discussed fully in Chapter IIs and III in this Response to Comments document, the pH frequency of continuous monitoring *when discharging* (including weekends and holidays) will remain in the Final Permit, consistent with the existing 1992 Permit. EPA does not believe this frequency is burdensome, not only because continuous monitoring is simple, inexpensive, and has been undertaken for the past 28 years, but also because the Station will operate sporadically going forward; its operations are greatly reduced since the Draft Permit was issued in 2011. Furthermore, the termination of the discharge of slag sluice water is a major change expected during the permit term, on December 31, 2023 (*see* Response to Comment V.1.1), that could potentially cause significant changes in the discharge pH, and continuous monitoring would allow the Region to better understand these future changes and any resulting impacts to water quality. Moreover, New Hampshire water quality-based limitations apply to all discharges, regardless of the time of day, week, or year. Continuous pH monitoring is also required because the effects of a discharge with pH outside of the permitted range could be detrimental to many of the aquatic species in the vicinity of the discharge.

Additionally, Footnote 4 from the Draft Permit states that the pH range limitations at Outfall 003 are State certification requirements. In the Final Permit, EPA is removing footnote 4 because the pH limitations, while necessary to ensure compliance with the New Hampshire water quality standards, are no longer State certification requirements. *See* Env-Wq 1703.18; 33 U.S.C. § 1311(b)(1)(C). In the 2011 Draft Permit, the Discharge Limitations table for Outfall 003 also includes a reference to Part I.F.4 (State Permit Conditions), which provides that the Permittee may demonstrate to NHDES that the pH range should be widened due to naturally occurring conditions or because the naturally occurring receiving water pH is not significantly altered by the permittee's discharge. EPA is including this reference to Part I.F.4 in a new footnote (footnote 12). Also included in footnote 12 of the Final Permit is the requirement that the pH range limit is an instantaneous limit, not to be exceeded at any time, and the requirement that the Permittee report minimum and maximum values, which are both standard requirements for pH in EPA-issued NPDES permits in New Hampshire.

This new footnote 12 is included in the Final Permit for Outfalls 004A, 004B, 004C, 005A, and 005B in addition to Outfall 003 because these outfalls also discharge directly to the Merrimack River and must be in compliance with the State's water quality standards. Finally, footnote 19 of the Draft Permit, which allows for the pH range to be widened due to ambient conditions for these outfalls, is no longer needed because new footnote 12 of the Final Permit will apply and makes clear how the pH range can be modified due to naturally occuring conditions. Old footnote 19 would therefore be redundant and need not be included in the Final Permit.

1.3 Wet Testing

Comment VI.1.3	AR-846, PSNH, p. 203

Comment: EPA admits that the potential toxicity of the discharges from Outfall 003 is "relatively low." NHDES Draft Permit Fact Sheet, at 48 ("The potential toxicity of the facility's remaining discharges cannot be known at this point, although EPA believes it is relatively low…"). Given the low threat of toxicity in the discharge as well as the time and expense involved, PSNH requests that the frequency of WET testing be reduced from a quarterly requirement (four times a year) to an annual requirement. The permit condition allowing for a reduction in frequency can be reversed to allow for increased frequency in WET testing if toxicity is detected.

EPA Response: The entire reference from the 2011 Fact Sheet cited by the Commenter above is (p. 48):

> Substantial changes to Merrimack Station's current operations are necessary in order for the station to meet the Draft Permit's heat and flow limits. The potential toxicity of the facility's remaining discharges cannot be known at this point, although EPA believes it is relatively low based on the re-calculated dilution factor and knowledge of other power plants using cooling towers (such as Newington Power). However, in order to properly evaluate the station's discharge going forward, EPA has included a "report only" WET test result (quarterly).

The Whole Effluent Toxicity (WET) testing frequency discussion above identified "substantial changes" due to the use of closed cycle cooling at the Station and hence a dramatic reduction in discharge flow. While EPA expressed its belief that the potential toxicity is relatively low, the actual toxicity is still unknown. Therefore, quarterly WET testing is appropriate to gather data to adequately characterize and evaluate the Station's discharge. If, as the commenter speculates, the discharge is demonstrated to have a low threat of toxicity or meets certain thresholds, the Final Permit maintains the option for the Permittee to request a reduction in toxicity testing frequency at such time.

Although the Station currently operates at a much lower capacity factor compared to 2011 when the Draft Permit was issued, the Final Permit no longer requires the Station to install closed cycle cooling towers for reasons discussed fully in Chapters II and III of this document.

Importantly, the existing 1992 Merrimack Station Permit does not require WET testing. Therefore, EPA has no information whether the discharge from Merrimack Station is causing or has the potential to cause aggregate and/or synergistic toxic effects to the ecology of the Merrimack River. As indicated in the Fact Sheet, EPA has embraced an integrated permitting approach involving the use of both parameter-specific effluent limitations and numeric criteria for toxicity. The main reason for requiring WET testing in the permit is that there is a lack of available data on the toxicity of the discharge from the facility. The Final Permit's quarterly monitoring requirement, as initially described in the 2011 Fact Sheet, for WET testing is necessary to provide data to assess whether the discharge causes, has the reasonable potential to cause, or contributes to an excursion above a numeric or narrative criterion for whole effluent toxicity in future permit cycles.

However, given the Station's sporadic and limited operations (*see* Response to Comment II.1.1 and II.3.2.2), chronic toxicity testing is no longer appropriate and has been removed from the Final Permit. The Final Permit also includes more recent updated acute WET testing protocol and the testing requirements therein because EPA no longer uses the chronic and modified acute WET methods that were specified in the Draft Permit. In addition, the table for Outfall 003 has been updated to include a mechanism to report ambient data, which is already required by the protocol. Furthermore, footnote 5 of the Draft Permit (footnotes 13 through 16 of the Final Permit) has been updated to clarify the requirements of the Freshwater Acute Toxicity Test Procedure and Protocol, updated February 2011, which is consistent with standard language used in Region 1 NPDES permits.

1.4 Shift the Majority of All Effluent Monitoring to Outfall 003

Comment VI.1.4	AR-846, PSNH, p. 204

Comment: EPA has historically defended the use of internal monitoring locations based on the high dilution provided by the existing open cooling water flow. With closed-cycle cooling, however, the canal flow will drop dramatically thereby eliminating EPA's concern with dilution. PSNH therefore requests that EPA—if it intends to incorporate the CCC requirement in the final permit—justify its decision to not shift the majority of all effluent monitoring to Outfall 003.

EPA Response: The Station is no longer required to install closed cycle cooling towers for reasons discussed fully in Chapters II and III of this Response to Comments document, and, therefore, this comment is not relevant.

2.0 OUTFALL 003A (TREATMENT POND WEIR)

2.1 Change in Description and Water Qualtiy-Based Limits

Comment VI.2.1	AR-846, PSNH, pp. 204, 205

Comment: Outfall 003A represents the discharge from Merrimack Station's Slag Settling/Wastewater Treatment Pond. As an initial matter and to avoid any confusion, PSNH first requests that the description of Outfall 003A include the discharge from the slag settling area (Waste Treatment Plant #3) as well as flows related to the FGD service water pump house, which may include, among other things, screen and filter backwash and quench pump test water.

As a result of the addition of the treated FGD purge stream and at the request of DES— who was arguably acting at the direction of EPA—PSNH and DES cooperatively conducted an antidegradation analysis to determine whether additional water quality based limits were necessary at Outfall 003A. Based upon guidance provided by EPA Region 1 (which included an explanation that there were no technology based limits available for FGD wastewater), PSNH understood that the FGD wastewater discharge would be regulated by these water quality based limits (along with the rest of the discharge into Outfall 003A) and that the FGD purge stream would be regulated as a low volume waste, such that there was little expectation that any other limitations would be applied to the FGD discharge itself. DES and PSNH discussed the fact that some monitoring might be better relocated to the actual FGD WWTS discharge due to analytical limitations related to potential permit limits far below usual and customary detection levels at Outfall 003A. In other words, it was understood that the majority of effluent monitoring would continue to be applied at Outfall 003A and not the new Outfall 003C. In fact, EPA need only include the more stringent of the technology based limit or the water quality based limit, not both.

However, EPA imposed both technology based limits at Outfall 003C, as well as water quality limits at Outfall 003A for the same constituents. This makes no sense and is contrary to EPA's prior position of applying only the more stringent limit. EPA cannot argue that the limits serve different purposes as the water quality based limits proposed at Outfall 003A are directly related to the addition of the FGD WWTS, i.e., Outfall 003C. Instead, EPA should remove the less stringent limits, either the water quality based limits at Outfall 003A or the technology based limits at Outfall 003C.

EPA Response: EPA agrees that the Outfall 003A description needs to include the slag settling area discharge, as well as flows related to the FGD service water pump house, namely the screen and filter backwash and the quench pump test water. The service water pump house is operated to remove water from the slag settling pond for use in the FGD scrubber. Therefore, no additional pollutants are added.

On March 25, 2020 the current owners of Merrimack Station, Granite Shore Power, LLC submitted a letter formally withdrawing its request to discharge wastewater generated from its flue gas desulfurization (FGD) system. AR-1690. Given this retraction, Outfall 003C, which was the proposed new internal outfall for the discharge from FGD equipment in the Draft Permit, has been removed from the Final Permit. Therefore, the Final Permit does not authorize the Permittee to discharge FGD wastewater. In 2010, NHDES drafted an Antidegradation Analysis of Merrimack River in the Vicinity of Merrimack Station (October 4, 2010) based on the proposed discharge of the new FGD wastestream. Based on data collected by PSNH, the Antidegradation Analysis provided a determination of whether there was reasonable potential (RP) for the proposed discharge to violate aquatic life criteria for certain pollutants known to be in the FGD wastestream. AR-209. Based on this determination, NHDES made permitting recommendations, including water quality-based effluent limits to be applied at Outfall 003A, the outlet of the slag settling pond into the discharge canal. Consequently, the Draft Permit included water quality-based effluent limits for Outfall 003A. Although there is a limited data set for aluminum, arsenic, mercury, selenium, and chlorides at Outfall 003A. EPA recently re-analyzed for RP and found there is no RP to exceed New Hampshire water quality standards for these pollutants. *See* AR-1694 through AR-1696 and AR-1709 through AR-1712. For the Final Permit, now that FGD wastewater is not authorized for discharge and therefore is not a contributing stream to the slag settling pond, any water quality-based effluent limits based on FGD wastewater are no longer necessary. Additionally, having no RP to violate aquatic life criteria in the Merrimack River, any water quality-based effluent limits at Outfall 003A even in the absence of FGD wastewater are inappropriate. Thus, EPA has removed monitoring and water quality-based limits that were proposed in the Draft Permit for the following pollutants: aluminum, arsenic, mercury, selenium and chlorides.

2.2 Water Quality Based Limits at Outfall 003A

Comment VI.2.2	**AR-846, PSNH, pp. 205, 260, 207**

Comment: The metal limits in EPA's draft permit were derived from the water quality study conducted by DES, discussed above. EPA also set technology based limits for most of these same metals at Outfall 003C, which EPA says are more stringent than the water-quality based limits at Outfall 003A. With minor revisions, PSNH supports the monitoring program proposed by DES with water-quality based limits at Outfall 003A and no technology based limits at Outfall 003C. If EPA insists on assigning these technology based limits at 003A then, there is no need to then place water quality based limits on the same metals at Outfall 003A. EPA should therefore remove the water quality based limits at Outfall 003A, since this effort at repetitive regulation leads to unreasonable and unduly burdensome permit limits that cannot be achieved over the long-term.

Further, EPA may only require internal effluent limits "[w]hen permit effluent limitations or standards imposed at the point of discharge are impractical or infeasible." 40 C.F.R. Part 122.45. This prohibition of internal limits was an issue in American Iron and Steel Institute v. EPA, 115 F.3d 979 (D.C. Cir. 1997) ("AISI"). In AISI, the court first recognized the strict limits of EPA:

> The [Clean Water] Act provides that when a permitting authority determines that "discharges of a pollutant from a point source would interfere with the attainment or maintenance of [applicable] water quality standards, effluent limitations (including alternative effluent control strategies) for such point source shall be established which can reasonably be expected to contribute to the attainment or maintenance of such water quality." The statute is clear: The EPA may regulate the pollutant levels in a waste stream that is discharged directly into the navigable waters of the United States through a "point source'; it is not authorized to regulate the pollutant levels in a facilities internal waste stream. Id. at 996 (internal citations omitted) (emphasis added). Then the AISI Court explained its rationale:
>
> We are apprised of nothing in the policy underlying the CWA that undercuts the plain meaning of the statutory text. To the contrary, by authorizing the EPA to impose effluent limitations only at the point source, the Congress clearly intended to allow the permittee to choose its own control strategy. By imposing water quality based standards upon internal facility waste streams, the EPA seeks to deprive the individual permittee of the ability to choose between a control system that meets the point-source WQBEL [Water Quality-Based Effluent Limitations] by means of point source controls and a control system that meets the point source WQBEL by means of internal waste stream purification. As we have just seen, however, the statute does not permit this sort of meddling inside the facility.

Id. (emphasis added). EPA's authority to require and set internal permit limits is very constrained.

EPA incorporated water quality based limits, which were originally calculated by NH DES, on the FGD WWTS discharge at Outfall 003A.* Because monitoring at Outfall 003 is not impractical or infeasible, EPA is not authorized to set internal monitoring for water quality based limits and its actions are clearly arbitrary and contrary to law.

* To the extent that EPA set additional water quality based limits on internal outfalls, the CWA does not permit "this sort of meddling inside the facility." EPA must amend the draft permit to correct its overreaching effort.

EPA Response: See Response to Comment 2.1 above.

2.3 If EPA Does Not Remove All of the Water-Quality Based Limits for the Metals at Outfall 003A [Slag Settling Pond], It Should Revise the Permit Limits as Follows

2.3.1. The Water Quality Limits for Selenium and Arsenic Should Be Removed

Comment VI.2.3.1	AR-846, PSNH, pp. 207, 208

Comment: Based on its extensive water quality study, NHDES only recommended monitoring and reporting for selenium and arsenic. Specifically, for arsenic, DES noted that it was "concerned about (1) the arsenic water quality standard being outdated and subject to revision by EPA; (2) the proposed limit possibly being unnecessarily stringent; (3) the potential for the federal antibacksliding regulations to require such a limit to be retained in the permit; (4) the excessive cost of monitoring for arsenic using clean sampling and analytical procedures, not just for PSNH but possibly for other permittees; and (5) the technical feasibility of achieving the limit. NHDES has determined that it would be inappropriate to include a numeric permit limit for arsenic in NPDES permits at this time." See NHDES Antidegradation Analysis of Merrimack River in the Vicinity of Merrimack Station (Oct. 4, 2010) at 5-6 (AR-209). DES went on to note that PSNH should only monitor and report the concentrations of arsenic in outfalls 003A and 003C (and conduct fish tissue monitoring to develop a site specific bioaccumulation factor for arsenic for the middle Merrimack River).

Regarding the selenium monitoring and reporting requirements, DES stated that it "proposed that monitoring for selenium be included in the draft permit and that a reopener clause be added to allow the permit to be modified to include the limit of 0.058 mg/l at Outfall 003A if it is determined during the permit term that there is reasonable potential for the limit to be violated. Accordingly, the draft permit contains a reopener clause and a monitoring requirement for selenium." AR-209 at 7. DES therefore found that there was no reasonable potential that the water quality based limit would be violated. Therefore, the very data that EPA relied on to require water-quality based limits is the very data that DES used to conclude that only monitoring and reporting—and not water quality based limits—were necessary for arsenic and selenium. EPA should remove these limits from the permit because they are unnecessary and EPA's overreaching is in error.

EPA Response: See Response to Comment 2.1 above.

2.3.2. There Is No Reasonable Potential that Copper Will Exceed the Proposed Permit Limits, So the Water Quality Limits Should Be Deleted

Comment VI.2.3.2	AR-846, PSNH, p. 208

Comment: The copper water quality based limit must be revised and removed because there is no reasonable potential that the proposed copper permit limits will be exceeded. Specifically, Attachment F to the Draft Permit compiles six years of actual monitoring data, which reports average and maximum concentrations of copper of 0.010 and 0.05 mg/l, respectively. PSNH has provided a larger historical data set that substantiates the respective concentrations even further. This data therefore shows that there is clearly no reasonable potential to exceed the proposed permit limits of 0.027 and 0.083 mg/l. Therefore, the copper water-quality limit must be removed from the permit.

EPA Response: During development of the 2014 Revised Draft Permit, EPA re-evaluated the basis of the water quality-based copper limits at Outfall 003A and concluded that there was no reasonable potential to violate water quality standards for copper. See AR-1086. Therefore, EPA proposed removing the copper discharge limitations from Outfall 003A. EPA again conducted a reasonable potential analysis utilizing New Hampshire's revised copper water quality criteria. Based on this recent analysis using data from the last five years (and also evaluated using data from the last 10 years), EPA concludes that there is no reasonable potential for copper to violate water quality limits. *See* AR-1693 through AR-1696. As explained in the 2014 Fact Sheet and still relevant now,

> [t]he anti-backsliding regulations at 40 C.F.R. § 122.44(l)(1) allow for this change when "circumstances on which the previous permit was based have materially and substantially changed since the time the permit was issued and would constitute cause for permit modification or revocation and reissuance under § 122.62." See 40 CFR 122.62(a)(2). The "circumstances" that have changed include: 1) the Region has a performed a more robust statistical reasonable potential analysis (AR #1086); and 2) the 2011 Draft Permit includes technology-based copper limits for metal cleaning waste at Outfall 003B, upstream of the slag settling pond.

AR-1135 (2014 Fact Sheet), p. 53. Therefore, the Final Permit does not include water quality-based effluent limits for copper. However, due to concerns that pollutants can be released from the solids that build-up in the pond, especially during and after storm events, EPA is requiring quarterly composite monitoring and reporting only for copper at Outfall 003A.[2] EPA determined that quarterly monitoring is appropriate to provide a data set for evaluation that accounts for seasonal variation, if any, in the discharge. Furthermore, the termination of the discharge of bottom ash transport water is a major change expected during the permit term, December 31, 2023 (see Response to Comment V.1.1), that could potentially cause significant changes in the discharge from the pond. Copper data will be used to assess whether water quality requirements continue to be met and act as an indicator of whether other metals might resolubilize in the pond and require future sampling.

2.3.3. The Monitoring Requirement for Mercury is Unduly Burdensome and Must be Less Stringent in Order to be Reasonably Achieved

Comment VI.2.3.3	**AR-846, PSNH, p. 209**

Comment: NHDES set a mercury limit of .00072 μg/l at Outfall 003A but, because of analytical limitations, the reporting detection limit was set at 0.2 μg/l. DES also recommended that a mercury water-quality based limit of 0.13 mg/l be required at Outfall 003C, with the assumption that the same reporting detection limit of 0.2 μg/l would be established. PSNH supports the DES proposal for mercury regulation over the conditions that EPA required in the Draft Permit, including the requirements at both Outfall 003A and Outfall 003C as they relate to mercury. EPA's expectation to consistently and accurately monitor at such low concentration is unreasonable and the monitoring requirements are unduly burdensome.

[2] This concern was originally expressed in the 1992 Fact Sheet and reiterated in 2011 Fact Sheet, that "there is a possibility that copper retained in the pond may be released at times other than cleaning periods. This can occur by re-suspension of copper in the sediments or through conditions of low pH (acid rain, for example) where copper in the sediment has the potential to go back into solution." AR-112, p. 5; *see also* AR-608, p. 23; AR-1803.

EPA Response: See Response to Comment 2.1 above.

2.3.4. The Monitoring Limit for Aluminum Is Unnecessary

Comment	**AR-846, PSNH, p. 209**

On the Fact Sheet, EPA states that it does not consider aluminum "a pollution [sic] of concern for the FGD WWTS effluent discharge" and, therefore, has not set a technology-based standard at Outfall 003C. Since aluminum is not a pollutant of concern in FGD effluent and since the water quality based limits at Outfall 003A were a result of the FGD addition, PSNH requests the limit for aluminum be removed.

EPA Response: See Response to Comment 2.1 above.

2.3.5. EPA Cannot Justify Increasing the Monitoring and Reporting Requirements from Monthly and Quarterly Grab Samples to Weekly Composites

Comment VI.2.3.5	**AR-846, PSNH, pp. 209, 210**

Comment: Moreover, EPA's requirement that monitoring and reporting requirements for the metals in Outfall 003A increase from monthly and quarterly grab samples to weekly composite sampling is also clearly unreasonable and must be revised. Attachment F to the Draft Permit compiles six years of actual monitoring data, and during that six years Merrimack Station had one—and only one—permit noncompliance at Outfall 003A. This compliance record hardly justifies increasing effluent monitoring from monthly and quarterly grab samples to weekly composites. This redundant and excessive monitoring is particularly burdensome given that EPA's extremely low limits will require that most samples be collected using clean techniques and then shipped across the country for analysis. These monitoring and reporting requirements **are crippling and unachievable, and EPA cannot justify this unwarranted regulation.**

EPA Response: See Responses to Comments 2.1, 2.3.2 (for copper monitoring) and Chapter IV of this Response to Comments document above.

2.3.6. The Existing Monitoring Requirements for TSS, Oil and Grease Should Be Retained

Comment VI.2.3.6	**AR-846, PSNH, p. 210**

Comment: The data in Attachment F indicates that EPA's data for TSS shows that the maximum and average values for 72 readings conducted over a six-year period were 19.2 and 5.6 mg/l respectively, compared to permit limits of 100 and 30 mg/l respectively. At a minimum, this data supports maintaining the existing monitoring program of monthly grab samples, with no justification to increase to weekly composite samples.

Further visual monitoring has been an excellent surrogate for weekly analysis of oil and grease at several outfalls at Merrimack Station, including Outfall 003A.

EPA Response: EPA agrees that the existing monitoring frequency of monthly sampling for TSS and O&G is sufficient to determine compliance of these parameters at Outfall 003A. Past sampling data and the facility's reduced operations (*see* Chapters II and III of this document) support this determination. Specifically, EPA anticipates that reduced operations at the plant (i.e., reduction in discharge flows) will provide more residence time in the slag settling pond for solids to settle out of the wastewater. Therefore, the Final Permit includes monthly sampling for TSS and O&G. For TSS, composite sampling is a more representative measure of the discharge and accounts for variability in pollutant concentrations and is maintained in the Final Permit.

As for the commenter's suggestion that visual monitoring may serve as a surrogate for O&G grab sampling, EPA disagrees. As mentioned, O&G sampling and limitations are required by the Steam Electric ELGs; visual monitoring is not acceptable to ensure compliance with these limits.

2.3.7. The Flow (MGD) Permits Limits at Outfall 003A Are Unnecessary Given EPA's Decision to Impose Technology-Based Limits at Outfall 003C

Comment VI.2.3.7	AR-846, PSNH, p. 210

Comment: If EPA intends to regulate the FGD effluent with technology-based standards, PSNH requests that the flow limits be eliminated or, at a minimum, the average monthly flow be increased to 6.5 mgd. EPA recognized a similar oversight at Outfall 003C when they removed the permit limits in their correction letter, issued December 16, 2011.

EPA Response: First, EPA notes that FGD wastewater is no longer authorized to discharge to the slag settling pond. Therefore, to the extent that the commenter cites technology-based standards for FGD as a reason for eliminating flow limits at Outfall 003A, this is no longer relevant.

EPA disagrees that the flow limit at Outfall 003A should be eliminated or increased above the limits in the Draft Permit. First, the Draft Permit limits ensure that EPA's water-quality based assumptions continue to be protective. *See* AR-1693 (updated reasonable potential analyses were based on a maximum daily flow of 13 MGD). Additionally, the Draft Permit limits are maintained in the Final Permit because: 1) the flow data from this outfall over the past 5 years shows that the Permittee is able to meet these limits (AR-1695); 2) the reduced operations at the facility result in lower flows to the slag settling pond; and 3) the bottom ash sluice water discharge will be terminated by December 31, 2023. Collectively, these factors demonstrate that the flow limits are necessary, appropriate, and achievable.

2.3.8. There is No Basis for the Requirement to Monitor Chloride

Comment VI.2.3.8	AR-846, PSNH, pp. 210, 211

Comment: PSNH agrees with the NHDES statement that there "is no reasonable potential for the existing discharge to cause a violation of the chronic aquatic life criteria. AR-209 at 8. Therefore, there is no reason to require a 24-hour composite sample be collected and tested for chloride every week. EPA's concern about future effluent quality does not change the fact that there are no water quality concerns or technology standards. EPA Fact Sheet to NPDES Draft Permit at 26. Therefore, there is no basis to monitor chloride and the requirement limit must be deleted.

EPA Response: See Response to Comment 2.1 above.

3.0 OUTFALL 003D (COOLING TOWER BLOWDOWN)

Comment VI.3	AR-846, PSNH, p. 214

Comment: PSNH respectively requests the following revisions to the permit limits at Outfall 003D, Cooling Tower Blowdown:

- PSNH requests the FAC monitoring be reduced to Monday through Friday, excluding holidays, and when qualified plant personnel are available.
- Based upon footnote 14, it appears that the discharge limit should be labeled as "Average Daily" instead of "Average Monthly."
- PSNH requests the chromium and zinc monitoring requirements be reduced to monthly grab samples. The current monitoring requirements are unduly burdensome and unreasonable.
- PSNH requests the characteristic description be expanded to reflect the language contained at 40 C.F.R. § 423.15(j)(3) which requires no detectable amounts of the 126 priority pollutants "contained in chemicals added for cooling tower maintenance."
- Given that EPA has reduced the allowable thermal discharge by 99.6-percent, it makes no sense to establish thermal limits and require continuous thermal monitoring at two locations with daily heat load calculations and monthly and annual reporting. PSNH therefore requests the entire thermal effluent section be removed.
- EPA should amend the draft permit to recognize that the 1.19 million gallons per day was a preliminary estimate of total flow and there is no real need to regulate the flow.

EPA Response: The Final Permit no longer requires that the Station install closed cycle cooling towers for reasons discussed fully in Chapters II and III of this Response to Comments document. Therefore, this comment is no longer relevant.

4.0 OUTFALL 004 – UNIT 1 & 2 TRAVELLING SCREEN WASHWATER, UNIT 1 & 2, CWIS OPERATIONAL SUMP PUMPS, UNIT 1 & 2 DEICING HEADERS, AND FIRE PUMP OVERFLOW & ICE DAM REMOVAL SPRAYS

4.1 Outfall 004A – Unit 1 & Unit 2 Traveling Screen Washwater

Comment VI.4.1	AR-846, PSNH, pp. 214, 215

Comment: PSNH respectfully requests revisions to the permit limits at Outfall 004A, the Unit 1 and Unit 2 Traveling Screen Washwater. First, there is no reason to have a flow limit and PSNH requests that EPA remove this limit. Additionally, the inspections are unreasonable, unduly restrictive, and unachievable over the long-term. PSNH therefore requests that the inspections be reduced to Monday thru Friday, excluding holidays, when qualified personnel are available to conduct the inspections. PSNH further requests that EPA eliminate monitoring for oil and grease if inspections will be required on a daily basis.

EPA Response: EPA agrees that a flow limit is not necessary for this outfall location, which is consistent with the 2011 Fact Sheet and the 1992 Permit. However, EPA is not removing the inspection and monitoring requirements for oil and grease (O&G). Any sheen is considered a water quality violation. Given that the Station now operates sporadically, EPA does not consider daily inspections when there is a discharge (including weekends and holidays) to be overly burdensome. Furthermore, annual sampling is providing the Agency with the minimum amount of data to confirm that O&G are not being discharged from this outfall.

EPA is also adding to the corresponding footnote (footnote 18 in the Final Permit) that 1) if a sheen is detected, the discharge shall be terminated until the source of the oil can be identified and removed from the wastewater prior to re-initiating the discharge, and 2) the results of the analysis and cause of the excursion shall be documented and reported to EPA as an attachment to the next monthly DMR report. Also see RTC VI.1.2 above regarding pH requirements for this outfall.

4.2 Outfall 004B – Fire Main Pump Overflow and Ice Dam Removal Sprays

Comment VI.4.2	AR-846, PSNH, p. 215

Comment: PSNH respectfully requests revisions to the permit limits at Outfall 004B, the Fire Main Pump Overflow and Ice Dam Removal Sprays. First, there is no reason to have a flow limit and PSNH requests that EPA remove this limit. Additionally, the inspections are unreasonable, unduly restrictive, and unachievable over the long-term. PSNH therefore requests that the inspections be reduced to Monday thru Friday, excluding holidays, when qualified personnel are available to conduct the inspections. PSNH further requests that EPA eliminate monitoring for oil and grease if inspections will be required on a daily basis.

EPA Response: EPA agrees that the flow limit for the Outfall 004B discharge be eliminated. The variable amount of water discharge that overflows from the fire main pump cannot be predicted. Similarly, the amount of water discharged from the spray used to remove ice dams is dependent on the amount of river ice, which is difficult to predict from year to year. Due to this unpredictability, a flow limit would be overly restrictive. EPA has removed the 0.72 MGD daily maximum discharge limit from the Final Permit for Outfall 004B. Instead, the Final Permit includes a report only yearly flow requirement.

As previously indicated in Response to Comment 4.1 above, any sheen is considered a water quality violation. Given that the Station now operates sporadically, EPA does not consider daily inspections when there is a discharge to be overly burdensome. As with Outfall 004A, EPA is also adding to the corresponding footnote (footnote 18) of the Final Permit that if a sheen is detected, the discharge shall be terminated until the source of the oil can be identified and removed from the wastewater prior to re-initiating the discharge and the results of the analysis and cause of the excursion shall be documented and reported to EPA as an attachment to the next monthly DMR report. Annual sampling is providing the Agency with the minimum amount of data to confirm that O&G are not being discharged from this outfall. Also see RTC VI.1.2 above regarding pH requirements for this outfall.

4.3 Outfall 004C – Unit 1 & Unit 2 CWIS Operational Sump Pumps

Comment VI.4.3	AR-846, PSNH, p. 215

Comment: PSNH respectfully requests revisions of the permit limits at Outfall 004C, the Unit 1 and Unit 2 CWIS Operational Sump Pumps. First, there is no reason to have a flow limit and PSNH requests that EPA remove this limit. Additionally, the inspections are unreasonable, unduly restrictive, and unachievable over the long-term. PSNH therefore requests that the inspections be reduced to Monday thru Friday, excluding holidays, when qualified personnel are available to conduct the inspections. PSNH further requests that EPA eliminate monitoring for oil and grease if inspections will be required on a daily basis. Finally, if EPA refuses to remove the sampling requirement for oil and grease, PSNH requests the frequency be reduced to 1/year which is consistent with the other outfalls and the language in subscript 18 (NHDES Draft Permit, at 22 n.18) which states that "[i]n addition to yearly testing, testing for oil and grease shall be immediately initiated if oil sheen is observed."

EPA Response: EPA agrees that the flow limit for Outfall 004C be eliminated. Because the amount of water accumulating in the CWIS floor sumps cannot be predicted, a flow limit would be overly restrictive. EPA will remove the 110 GPD daily maximum discharge limit from the Final Permit. Instead, the Final Permit requires a report only flow requirement.

For the same reasons previously discussed above for Outfall 004A and 004B, EPA maintains that the daily visual inspection of the floor sump prior to being discharged. This requirement ensures compliance with narrative water quality standards for O&G and is not unduly restrictive because the Station now operates only sporadically. In addition, EPA agrees that annual monitoring for O&G is appropriate as it is consistent with other outfalls and footnote 18 of the Final Permit. *See also* Responses to Comments VI.4.1, VI.4.2, and VI.5.1. EPA has modified the O&G monitoring frequency and has also modified the corresponding footnote for this outfall as described in the response above. In addition, footnote 17 of the Final Permit includes language to clarify that visual inspections of the floor sump must occur prior to discharging. Also see RTC VI.1.2 above regarding pH requirements for this outfall.

4.4 Outfall 004D – Unit 1 & Unit 2 Deicing Headers

Comment VI.4.4	AR-846, PSNH, p. 216

Comment: PSNH respectfully requests revisions of the permit limits at Outfall 004D, the Unit 1 and Unit 2 Deicing Headers. The deicing recirculation water is not a discharge to the river since it is immediately drawn back into the station; therefore, this outfall should be eliminated from the permit. If EPA ignores PSNH's request and refuses to remove the outfall from the permit, then there is no reason to have a flow limit and PSNH requests that this limit be removed. Additionally, the permit application reports that the estimated flow for the two units is 21 MGD, not 1.0 MGD as EPA has provided as the permit limit, and the flow cannot be estimated from a pump curve as the water is simply forced back from the condenser outlet. Moreover, if the outfall is not eliminated, then PSNH further requests that the oil and grease monitoring be removed if inspections are required on a daily basis, and that the inspections be reduced to Monday thru Friday, excluding holidays, when qualified personnel are available to conduct the inspections.

EPA Response: Since the heated, chlorinated water discharged from Unit 1 and 2's deicing headers was being discharged into the waters of the United States, EPA considered it appropriate to regulate this discharge. Accordingly, EPA designated this discharge as Outfall 004D and proposed flow, O&G and pH limits. The Draft Permit further required that Outfall 004D's discharge not violate mixing zone requirements in the New Hampshire Surface Water Regulation Env-Wq 1707.2. Finally, Merrimack Station injects a biocide (chlorine or bromine) up to two hours per day per Unit into its condensers; from which the deicing water is drawn. The biocide is used to prevent organisms from growing on the condenser tubes. Any organisms entering the screen house bay could be adversely affected by the deicing water if it contained elevated levels of chlorine. Indeed, the Draft Permit includes a requirement that during chlorination of the condensers, each screen house traveling screen would be continuously rotated to reduce the amount of time impinged organisms are subjected to high levels of chlorine.

Based on PSNH's assertion that "… deicing recirculation water is not a discharge to the river since it is immediately drawn back into the station …," EPA agrees to remove sampling Outfall 004D from the Final Permit and the corresponding requirement that the use of deicing water meet the mixing zone requirements contained in New Hampshire Surface Water Quality Regulation Env-Wq 1707.02. However, the requirements of the corresponding footnote remain, which are to prohibit the discharge of deicing water, to visually inspect and adjust the flow rates to ensure there is no discharge of deicing water to the Merrimack River and to maintain a log of these inspections. See Part I.H.6 of the Final Permit. See also EPA's Response to Section 6, footnote 20, below.

In addition, EPA remains concerned that impinged fish and other organisms trapped on the intake screens would be subjected to high levels of chlorine. Because the need for deicing is intermittent, the Final Permit continues to require that the Permittee either employ an alternative water source that is not chlorinated for deicing water or dechlorinate the deicing water. EPA has added another option to address deicing concerns to the Final Permit which allows that deicing can be performed only at times when chlorination of the condensers is not taking place.[3] Furthermore, because the deicing water used is heated condenser cooling water, the Final Permit requires that each screen house traveling screen must be continuously rotated during deicing to reduce the amount of time impinged organisms are subjected to elevated temperatures. See Part I.E.6 of the Final Permit. For more information about the Final Permit's Cooling Water Intake Structure related requirements, see Chapter III of this document.

5.0 OUTFALL 005 – UNIT 1 & 2 COOLING WATER INTAKE STRUCTURE MAINTENANCE SUMP PUMPS

5.1 Outfall 005A – Unit 1 Cooling Water Intake Structure Maintenance Sump Pumps

Comment VI.5.1	AR-846, PSNH, p. 216

Comment: PSNH respectfully requests revisions to the permit limits at Outfall 005A, the Unit 1 Cooling Water Intake Structure Maintenance Sump Pumps. First, there is no reason to have a flow limit and PSNH requests that EPA remove this limit. Additionally, the inspections are

[3] The 2011 Fact Sheet explains that "[t]hroughout the winter months, warmed water is *intermittently* pumped from the discharge of both generating units' condensers to the screen house bays to prevent ice buildup." (emphasis added)

unreasonable, unduly restrictive, and unachievable over the long-term. PSNH therefore requests that the inspections be reduced to Monday thru Friday, excluding holidays, when qualified personnel are available to conduct the inspections. PSNH further requests that EPA eliminate monitoring for oil and grease if inspections will be required on a daily basis.

EPA Response: EPA agrees that the flow limit for Unit 1's CWIS maintenance sump pump discharge be eliminated. Even though Unit 1's CWIS forebay is isolated from the Merrimack River by a head gate during maintenance outages, water still seeps in from the river. Since the Permittee cannot predict with any accuracy the volume of river water entering the CWIS during an outage, it is overly restrictive to place a discharge limit on the maintenance sump pumps discharge. Therefore, EPA has removed the 0.3 MGD daily maximum discharge flow limit from the Final Permit and replaced it with a yearly report only requirement.

For the same reasons previously discussed for Outfall 004, EPA maintains that daily visual inspections (including weekends and holidays) and annual monitoring for O&G of the wet wells during maintenance are not unreasonable, unduly restrictive, or unachievable over the long-term, given that Merrimack Station now operates infrequently. *See* Response to Comment 4.1 above.

As with Outfall 004A, EPA is also adding to the corresponding footnote of the Final Permit (footnote 18) that if a sheen is detected, the discharge shall be terminated until the source of the oil can be identified and removed from the wastewater prior to re-initiating the discharge and the results of the analysis and cause of the excursion shall be documented and reported to EPA as an attachment to the next monthly DMR report.

Furthermore, based on the reduction in operations at the facility and the possibility that maintenance of the sumps may occur during times other than an "annual outage," there is no need to specify that sampling at Outfalls 005A and 005B occur during an annual outage. Measurement frequency for flow, O&G, and pH have been changed from once per annual outage (1/Annual Outage) to once per year (1/Year). Also see RTC VI.1.2 above regarding other pH requirements for this outfall.

5.2 Outfall 005B – Unit 1 Cooling Water Intake Structure Maintenance Sump Pumps

Comment VI.5.2	AR-846, PSNH, p. 217

Comment: EPA independently authorized the discharge of Outfall 005A and 005B into the Merrimack River. However, these two outfalls are substantially identical and simply represent different locations where the pump hose may discharge. Therefore, Outfall 005B should be eliminated from the permit.

EPA Response: It was not specified in either Merrimack Station's NPDES renewal application or the email string (See AR-526) requesting further information concerning the maintenance sump pump(s) configuration on exactly how many pumps were deployed to dewater Unit 1's CWIS. In a subsequent telephone conversation between EPA and PSNH (John King, EPA and Allan Palmer, PSNH; March 18, 2013), it was clarified that one pump was employed as a sump pump for the CWIS. After installing a head gate to isolate the CWIS from the Merrimack River, the screen wells are dewatered using the screenwash pumps. Each CWIS consists of two separate screen wells.

After dewatering, a portable sump pump is placed in the screenwell in which maintenance is being conducted. Each CWIS has several holes cut through both sides of the structure. This allows flexibility for locating the sump pump in the CWIS screenwell. Outfall 005A, therefore, is defined not by a location in the CWIS structure, but by the location of the sump pump's discharge hose. Additionally, only one sump pump is used at a time, because maintenance is conducted in one screenwell at a time. Based on this clarification, EPA has eliminated Outfall 005B as described in the Draft Permit. Now, Outfall 005A represents the sump pump's discharge hose when used for either screen well of Unit 1. The Final Permit renames Outfall 005B as the discharge from Unit 2's (i.e., MK-2) cooling water intake structure sumps during maintenance activities (see below). Also see RTC VI.1.2 above regarding pH requirements for this outfall.

5.3 Outfall 005C – Unit 2 Cooling Water Intake Structure Maintenance Sump Pumps

Comment VI.5.3	AR-846, PSNH, p. 217

Comment: PSNH respectfully requests revisions to the permit limits at Outfall 005C, the Unit 2 Cooling Water Intake Structure Maintenance Sump Pumps. First, there is no reason to have a flow limit and PSNH requests that EPA remove this limit. Additionally, the inspections are unreasonable, unduly restrictive, and unachievable over the long-term. PSNH therefore requests that the inspections be reduced to Monday thru Friday, excluding holidays, and as long as personnel are available to conduct the inspections. PSNH further requests that EPA eliminate monitoring for oil and grease if inspections will be required on a daily basis.

EPA Response: For the same reasons discussed in the Response to Comment 5.1 related to Outfall 005A, above, EPA is removing the flow limit and requiring report only for flow at this outfall. Similarly, daily visual inspections and annual monitoring for O&G of the sump pump wet wells during maintenance remains in the Final Permit.

Furthermore, given that Outfall 005B (representing maintenance discharge of Unit 1's wet wells) has been removed, what was Outfall 005C and Outfall 005D in the Draft Permit is now re-designated as Outfall 005B in the Final Permit.

5.4 Outfall 005D – Unit 2 Cooling Water Intake Structure Maintenance Sump Pumps

Comment VI.5.4	AR-846, PSNH, p. 217

Comment: EPA independently authorized the discharge of Outfall 005C and 005D into the Merrimack River. However, these two outfalls are substantially identical and simply represent different locations where the pump hose may discharge. Therefore, Outfall 005D should be eliminated from the permit.

EPA Response: Similar to response to comment 5.2 above for Outfall 005B, EPA agrees that it is unnecessary to separately define outfalls for the discharge from the same unit's wet wells. Therefore, Outfall 005C and Outfall 005D have been combined and designated as Outfall 005B in the Final Permit. Therefore, there are no Outfalls 005C and 005D in the Final Permit.

6.0 EXPLANATION OF SUPERSCRIPTS, NHDES DRAFT PERMIT

Comment VI.6	AR-846, PSNH, pp. 217, 218

PSNH also takes issue with several of the Superscripts accompanying the permit document. Specifically, PSNH requests the following:

- (5)d. PSNH requests that chromium be removed from the list of WET test parameters as it is not listed in Attachment A.
- (5)f. PSNH requests that WET testing be automatically suspended for the permit duration after four consecutive sampling periods, if no test shows a LC50 < 100%.
- (8) PSNH requests the weekend discharge prohibition be eliminated since EPA has never collected a sample.
- (9) PSNH requests approval to substitute 8 grab samples over the discharge period as a suitable replacement for continuous pH monitoring.
- (11) If EPA refuses to eliminate BOD5 monitoring as requested earlier, PSNH requests a reduction to annual monitoring be granted automatically after six months of reporting. Moreover, PSNH requests BOD5 monitoring be automatically eliminated after the six month period.
- (14) If the limit is supposed to be the average of analyses made over a single period and if the sampling frequency is daily, then the limit should be labeled as an "Average Daily Limit."
- (17) PSNH requests that daily inspections are only required Monday thru Friday, excluding holidays, when qualified personnel are readily available.
- (20) PSNH requests this outfall and footnote be eliminated since there is no discharge to the river.

EPA Response:

- (5)d. Chromium has been removed from the list of WET test parameters because it is a not required parameter for either the Freshwater Acute Toxicity Test Procedure or Protocol (Attachment A) of the Final Permit.

- (5)f. As a matter of regional policy, EPA will not automatically suspend WET testing, until it has had the opportunity to review the WET results and determine whether the frequency of testing should be maintained or could be reduced (not suspended).

- (8) For the 2011 Draft Permit, EPA did not prohibit the discharge of metal cleaning wastewater during weekends; only that "provisions are made to allow the collection of a 24-hour composite sample by the EPA and NHDES." However, given that Outfall 003B in the Final Permit is dedicated to the discharge of chemical and non-chemical metal cleaning effluent through Waste Treatment Plant No. 1, as described in Response to Comment IV.1.1, and that sampling is required each day a discharge event occurs, regardless of which day of the week it falls on, this footnote is unnecessary and is removed from the Final Permit.

- (9) EPA disagrees that eight grab samples over the discharge period is a suitable replacement for continuous pH monitoring (see response to comment 1.2 above for pH) and therefore has not changed this footnote.

- (11) Outfall 003C (FGD effluent) and the corresponding footnotes 10 and 11 of the Draft Permit have been removed from the Final Permit because the discharge of FGD wastewater is not authorized under this permit. *See* Chapter VIII of this Response to Comments document.

- (14) The Final Permit does not require the installation or use of closed cycle cooling for the reasons described in Chapters II and III of this Response to Comments document. Therefore, Outfall 003D has been removed, as well as this corresponding footnote.

- (17) Daily inspections are required only when discharging as discussed above in responses to comments in Sections 4 and 5 above.

- (20) Although Outfall 004D has been removed from the Final Permit as described in Response to Comment VI.4.4 above, EPA has determined that it is appropriate to maintain the following requirements: 1) that no recirculation water used for deicing shall be discharged from the intake forebays to the Merrimack River, 2) to visually inspect and adjust the flow rates to ensure there is no discharge of deicing water to the Merrimack River and 3) to maintain a log of these inspections. Therefore, although the footnote has been removed, these requirements remain in the Final Permit under Part I.H – Unauthorized Discharges.

In addition, as also explained above, EPA remains concerned that impinged fish and other organisms trapped on the intake screens would be subjected to high levels of chlorine and also heat during deicing. The Final Permit continues to require that the Permittee either employ an alternative water source that is not chlorinated for deicing water or dechlorinate the deicing water. Another option added to the Final Permit, requires that deicing be performed only at times when chlorination of the condensers is not taking place. See Part I.E.6 of the Final Permit. Furthermore, the Final Permit, also at Part I.E.6 requires that each screen house traveling screen must be continuously rotated during deicing to reduce the amount of time impinged organisms are subjected to elevated temperatures.

<u>Also note</u>**: Footnote numbering has changed for the Final Permit - see List of Permit Changes located at the beginning of this Response to Comments document.**

7.0 Daylight Savings Time Adjustment

Comment VI.7	**AR-846, PSNH, p. 219**

Comment: PSNH respectfully requests that all flow limits in the Draft Permit be increased accordingly to account for the 25-hour operation for daylight savings time adjustment.

EPA Response: EPA realizes that there are two days per year that contain 25 hours as a result of daylight savings time. If the Permittee discharges above flow limits on those days, EPA will take this special circumstance into consideration when evaluating the exceedance. However, at no time shall the increase in flow be greater than 4% of the flow limit on those days.

8.0 Compliance Schedule

Comment VI.8	AR-846, PSNH, p. 219

Comment: PSNH requests that EPA revise the Draft Permit to recognize that PSNH need not immediately comply with the requirements to install a cooling tower and biological treatment system. Instead, an interim period is necessary to allow for construction of these facilities and integration of these facilities into the existing operation of Merrimack Station. A "compliance schedule" is authorized under CWA § 309, as recognized by EPA in its Draft Permit Fact Sheet. NHDES Draft Permit Fact Sheet, at 9 ("When appropriate, however, schedules by which a permittee will attain compliance with new permit limits may be developed and issued in an administrative compliance order under CWA § 309(a) or some other mechanism."). EPA should therefore recognize the high probability that PSNH will be issued an administrative compliance order such that immediate compliance will not be required and the existing facilities will be allowed to operate without interruption.

EPA Response: The Permittee is no longer required to install either closed cycle cooling towers or biological treatment as discussed fully in Chapters II, III and VIII of this Response to Comments document. Therefore, this comment is no longer relevant.

9.0 ALL OUTFALLS, MISCELLANEOUS

9.1 Sensitive Test Methods Rule

Comment VI.9.1	AR-1548, PSNH, p. 217

Comment: PSNH has no issue with the requirements of 40 C.F.R. § 122.44(i)(1)(iv) being explicitly referenced in the Final Permit for the facility. To the extent EPA is able to do so, the phrases "known level of confidence" and "reliably measured within specified limits of precision and accuracy" should be better defined or explained in the proposed permit language to eliminate any ambiguities regarding when a particular procedure or method is satisfactory.

EPA's Response: As described in EPA's 2017 Statement of Substantial New Questions for Public Comment (2017 Statement), EPA anticipated including the following language in the Merrimack Station Permit:

> In accordance with 40 CFR § 122.44(i)(1)(iv), the Permittee shall use sufficiently sensitive test procedures (i.e., methods) approved under 40 CFR Part 136 or required under 40 CFR Chapter I, Subchapter N or O, for the analysis of pollutants or pollutant parameters limited in this permit (except WET limits). A method is considered "sufficiently sensitive" when either: (1) The method minimum level (ML) is at or below the level of the effluent limit established in this permit for the measured pollutant or pollutant parameter; or (2) The method has the lowest ML of the analytical methods approved under 40 CFR Part 136 or required under 40 CFR Chapter I, Subchapter N or O for the measured pollutant or pollutant parameter. The ML is not the minimum level of detection, but rather the lowest level at which the test equipment produces a recognizable signal and acceptable calibration point for a pollutant or pollutant parameter, which is representative of the lowest concentration at which a pollutant or pollutant parameter can be measured with a known level of confidence. For the purposes of this permit, the detection limit is the lowest concentration that can be reliably measured within specified limits of precision and accuracy for a specific laboratory analytical method during routine laboratory operating conditions (i.e., the level above which an actual value is reported for an analyte, and the level below which an analyte is reported as non-detect).

Since the 2017 Statement was issued, EPA refined the standard Sufficiently Sensitive Test Method language for use in all NPDES permits issued by the Region. The language used in the Final Permit for Merrimack Station is not substantially different than the language above. However, the language used to describe "detection limit" which includes the phrase "reliably measured within specified limits of precision and accuracy" has been removed from the standard language for NPDES permits because "minimum level (ML)" is the metric used in the Rule, not detection limit. Therefore, the "reliably measured . . ." language is not included in the Final Permit for Merrimack Station. Similarly, the phrase "known level of confidence" was proposed by EPA to describe quantitation limits, such as minimum levels. *See* https://www.federalregister.gov/documents/2003/03/12/03-5712/guidelines-establishing-test-procedures-for-the-analysis-of-pollutants-procedures-for-detection-and. However, this proposed definition was not adopted in the Final Rule. Consequently, this phrase has also been removed from the Final Permit for Merrimack Station. Appendix B of 40 CFR part 136 states that "[t]he Minimum Level (ML) for each analyte is defined as the level at which the entire analytical system must give a recognizable signal and acceptable calibration point. It is equivalent to the concentration of the lowest calibration standard, assuming that all method-specified sample weights, volumes, and cleanup procedures have been employed." *See* footnote #2 of the Final Permit.

Footnote 2 containing the revised Sufficiently Sensitive Test Method Rule language is included in the Monitoring Requirements heading of every outfall table in the Final Permit and consists of standard language currently added to every Region 1 NPDES permit issued by EPA. Footnote 3 is also included in the Monitoring Requirements heading for each outfall in the Final Permit and provides standard clarifying language of the reporting requirements for this Rule.

9.2 PCB Discharges

Comment VI.9.2	AR-1548, PSNH, p. 218

Comment: PSNH has no issue with EPA's proposed general prohibition against discharges of polychlorinated biphenyl compounds in the Final Permit for the facility. As the agency correctly points out, such a provision is included in the existing NPDES permit for the facility.[817]

[817] *See* AR-236 at 3.

EPA's Response: Comment noted; no response necessary.

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1.0 General Comments Expressing Concerns About the Cost of the Draft Permit

Comment VII.1.1	**AR-1064, AR-1119 (also read at public hearing)**

William O'Brien, Speaker of the New Hampshire House of Representatives

I am writing to express my concerns with the recent draft National Pollutant Discharge Elimination System permit mandating a water cooling facility at Public Service of New Hampshire's Merrimack Station in Bow, New Hampshire. The EPA's draft permit shows great disregard for our state's economy, and is a significant threat to jobs in our state.

At a time when we are doing everything we can to make New Hampshire more competitive and attractive to employers, the federal government is seeking to punish our residents and small businesses with higher electric rates through unnecessary regulation. The Granite State already has among the highest energy costs in the nation, and this federal mandate will make these costs even higher and make it harder to expand our economy and grow good, new jobs here.

If the current Administration is truly interested in helping create new jobs, it would stop his overzealous regulatory mandate immediately. We accept the fact that the Obama Administration will not be assisting our country in allowing businesses to create new jobs. In New Hampshire, all we ask is that it not actively work to prevent job growth here. The working families and small businesses of New Hampshire simply can't afford EPA adding a $112 million mandate onto our electric bills.

I also object to the EPA attempting to burden New Hampshire electric customers with a costly mandate that is based on regulations that have not been approved. As the agency recognized in its recent letter extending the comment period on this permit, "it remains unavoidably uncertain at the present time when any new final regulations will go into effect under Section 316(b)." EPA should not burden New Hampshire electric customers with the costs associated with regulation that is not legally in effect.

Finally, the Obama Administration and EPA have shown disregard for New Hampshire's residents by scheduling this public hearing in the midst of one of our state's worst storm related electric outages. At a time when more than 40,000 New Hampshire businesses and families are suffering through an extended period without basic electric services due to the recent snow storm, and our state is relying on PSNH to devote all of its resources to the restoration effort, the EPA has forced PSNH to divert resources away from the critical effort. Clearly, rescheduling this hearing would have been in the best interest of the people of New Hampshire.

The attempt to implement this crushing, job-killing federal mandate needs to stop now, and we call on the EPA to stop this absurd and outrageous assault on New Hampshire electric ratepayers.

Comment VII.1.2	**AR-1119**

Bill Ohm, State Representative, Hillsborough 26, Representing South Nashua

- EPA is asking NH taxpayers to spend $112,000,000 on pollution mitigation. What is this pollution mitigation? Is this mercury that goes into the tissue of fish that we eat? Is this sulfur dioxide something that produces acid rain and harms the forest of the northeast? Is this $112,000,000 for CO2? No to all those.
- What is it for? It is for clean, warm water. This is to mitigate warm clean water at a cost of $112,000,000 to taxpayers of New Hampshire for the PSNH customers of my district in Nashua. That's $85. For every man, woman and child of New Hampshire to prevent warm clean water from going into the Merrimack River.
- I am very skeptical that this is an appropriate expense for the taxpayers…I urge the EPA to rescind this requirement of a thermal variance for the Bow Power Plant and indeed, grant Public Service New Hampshire the requested thermal variance so they can get down to the business of supplying low cost power to the taxpayers of New Hampshire.

Comment VII.1.3	**AR-1119**

Don LeBrun, Representative from South Nashua, Ward 859

- The EPA's draft permit shows great disregard for our state's economy and is a significant threat to jobs in our state. At a time when we're doing everything we can to make New Hampshire more competitive and attractive to employers, the federal government is seeking to punish our residents and small businesses with higher electric rates through unnecessary regulation.

- New Hampshire already has among the highest energy costs in the nation. And this federal mandate will make these costs even higher and make it harder to expand our economy and grow good new jobs here.
- If the current administration is truly interested in helping create new jobs, it would stop—it would stop the over-zealous regulatory mandate immediately. We accept the fact that the Obama administration will not be assisting our country and allowing business to create new jobs. In New Hampshire, all we ask is that, it not actively work to prevent job growth here.
- …I also object to the EPA attempting to burden New Hampshire electric customers with costly mandates that is based on regulations that have not been approved.
- …it remains unavoidably uncertain at the present time when any new final regulations will go into effect under Section 316(b). The EPA should not burden New Hampshire electric customers with the cost associated with regulation that is not legally in effect.

Comment VII.1.4	**AR-1119**

Timothy Twombly, State Representative, Nashua, New Hampshire, Hillsborough 25, Ward 7 in Nashua

- I would like you to allow the Public Service Company of New Hampshire to go ahead and not have to put this $112,000,000 cooling tower in place.
- …they already spent…something like $400,000,000 to put a scrubber in place which is protecting our air quality. Public Service of New Hampshire is the only residential provider of electricity. I hope that they are not—that the Administration is not trying to put them out of business…

Comment VII.1.5	**AR-1119**

Williams, Chichester, NH, Member of the Board of the Campaign for Ratepayers Rights

- While Ratepayers' Rights is very much concerned with electrical rates, we also think about the total electricity picture in terms of residues from generation, whether it is radioactive waste or…plants such as the Bow plant.
- Has anybody taken a good look at the total picture of costs involved for both capital improvements as well as…annual operating expenses?
- A few years ago…for the hearing on the…proposed Bow scrubber for the mercury emissions…there was no mention of an upcoming…improvement in the reduction of the hot water treatment that the Bow plant involved. And I wonder if there are any other capital projects that may be proposed in the next five or ten years that we should think about.
- If the Legislature has full information about the total costs involved with the scrubber, and this thermal treatment, and possibly other things, then they might have made a different decision than just giving the Public Service Company a blank check to go ahead and build the scrubber no matter what it costs. Because then we get locked into the idea of…now can't shut down the Bow plant, because we've spent so much money [on] it. We have to keep it going…and then we have to spend some incremental money still using so much coal.

Comment VII.1.6	AR-1066

David A. Fink, President of Pan Am Railways, N. Billerica, Massachusetts

On behalf of Pan Am Railways (PAR), I write today to express my concern with the Environmental Protection Agency's (EPA) recent National Pollutant Discharge Elimination System (NPDES) draft permit for Merrimack Station in Bow, New Hampshire.

PAR owns and operates over 1500 miles of railroad in six states and as a result regularly interacts with numerous federal and state environmental agencies. Through these frequent interactions, it has become apparent that the most beneficial outcome of any business development efforts take into account both the environmental and economic impacts of such development. PAR has been fortunate to find federal and state regulators who recognize the need for balancing economic benefits with environmental impacts and in each instance PAR has worked with those regulators to address their concerns, including several instances where regulators do not have jurisdiction over PAR operations.

PAR has been advised of the conditions that the proposed EPA NPDES permit would impose on the operations of the Bow power plant and would respectfully submit that those conditions are contrary to the delicate balance that is necessary between private development and government regulation that is imperative to ensure that the needs of both sides are met. Furthermore, in these difficult economic times it is critical that government and private industry work together to remove uncertainty and encourage economic growth, and the current draft NPDES permit for the Bow plan does not appear to meet either of these goals.

While it would seem that PAR has little interest in this issue, in reality PAR does have a vested interest in the continuation of operations of the Bow plant. PAR's rail line to the Bow plant provides the only freight service in New Hampshire from PAR in Massachusetts and the newly formed Pan Am Southern LLC. Should the Bow plant cease or curtail operations due to the proposed NPDES permit conditions, then the economics of sustaining a main line of over 50 miles would be tenuous at best.

Given the importance of the Bow plant for providing economically competitive power option to New Hampshire users, as well as the economic benefits that flow from the plant's operation, PAR would respectfully request that EPA reconsider the conditions that have been proposed in the draft NPDES permit for the Bow power plant.

EPA Response to Section VII.1 Comments:

EPA appreciates the commenters concerns about the cost of installing closed cycle cooling at Merrimack Station. In Attachment D of the 2011 Fact Sheet, EPA provides a detailed determination showing that PSNH had not demonstrated that its thermal discharges had caused "no prior appreciable harm" to the balanced indigenous population (BIP) of the Hooksett Pool. Therefore, EPA concluded that closed cycle cooling technology was necessary to protect the

BIP. However, over the last six years Merrimack Station's operational profile has changed, from that of a baseload facility to that of an intermittent, seasonal (winter/summer) generator and the current owner, Granite Shore Power, has indicated that it expects to continue to operate in this reduced manner for the foreseeable future. This is the result of lower prevailing prices for natural gas having rendered older, less efficient coal-burning plants, such as Merrimack Station, less competitive within New England relative to natural gas-burning plants.

Based on more recent fisheries studies and information submitted to EPA, as discussed in Chapter II of this document, the current extent of the thermal discharge does not appear to be causing, and likely will not cause going forward, appreciable harm to the BIP. Subsequently, the Agency determined that permit limits designed to maintain the current operating conditions provide reasonable assurance of the protection and propagation of the BIP. Therefore, EPA has concluded that a variance can be authorized pursuant to a CWA § 316(a) and that closed cycle cooling is not warranted at this time. As a result, the costs associated with cooling tower technology at Merrimack Station will not affect rate payers going forward. These new, variance-based permit limits based on the current operating conditions at the plant are discussed in Chapter II of this document. In addition, requirements related to the Station's cooling water intake structure, pursuant to CWA 316(b) are also discussed in detail Chapter III this document.

2.0 Concerns About Mercury and Sending FGD Wastewater to POTWs

Comment VII.2.1	**AR-1119**

Kenneth Colburn, Stonyfield Farm

- My second concern is related to the fate of mercury itself...mercury is a persistent bioaccumulative toxin…just a little bit is not safe, because little bits build up over time in the food chain and become big bits and harmful and neurotoxic to developing fetuses.
- The Merrimack River is a TMDL limited river; the river is already maxed out for mercury. And that means it can accept no more under federal provisions. Hence the importance of the stringent draft permit conditions that you have included.
- I would like to ask you also include equally stringent near term constraints because, you see, the scrubber removes sulfur. And in the process, it also captures the majority of the mercury.
- Some of that mercury winds up in the scrubber wastewater. If that wastewater is not subject to comprehensive and thorough zero discharge treatment at the plant, but is instead shipped elsewhere, probably to municipal publicly owned treatment works…and because mercury then adheres to the solids in the treatment process, some of those treatment works incinerate their solids as a way to dispose of them. That means that the mercury that is with the solids that are then incinerated is readmitted, PSNH's coal mercury is readmitted. It is just being emitted out of a different stack…under those conditions…we didn't accomplish a whole lot in terms of mercury reductions.

Comment VII.2.2	**AR-1119**

Linda Rauter, Chichester, New Hampshire

- I am also extremely concerned about the amount of mercury discharged by the plant. There is absolutely no question that mercury is a toxic substance and it is falling indiscriminately into our sewers and every water body. This is dangerous to all life and must be stopped.

Comment VII.2.3	**AR-1119**

Tom Irwin, Director, New Hampshire Office of the Conservation Law Foundation - Joint Statement of Conservation Law Foundation, the Appalachian Mountain Club, Conservation New Hampshire, New Hampshire Audubon, Environment New Hampshire, the New Hampshire Chapter of the Sierra Club, Clean Water Action, and the Society for the Protection of New Hampshire Forests

- While we strongly support EPA's intent to require the construction of a modern, closed cycle cooling system, we are greatly disappointed with the draft permit's failure to limit the power plant's discharge of mercury to zero. The State of New Hampshire and the EPA have determined that the Merrimack River already violates state water quality standards for mercury.
- Because it is a biocumulative and persistent neurotoxin, even small amounts of mercury discharges build up over time in fish threatening people, other mammals and birds that consume fish from the river. …as a result, no amount of mercury discharge into this already impaired water is safe.
- …PSNH previously informed the New Hampshire Site Evaluation Committee, in a 2009 hearing on its installation of a wet flue gas desulfurization scrubber, that the scrubber wastewater treatment system, PSNH was constructing, would not discharge any mercury wastewater to the Merrimack River.
- We strongly urge EPA to amend its Draft Permit to require zero liquid discharge to prevent further pollution of the river with mercury, selenium, and other toxic pollutants.

Comment VII.2.4	**AR-1119**

Catherine Corkery, New Hampshire Sierra Club

- The concern we do have...the wastewater treatment with the effort to take the mercury out of the smoke stack only to be going out to the outfall pipe into the river is something we asked the EPA to regulate…the Merrimack River is maxed out on mercury. And there should be no more allowable mercury added to the river, or the other pollutants.
- …adding more pollution into the Merrimack River through the wastewater treatment facility is…a step in the wrong direction. And we ask that EPA reexamine that and put tougher standards in. (She references mercury studies and EPA tells her that if she would send them electronically, they would be very helpful.)

Comment VII.2.5	AR-991 (also AR-1061)

Environmental Organizations: Conservation Law Foundation, Environment New Hampshire, New Hampshire Sierra Club, Conservation New Hampshire, Appalachian Mountain Club, New Hampshire Audubon Society, Clean Water Action, and the Society for the Protection of New Hampshire Forests

While we strongly support the EPA's intent to require the construction of a modern closed-cycle cooling system, we are greatly disappointed with the draft permit's failure to limit the power plant's discharge of mercury to zero. The State of New Hampshire and EPA have determined that the Merrimack River already violates state water quality standards for mercury. Because it is a bioaccumulative and persistent neurotoxin, even small amounts of mercury discharges build up over time in fish, threatening people, other mammals, and birds that consume fish from the river. As a result, no amount of mercury discharged into this already-impaired waterbody is safe. Indeed, PSNH previously informed the New Hampshire Site Evaluation Committee, in a 2009 hearing on its installation of a wet flue gas desulfurization scrubber, that the scrubber wastewater treatment system PSNH was constructing would not discharge any mercury-laden wastewater to the Merrimack River. EPA's Fact Sheet (Attachment E, page 5) appropriately acknowledges that PSNH designed, financed and constructed the new Merrimack Station wastewater treatment system without first discussing with EPA whether it would meet the standards required under the Clean Water Act. We strongly urge EPA to amend its draft permit to require zero-liquid-discharge to prevent further pollution of the river with mercury, selenium, and other toxic pollutants.

EPA Response to Section VII.2 Comments:

EPA acknowledges the commenters' concerns regarding mercury potentially being discharged from Merrimack Station and Merrimack Station's shipment of flue gas desulfurization (FGD) waste to local publicly owned treatment facilities ("POTWs"). EPA notes that discharges of FGD wastewater are not authorized by the Final Permit, so to the extent that these comments relate to direct discharges of FGD wastewater (with mercury) into the Merrimack River, those comments are no longer relevant. See Chapter VIII, Section 1 of this document for a more detailed discussion of FGD wastewater.

Some commenters also identified concerns with shipping FGD wastewater off-site to local POTWs. EPA's Response to Section 2 Comments in Chapter VIII of this document provide a full discussion of the facility's practice of shipping FGD wastewater to POTWs and address such concerns. In short, however, the facility's decision and practice of sporadically hauling FGD wastewater off-site is not covered by or regulated under this NPDES permit, and instead would be covered by the pretreatment programs authorized at each specific POTW accepting indirect discharges. Based on the pretreatment standards for the Steam Electric Category promulgated as part of EPA's 2015 National Rulemaking, *see* 40 CFR § 423.16, all POTW's that receive indirect discharges from a categorical industrial user like Merrimack Station must assure that all wastewater meets the applicable National Categorical Pretreatment Standards. Thus, any FGD wastewater trucked to a POTW must meet the requirements of 40 CFR § 423.16(e) for existing sources, including limits on arsenic, mercury, selenium, and nitrate/nitrite as nitrogen beginning November 1, 2020.

3.0 General Comments in Support of Closed Cycle Cooling at Merrimack

Comment VII.3.1	AR-1119

Tom Irwin, Director, New Hampshire Office of the Conservation Law Foundation - Joint Statement of Conservation Law Foundation, the Appalachian Mountain Club, Conservation New Hampshire, New Hampshire Audubon, Environment New Hampshire, the New Hampshire Chapter of the Sierra Club, Clean Water Action, and the Society for the Protection of New Hampshire Forests

- We appreciate that EPA is addressing the harmful impacts on the Merrimack River that occur as a result of the massive water intake and heated and chemical wastewater discharges associated with the coal plant's obsolete water cooling system.
- We are frustrated that 14 years have elapsed since the expiration of the current permit, we commend EPA for requiring PSNH to ensure that Merrimack Station is operating in a way that is both protective of the fragile river ecosystem and in compliance with the Clean Water Act, a law that is essential to protecting the health of New Hampshire's natural environment, economy, and communities.
- We fully support EPA…requiring the installation at Merrimack Station of a modern closed cycle cooling system that will nearly eliminate the harmful impacts associated with the power plant's current system. Impacts, that, as EPA acknowledges, have resulted over the plant's lifetime in a 94 percent decline of species in that part of the Merrimack River.
- The current method of cooling the plant pulls living creatures into the system, crushing, mutilating and suffocating them. It traps fish and other aquatic life against the screens, covering pipes that pull water into the system injuring or killing them, and then subjects the river and its aquatic life to the further stresses of heated wastewater discharges.
- The upgrades to Merrimack Station that EPA is requiring are long overdue. Installing a modern, closed cycle cooling system and operating it year round will decrease the plant's discharge of heated water by nearly 100 percent.
- …because it will not require the same volume of water from the river, the upgraded system will dramatically reduce the loss of adult fish, fish larvae and fish eggs, that today are getting sucked into the structures and killed.

Comment VII.3.2	AR-1119

Catherine Corkery, New Hampshire Sierra Club

- The New Hampshire Sierra club supports the permit in requiring the closed cycle water facility. It is a huge improvement from what is there now.
- A 90 plus improvement on reducing the water intake. The Merrimack River has been abused and used and dumped in—dumped on for too long. And the other abusers…have been

eliminated. And now we just have the Merrimack Station here in Bow as one of the few polluters left…it is a simple solution with the thermal pollution.

- Secondly, it is such an improvement with the wildlife. We really commend you for that.

Comment VII.3.3	AR-1119

Jeff Daly, Nashua, New Hampshire, Member of Lower Merrimack River Local River Management Advisory Committee (LAC) and outside member of Sierra Club

- The same thing with the coolant. There are air cooled heat exchanging systems that are totally enclosed, do not require any water discharge once they are shut up, other than some make up for the regular relief value blow outs that take place in any power plant. It doesn't, matter where you go.
- Also, the hot air that is driven through those air cooled heat exchangers can then be used to reheat the combustion air used to burn in the boilers. You don't have to pump it up into the atmosphere. Go down to Manchester and look at the Granite Ridge Plant, which is an over peaking plant. And look at the steam that comes out of their cooler. The other day we measured it. It is 6000 feet plume of steam rising into the atmosphere. We went to the other side of Stonyfield and the gentleman from Stonyfield may be able to confirm this, it was raining a mist of rain. Are we wanting the same thing, if you have an *open* closed loop system rather than a *closed* closed loop system?
- This should have been addressed in your permit. I agree, we have to lower the temperature. But there is technology around. It's been around for years. In Europe, they have been using air cooled heat exchanging systems for 35 years. It's been around in the United States for 20+ years. I've worked on four of them.
- You mentioned the Everett unit down in Boston. That works very well. You don't see tons of steam pouring out into the atmosphere there.
- We've got to look and utilize the best technology. EPA is doing a good job. But you've got to go out. You've got to ask for help…you can go to round tables and ask for people to come up with suggestions. Ask PSNH to be part of it. Have them have some of the input. I know some of the directors of PSNH. They would be very willing to open up and say, hey, let's sit down and let's hear from engineers. Let's hear from people who've got ideas.
- The destruction of our environment, especially, the Merrimack River cannot continue. Heat is one of the killers that changes the environment dramatically. Whether it is in the water or in the atmosphere.
- We can't pump out close 1,000,000,000,000 BTUs into the atmosphere of any sort. We've got to try to recover it. And one way is, you take an air cooled heat exchanger, take the air from that and use it as pre-combustion air rather than outside cold air, irrespective of what time of year it is.
- …this thing about the US Army Corps of Engineers, please, revisit it. Re-look at it. Because if you're saying we've got to look at restructuring, and you even say it here, well, the next time the permit is revised, why next time, why not say zero.

Comment VII.3.4	AR-1119

Frederick S. Tuttle, Jr.

- I have paddled that Hooksett pool many, many times. I have rarely seen much wildlife on that pool. And I believe it's simply because of the change in thermal. I wish to support the strongest possible controls on thermal output from that power plant.

- My strongest concerns…revolve around the wildlife of the river…to me, the fish populations are almost the smallest part of the overall equation…what do the fish depend upon to eat, what depends on the fish to feed them. We've got bald eagles…osprey…half a dozen species of herons…otter…weasels…beavers, herons, fishermen and many other things that we don't even know about that are part of the food web of that area. This to me is the more important aspect of why we should have control over those thermal outputs. Simply because we don't know what we're doing to the food web. We don't know what we're doing to the environment web in a lot of cases.

Comment VII.3.5	AR-1119

Kenneth Colburn, Stonyfield Farm

- I interpret by its blog that PSNH does not agree with the EPA draft permit. And this mystifies me because it probably relates to cost.
- Back in 2008, when the cost of the scrubber project and the turbine enhancements went from $250,000,000 to $457,000,000, an increase of nearly $200,000,000, that was good news. PSNH supported that…pushed it very, very hard…suggested in terms of labor…that it was good for jobs. So I am confused why, if you can add another $200,000,000 and that's a good thing and you can rate base another $200,000,000 even though you had cheaper cost options on the market or in a different plant replacement, and that's good for jobs, why another $100,000,000 so a total of $300,000,000 isn't better.
- PSNH chose to do that…they knew that this permit process was coming up. So, surely as a public utility, it planned, it has an obligation to plan for this kind of permit determination.
- So, I'm sure it was aware of the risk of a closed loop cooling system. Indeed, I assisted in the drafting of a compendium of issues associated with this plant issued in late 2008 in which this issue was called out and the cost estimates were approximately in the range that we have described tonight. That, having been called out also was not a surprise.
- …fundamentally my confusion rests over the issues that PSNH can't argue about costs. It can't argue about jobs. And it can't argue about surprise. So, I'm not sure why we are here and why they are opposing.

Comment VII.3.6	AR-861, AR-862

Josh Nelson, Credo Action Campaign Manager

Josh Nelson submitted comments made by over 1000 individuals across New Hampshire and Massachusetts through Credo Action, an online social change network where activists go to sign petitions. Petitioners also included others from across the United States including Arizona, California, Florida, Idaho, Hawaii, Maine, Montana, Nevada, New Jersey, Pennsylvania, Vermont, and Washington, D.C. All the individuals submitted the following text provided by Credo, with some adding their own brief personal comments:

> ***The fish kills and water usage associated with the Merrimack Coal Plant are unacceptable. As someone who lives near the river and cares about the local environment, I urge you to require Public Service of New Hampshire to implement a closed-cycle cooling system at its Merrimack coal plant.***

Comment VII.3.7	**AR-991 (also AR-1061)**

Environmental Organizations: Conservation Law Foundation, Environment New Hampshire, New Hampshire Sierra Club, Conservation New Hampshire, Appalachian Mountain Club, New Hampshire Audubon Society, Clean Water Action, and the Society for the Protection of New Hampshire Forests

We fully support EPA at long last requiring the installation at Merrimack Station of a modern "closed-cycle" cooling system that will nearly eliminate the harmful impacts associated with the power plant's current system – impact that, as EPA acknowledges, have resulted over the plant's lifetime in a 94 percent decline of species in that part of the Merrimack River. The current method of cooling the plant pulls living creatures into the system, crushing, mutilating and suffocating them, and traps fish and other aquatic life against the screens covering pipes that pull water into the system, injuring or killing them, and then subjects the river and its aquatic life to the further stresses of heated wastewater discharges.

The upgrades to Merrimack Station that EPA is requiring are long overdue. Installing a modern closed-cycle cooling system and operating it year round will decrease the plant's discharge of heated water by nearly 100 percent. In addition, because it will not require the same volume of water from the river, the upgraded system will dramatically reduce the loss of fish, fish larvae and fish eggs that today are getting sucked into the structures and killed.

EPA Response to Section VII.3 Comments:

EPA acknowledges and appreciates all the commenters that expressed their support of EPA's conclusion that closed-cycle cooling was appropriate and necessary to protect the ecology of the Merrimack River. EPA has considered the extensive comments it has received on the Draft Permit and the spirit of environmental stewardship expressed in these comments. EPA agrees that the Merrimack River is an important public resource.

Back in 2001, EPA determined that PSNH had not demonstrated that its thermal discharges had caused "no prior appreciable harm" to the balanced indigenous population (BIP) of the Hooksett

Pool. Therefore, EPA concluded that closed cycle cooling technology was necessary to protect the BIP. However, over the last six years Merrimack Station's operational profile has changed, from that of a baseload facility to that of an intermittent, seasonal (winter/summer) generator and the current owner, Granite Shore Power, has indicated that it expects to continue to operate in this reduced manner for the foreseeable future. This is the result of lower prevailing prices for natural gas having rendered older, less efficient coal-burning plants, such as Merrimack Station, less competitive within New England relative to natural gas-burning plants.

Based on more recent fisheries studies and information submitted to EPA, as discussed in Chapter II of this document, the current extent of the thermal discharge does not appear to be causing, and likely will not cause going forward, appreciable harm to the BIP. Subsequently, the Agency determined that permit limits designed to maintain the current operating conditions provide reasonable assurance of the protection and propagation of the BIP. Therefore, EPA has concluded that a variance can be authorized pursuant to a CWA § 316(a) and that closed cycle cooling is not warranted at this time. These new, variance-based permit limits based on the current operating conditions at the plant, are discussed in detail in Chapter II of this document. In addition, requirements related to the Station's cooling water intake structure, pursuant to CWA 316(b) are also discussed in detail Chapter III this document.

Given that the above comments do not include specific recommendations or objections concerning the Draft Permit's limitations or other requirements, no specific changes have been made to the Final Permit as a result of these comments. EPA acknowledges that there may be objections by these commenters to the Final Permit, as it does not require closed-cycle cooling technology. The basis for this change is fully explained in Chapter II of this Response to Comments document.

4.0 General Comments in Support of the Draft Permit

4.1 Comments Received by Letter

Comment VII.4.1.1	AR-1059

Judi Lindsey, Candia, New Hampshire

Thank you for protecting NH's waters from dirty coal polluters like Public Service Company of NH's Merrimack Station coal plant in Bow. It has been destroying the fish and other living creatures in the Merrimack River for many decades. The Merrimack River provides drinking water and recreation for communities in this NH and MA watershed.

I support your new draft National Pollutant Discharge Elimination System (NPDES) permit for this Merrimack (River) Station coal-fired power plant in Bow. It is past time they installed modern, efficient technologies to reduce water use and stop killing so many fish. I love to kayak the Merrimack River as well!

Comment VII.4.1.2	AR-1060

Sylvia S. Field, Lebanon, New Hampshire

I want to thank you for your action protecting New Hampshire waters from the Public Service Company of NH, whose polluting coal plan in Bow has been killing fish and other creatures in the Merrimack River for many decades. I support whole-heartedly your new Draft National Pollutant Discharge Elimination System permit for this plant. It's high time new technologies are installed.

Comment VII.4.1.3	AR-1062

Gary S. Chag, Sanbornville, New Hampshire

Thank you for protecting New Hampshire's waters from dirty coal polluters like the Merrimack Station coal plant in Bow, NH. I support your New Draft National Pollutant Discharge Elimination System permit for the Merrimack Station coal fired plant in Bow. It is time they installed efficient technologies to reduce water use and killing wildlife.

Comment VII.4.1.4	AR-1063

Russell, Perkins, New Hampshire

I understand the EPA is considering issuing an NPDES permit for PSNH's Merrimack Station coal burning plant in Bow, New Hampshire. I was amazed to find out that the plant didn't already have a water recirculation system and uses hundreds of millions of gallons of fresh river water every day. This kills millions of fish and releases warm water into the river. It is about time PSNH installed a modern water recirculation system and had to operate under the appropriate safeguarding permits.

Comment VII.4.1.5	AR-1068, AR-1119 (also read at public hearing)

Linda Rauter, Chichester, New Hampshire

My family and I have lived in the greater Concord area for about 38 years. Concord with its beautiful Merrimack River has been the center of most of our activities over the years. Not too long ago before we arrived, the Merrimack was so polluted that one could not even safely swim in it. I understand that now, it is safe for swimming, boating and for wildlife. Because of the Bow Power Plant, I personally believe that only the area above the plant is safe for water activities. Sadly, extremely polluted discharge water from the plant continues to foul the river below it. Warmer water temperatures of the discharge also affect life in the river below the plant. In addition, it is my understanding that the 287 MILLION gallons of water withdrawn every day by the plant results in horrible deaths for whatever creatures may be in that water. A short distance upriver along the Forrest [*sic*] Society Conversation area, I have noted turtles, mink, muskrats, otter, and water birds in addition to the fish that live in the river. It is extremely disturbing to imagine these creatures being sucked into the plant turbines or drowned on the intake screens.

The right thing to do is drastically limit the amount of water withdraw by the river and to make Certain that whatever water is discharged if first cooled and cleaned. I am also extremely concerned about the amount of mercury discharged by the plant. There is absolutely no question that mercury is a toxic substance, and it is falling indiscriminately into our soils and every water body. This is dangerous to all life and must be stopped.

Comment VII.4.1.6	**AR-1070**

Lower Merrimack River Local Advisory Committee

The Lower Merrimack River Local Advisory Committee was created in 1990 after the Lower Merrimack was designated a protected river in the State of NH. As a designated river, the Lower Merrimack is protected under RSA 483; administered by the New Hampshire Department of Environmental Services (NH DES) Rivers Management and Protection Program.

The Lower Merrimack River Local Advisory Committee (LMRLAC) has reviewed the draft permit for the PSNH Merrimack Station in Bow, NH and offers the following comments:

> The LAC supports the approval of the draft permit as written as it will be beneficial to the river. The draft permit is consistent with the efforts undertaken by the U.S. Fish and Wildlife Salmon Restoration Program.

Comment VII.4.1.7	**AR-1069**

Janis Porter, Hampton, New Hampshire

Thank you for protecting New Hampshire's waters from dirty coal polluters like Public Service Company of New Hampshire's Merrimack Station coal plant in Bow, NH. It has been destroying the fish and other living creatures in the Merrimack River for many decades. The Merrimack River provides drinking water for communities throughout New Hampshire and Massachusetts. I support your new Draft National Pollutant Discharge Elimination System (NPDES) permit for the Merrimack Station coal-fired power plant in Bow, New Hampshire. It is past time they installed modern, efficient technologies to reduce water use and stop killing so many fish!

Comment VII.4.1.8	**AR-1071**

Karen Campbell, Derry, New Hampshire

Thank you for protecting New Hampshire's waters from dirty coal polluters like Public Service of New Hampshire's Merrimack station coal plan in Bow, NH. It has been destroying the fish and other living creates in the Merrimack River for many decades by withdrawing up to 287 million gallons of water from the river every day killing billions of fish and polluting the water. The Merrimack River provides drinking water for communities throughout New Hampshire and Massachusetts. I support your new Draft National Pollutant Discharge Elimination System (NPDES) permit for the Merrimack Station coal-fired power plant in Bow, New Hampshire since the permit would reduce the amount of water the coal plant uses by 90% and protect technologies to reduce water use and stop killing so many fish.

Comment VII.4.1.9	AR-1072

Steven E. Opre

I am writing to express strong support for the EPA's proposal to require the installation of a modern closed-cycle cooling water system at the Merrimack Station, as described in its draft NPDES permit.

Comment VII.4.1.10	AR-1073

Ruth Heden, Milford, New Hampshire

I am writing to express strong support for the EPA's proposal to require the installation of a modern closed-cycle cooling water system at the Merrimack Station, as described in its draft NPDES permit.

I am concerned both because of the damage to wildlife, but the pollution issues are of greater concern to me. Discharging mercury causes so many problems, many that we know about especially as many communities rely on rivers for their drinking water – both other problems we discover as we study the issues. It's cost effective to deal with the problem with prevention – than to pay for the problems later: healthcare issues, impaired educational capacities.

Comment VII.4.1.11	AR-1074

Alisha DiMasi

I am writing to express strong support for the EPA's proposal to require the installation of a modern closed-cycle cooling water system at the Merrimack station, as described in its draft NPDES permit.

Comment VII.4.1.12	AR-1075

Nancy Reiss, East Kingston, NH

Thanks for protecting NH's waters from dirty coal polluters like Public Service Company of NH's Merrimack Station coal plant in Bow, NH, which has been destroying fish and other creatures in the Merrimack River for many decades. This river provides drinking water and recreation for communities in this NH and MA watershed.

I support your new draft National Pollutant Discharge Elimination System (NPDES) permit for this Merrimack Station coal-fired power plant. The company must be made to install modern, efficient technologies to reduce water use, stop pollution, and prevent fish kill.

Comment VII.4.1.13	AR-1076

Barbara Fortune, Effingham, NH

Please help protect the Merrimack River from PSNH's polluting withdrawal + discharge of river water for Merrimack Station in Bow, NH. It is unacceptable that aquatic life is being destroyed and that a public water supply is being so degraded. It's time for a closed-cycle system. I support the NPDES permit. It is long overdue!

Comment VII.4.1.14	AR-1077

Marlies G. Coronado, Manchester, NH

Thank you for protecting New Hampshire's waters from dirty coal Polluters like Public Service Company of New Hampshire's Merrimack Station coal plant in Bow, NH. It has been destroying the fish and other living creatures in the Merrimack River for many decades. The Merrimack River provides drinking water for communities throughout New Hampshire and Massachusetts. I support your New Draft National Pollutant Discharge Elimination System (NPDES) permit for the Merrimack Station coal-fired power plant in Bow, New Hampshire. It is past time they installed modern, efficient technologies to reduce water use and stop killing so many fish.

Comment VII.4.1.15	AR-991 (also AR-1061)

Environmental Organizations: Conservation Law Foundation, Environment New Hampshire, New Hampshire Sierra Club, Conservation New Hampshire, Appalachian Mountain Club, New Hampshire Audubon Society, Clean Water Action, and the Society for the Protection of New Hampshire Forests

To be clear, these comments should not be interpreted as support for the continued operation of PSNH's Merrimack Station coal-fired power plant. The plant is the single largest source of greenhouse gas emissions in New Hampshire, perpetuates the adverse health impacts associated with burning coal, and cannot generate power cost-effectively in comparison to more efficient power plants operating in New England today. No matter what PSNH spends to upgrade the facility, it will not be able to turn this 50-year-old plant into a desirable source of energy that benefits the people of New Hampshire and New England. Nonetheless, as long as this plant remains in operation, it *must*, as a matter of law, comply with the Clean Water Act.

We commend EPA for finally addressing Merrimack Station's outdated and environmentally harmful cooling system, and we urge EPA to amend its draft permit to require the elimination of any mercury discharge from the plant. We request that EPA proceed expeditiously with the finalization of its draft permit.

EPA Response to Section VII.4.1 Comments:

EPA acknowledges and appreciates the above comments reflecting support for the Draft Permit. EPA has considered the extensive comments it has received on the Draft Permits and the spirit of environmental stewardship expressed in these comments. Further, EPA agrees that the Merrimack River is an important public resource. EPA has applied the appropriate standards of the Clean Water Act in establishing the terms of the Final Permit. See response to Section VII.3 comments above. Given that the above comments do not include specific recommendations or objections concerning the Draft Permit's limitations or other requirements, no specific changes have been made to the Final Permit as a result of these comments. EPA acknowledges that there may be objections by these commenters to the Final Permit, as it does not require closed-cycle cooling technology. The basis for this change is fully explained in Chapter II of this Response to Comments document.

4.2 Comments Made at November 3, 2011 Public Hearing

Comment VII.4.2.1	AR-1119

Catherine Goldwater, Hollis, New Hampshire, Member of the New Hampshire Green Coalition and Sierra Club of New Hampshire and national Sierra Club

- I have lived in Hollis for 30 years, raised two kids there.
- Decades ago, Marion Stoddard began to notice the pollution in the Nashua River that, at the time, was so visible…the factories were discharged into the river so that you could look and see yellow foam…it was almost like plastic or blue. The river was colored. And it was just being treated like a garbage dump.
- Now the kinds of pollution are not visible. And yet, we know the harm of mercury, arsenic, and other chemicals in minute amounts…we know there is a lot of mercury in the fish in New Hampshire lakes, mostly from the air. And that's not all from the Bow plant. It also comes from Ohio and drops into our lakes.
- We have been told to eat very few fish from the lakes…maybe one a month is safe, none if you are pregnant…
- …I am concerned about these chemicals and how they are hurting people and animals.
- A fact Sheet…from Sierra Club indicated that some of the Merrimack water downstream is used for drinking water in Lowell. And I hope that's properly cleaned if it is really being used for drinking water.
- I also have a question which I hope to get answered someday, that the water that is heated, and it goes over the dam and then gradually mixes so it cools down, but, it stays warmer, I'm sure it was 30, 40 years ago. And I wonder what the effect of that heated water is on the

growth of bacteria or what kinds of insects may be more common because the water is warmer.
- PSNH just invested in those new scrubbers to reduce the sulfur, but not remove all of it, I don't believe, reduce the mercury. And we know, for that reason that this PSNH is likely to be around for quite a while.
- …I fully support and am in favor the EPA draft to make it as strong as possible.

Comment VII.4.2.2	AR-1119

Jerry Curran, Chair of New Hampshire Chapter of the Sierra Club

- Thank the EPA for starting this whole process and I am struck by the words of "warm, clean water" coming out of the Merrimack Station power plant. I don't know how many of you have actually seen that power plant. But, terms like warm, clean water coming from the power plant, it seems a little odd.
- I think it will provide jobs. If we…leave it as it is, there will be jobs for healthcare providers. If we were to keep this power plant operating, which we don't agree with…we've got the third highest asthma rate in the country. We've got 18,000 children who suffer from asthma in New Hampshire and we are an EPA non-attainment area for ozone. And that exacerbates the 18,000 children with asthma. So even in the best situation, we if keep the plant running when there are so many other ways to produce power other than with coal in a 40 year old power plant, and keeping it running is really not a great option.
- If we were to keep it running, cleaning the warm clean water from the effluent would be a good idea.
- …the slurry from the scrubbers, all of that water will end up back in the Merrimack with other chemicals, along with mercury in the Merrimack, and that's even water that is drinking water for Nashua, as I understand. It just seems kind of hard to call that warm, clean water.
- I do support the denial of the thermal variance…I would like to thank EPA for the work they are doing and it is overdue.

Comment VII.4.2.3	AR-1119

Marsh Feigl, Concord, New Hampshire

- I've paddled on the…Hooksett Pool probably upwards of 50 times…I paddle there in the winter…I don't paddle there the rest of the year because…I just have other spots to go. But…we paddle there in January, February, and March because there is open water…it's a great place to paddle…because everywhere else in New Hampshire is locked up. There is nowhere else to go. But it's also very strange and weird…to be in that river and to look upstream from the power plant and see this much ice just locked up as I suppose it should be. And below the power plant, all the way down to…the Hooksett Dam, or down by the Hooksett District Court, it's probably three quarters of a mile, generally open water the whole way…. lots of ducks. I view lots of fish…lots of bald eagles…it's a strange and odd thing to see, and clearly unnatural. But I will leave it to others to decide whether it's a good thing or a bad thing. But, it's…not a natural thing, that's for darn sure.

Comment VII.4.2.4	AR-1119

Tom Irwin, Director, New Hampshire Office of the Conservation Law Foundation - Joint Statement of Conservation Law Foundation, the Appalachian Mountain Club, Conservation New Hampshire, New Hampshire Audubon, Environment New Hampshire, the New Hampshire Chapter of the Sierra Club, Clean Water Action, and the Society for the Protection of New Hampshire Forests

- EPA, in its permit fact sheet, appropriately acknowledges that PSNH designed, financed and constructed the new Merrimack Station wastewater treatment system without first discussing with EPA whether it would meet the standards required under the Clean Water Act.
- To be clear, these comments should not be interpreted as support for the continued operation for PSNH's Merrimack Station coal fired power plant. The plant is the single largest source of greenhouse gas emissions in New Hampshire, perpetuates the adverse health impacts associated with burning coal and cannot generate power cost effectively in comparison to more efficient power plants operating in New England today.
- No matter what PSNH spends to upgrade this facility, it will not be able to turn this 50-year-old plant into a desirable source of energy that benefits the people of New Hampshire and New England.
- …as long as this plant remains in operation, it must, as a matter of law, comply with the Clean Water Act.
- We commend EPA for finally addressing the Merrimack Station's outdated and environmentally harmful cooling system. And we urge EPA to amend its Draft Permit to require the elimination of any mercury discharge from the plant.
- We request that EPA proceed expeditiously with the finalization of this draft permit.
- …our understanding (is) that the Department of Environmental Services has authorized for wastewater—municipal wastewater treatment plants to accept indirect discharges of scrubber wastewater from Merrimack Station. Specifically, we understand that the city of Concord is authorized to accept up to 25,000 gallons per day of the scrubber wastewater, that the city of Manchester and the towns of Hooksett and Allenstown are each authorized to accept up to 100,000 gallons per day of scrubber waste water. We are concerned about the potential impacts, not only to the Merrimack River, but…with the impacts of mercury from this wastewater absorbing into solids and ending up either on the land or potentially even incinerate. So it is an issue of concern we hope EPA will closely address.

Comment VII.4.2.5	AR-1119

Frederick S. Tuttle, Jr.

- In 19 years, I've seen the effluent coming down the river…coming out of the stacks. I just hate the thought of seeing more yellow smoke coming out of those stacks. And if it doesn't come out of the stacks, it's going to come in the water. I don't want to have to paddle in that water.

- …my drinking water is from Hooksett. …Hooksett gets its drinking water…from wells, deep wells. Those wells are supplied by water in some way, shape or form from the river. I don't want to drink that water. But, at this point, it is filtered good. And we're able to drink it without getting too sick.
- …I really want to stress that we need those controls. We need to put that river back to…as close to its normal running temperature as possible. Not only for us but for everything else that survives on that river.

Comment VII.4.2.6	AR-1119

Jeff Daly, Nashua, New Hampshire, Member of Lower Merrimack River Local River Management Advisory Committee (LAC) and outside member of Sierra Club

- We spent—it went from $250,000,000 to $450,000,000. We now have a massive great chimney stack outside here. You've got a flue gas scrubbing system. And you say the technology does not exist to clean up the waste coming out of that.
- Within your own document, you talk about numerous outflows. Nowhere in there do you say, let's consolidate all this wastewater. Let's treat it in one place.
- I can take you to the Dow Chemical Plant in Midland, Michigan, and Freeport Texas where they take very toxic wastewater and they remove arsenic, cyanide, *thialysines* (phonetic), and mercuries. And they put the water back in their facility in Michigan cleaner than they take it out of Lake Michigan.
- The technology is there. And yet, the EPA has not addressed it in any of their paper work here. Other than on page 39, you talk about nitrogen. You talk about discharges of ammonia, nitrogen, and nitrogen can be treated to the depletion of a water body's dissolved oxygen levels. This can, in turn, cause a variety of adverse quality, water quality habitat effects.
- We all know dissolved oxygen's effect on the Gulf. Has the EPA been down there and allowed rehabilitation of the Gulf? No. We've been pouring, right now, in excess of 7,000,000 gallons of Corrects It 9572 (phonetic) into the Gulf because nobody wants to do remediation…What has that done? Reduced the dissolved oxygen content within the Gulf to a point where you've got vast areas that are dead.
- You can go off the coast of New Jersey, Toms River where the Seaver Geigy Company dumped materials.
- …you talk about the U. S. Army Corps of Engineers is working on a dissolved oxygen model for the Merrimack River. Gentlemen, that model has been around for 35 years. Why are we now talking about a new model?
- You said the results of this modeling analysis could lead to the conclusion that nitrogen limits are needed. Why don't you just turn around and say zero. We've got the technology.

Comment VII.4.2.7	AR-1119

Barbara Morris, Bow, New Hampshire

- I just moved to the Concord area from the beautiful and pristine Monadnock region of New Hampshire. Our lakes, our rivers, our streams are isolated from smoke stacks and highways.

I was so happy to find out about the society for the protection of New Hampshire forests conservation center that abuts the Merrimack River and does have access to the river for people, their dogs…just as recently…I found out just how polluted the Merrimack River is. And even worse, now that I'm finding out what's going on with the river from the Bow power station.

- I think you all need to reevaluate the technology that is available. Why does the Merrimack always have to learn and apply what is being done across the pond, no pun intended.
- There needs to be a lot more discussion and bringing in scientists and engineers, and authorities about putting the best system in because I don't think there is going to be a next time. I think this is the time. And the changes have to be made with the…best technology that is available.

Comment VII.4.2.8	AR-1119

Woodworth Winmill, High School Student

- I was looking at (the original permit) and it was really confusing. Because one of the problems I get, limitations of the discharges. And it has the one column that is the average monthly discharge, and the column that is the daily maximum. But, almost all the pollutants are measured only on a per week basis which is confusing me. don't understand why—the chemistry of that or not. Why do you have a maximum, if you only measure the weekly content? What is the applicability of that?
- Basically, most toxic heavy metals are listed here. I mean, you've got a chromium and cadmium and arsenic and lead…and…the catchall category more or less of mercury and manganese. And there also was…various quality quantities. You've got the daily maximum of arsenic is 15 micrograms per liter. Which means if you're discharging thousands of gallons of water and that's fifteen micrograms per liter. And add to that…a meaningful amount and it had them at a macroscopic level which they—like the recoverable lead is 100 micrograms per liter…which was kind of a shock, 100 micrograms and you discharge thousands of gallons and that's pretty vague.
- If you look at the chlorides…you have 18,000 micrograms of chlorides, no…it's actually measured in milligrams. So, you have 18,000 milligrams, which corresponds to 18 grams per liter of chlorides, which is a significant amount of chlorides…especially if you're going to list thousand gallons again.
- But, it is also addressed the issue of pollutant…the metabolic rates of different fish but, in terms of water temperature, if you reduce the water temperature, you reduce the total saturation capacity of oxygen.
- So, if you had the top layer, which has the most aquatic life in it, reduce the amount of…the carbon dioxide could be dissolved in that for the aquatic plants to digest. And you would reduce the amount of oxygen that can be held in the top layer of water.
- If you had a region of…like a flow area of water, how it could affect the currents. And especially, trying to bring back salmon in northeastern rives. And if you have other water, moving fast, it'll make it more difficult for fish in general to travel upstream beyond actually getting killed by…the plant.

EPA Response to Section VII.4.2 Comments:

EPA acknowledges and appreciates that the individuals above attended and participated in the EPA public hearing on November 3, 2011 and provided testimony reflecting support for the Draft Permit. As with the extensive written comments we received, EPA appreciates the support and positive statements made at the hearing for the Draft Permit as well as the spirit of environmental stewardship expressed in each given testimony. EPA agrees that the Merrimack River is an important public resource and has applied the appropriate standards of the Clean Water Act in establishing the terms of the Final Permit for Merrimack Station. Given that the above comments do not include specific recommendations or objections concerning the Draft Permit's limitations or other requirements, no specific changes have been made to the Final Permit as a result of these comments.

Please see the response to Section VII.2 comments above regarding the Permittee's use of POTWs. With respect to a commenter's concern about mercury transported to POTWs and ending up in the Merrimack River, in solids or on land, any FGD wastewater that is trucked to POTWs will have undergone chemical precipitation and been subject to the facility's Enhanced Mercury and Arsenic Removal System (EMARS), which together remove mercury and other pollutants.

In addition, EPA found no reasonable potential for New Hampshire's water quality criteria for nitrogen to be exceeded. If results of quarterly ammonia nitrogen monitoring at Outfall 003 show that limits are needed, EPA can modify the permit to include them. EPA acknowledges that there may be objections by these commenters to the Final Permit, as it does not require closed-cycle cooling technology. The basis for this change is fully explained in Chapter II of this Response to Comments document.

5.0 General Comments in Opposition to the Draft Permit

Comment VII.5.1	AR-1119 and AR-1067

Randy Herk, Northwood, NH

- …to share my perspective on the EPA's recent Draft Permit regarding the impact the operation of the Merrimack Station is having on the health of the Merrimack River.
- Much of the focus of EPA's recent Draft Permit is on the plant's impact on the fish population. So, I think it is important, people like myself, who fish the river regularly share my experience.
- The Merrimack River has undergone some dramatic changes over the last decades, all of which are for the better. During my time fishing on the river, I have caught plenty of fish. Of course, all my fishing is catch and release so the fish go right back into the population.
- In addition to being a very active fishing spot, the Merrimack River is also home to many other types of wildlife. I have observed ducks, blue heron, bald eagles, minx, beavers, and weasels and other form of wildlife all actively enjoying the healthy waters and ecosystem of the Merrimack River.

- It is no secret that the Merrimack River is a great spot for fishing and wildlife. The river is normally fished by several bass boats and used by others looking to enjoy the outdoors.
- I was very grateful to PSNH for installing a community boat launch near the Merrimack Station allowing many others to enjoy the river and all it has to offer.
- …it is my observation that the river is healthier and cleaner than it has ever been. My experience as a fisherman and my observation of so many others enjoying the river are a testament to that.

Comment VII.5.2	AR-1065 and AR-1119

Rob Frye, Sandown, NH - Rocking Fishing and Hunting Expo

A few credentials I would like to share:

1. Proud New Hampshire Resident and father of two with a loving wife
2. Founder of Bubba Bassin since 1996
3. President of the NHBass Federation from 2000-2006
4. Board of Directors of NH Lakes Association from 2004-2005
5. Founder/Owner of the Rockingham Fishing & Hunting Expo
6. Bass Tournament Angler since 1993
7. 1-time State Champion and 2-Time Angler of the Year
8. Commercial salt-water angler for 3 years
9. Hardware/Avid Angling Enthusiast
10. And for work, I am a Principle Software Automation Engineer

- I personally fish all year round and have been fishing the Hooksett Pool of the Merrimack River since 1992 since I first owned a boat, almost 20 years now.
- I fish the "Bow Power Plant" at least 6-12 times per year.
- I have posted YouTube videos while fishing the BPP that you can view now. These were recorded a couple of years ago while fishing on Thanksgiving, Christmas, and New Year's Eve weekends.
- I can share with you from my own personal experience that the BPP is an incredible and productive fishery.
- I have caught numerous lunkers (bass over 4 lbs.) both smallmouth and largemouth species every year.
- I have many friends that have caught largemouth 7 to 8 lbs.
- Recent tournament results are also strong arguments to support that the BPP is vibrant and healthy fishery.
- There have been a few times I have gone fishing from my boat and caught over 50 bass.
- Bass aren't the only species that are numerous here.
    - I have caught Salmon and seen schools and schools of yellow perch, especially by the beaver hut
    - I have even brought and used my AquaView (Underwater camera) and been so impressed by the fish I see including the massive amounts of white suckers that thrive in the pool area.

- It is also the only place I know of in NH where you can fish from a boat all year round.
  - No other water body in the state allows this.
  - I don't winterize one of my boats just so I can use it during the winter months at our beloved BPP.
  - I've met many anglers at the ramp and on the water from NH, Maine, Massachusetts, and Vermont.

- I question a lot of the data collected for the slide show…I question a lot of that data…for one, you can't tell me where that data came from or who it came from.
- In the slide show only four fish were caught…I can bring you to places, I mean to that Bow Power Plant and catch sometimes 50 fish a day. And you can catch multiple species there.
- If you know where the dam is in that section, there is a ton of yellow perch in that area…I was very impressed by the amount of white suckers that are there.
- …I question where you're getting your data…it looks like you guys are looking in the wrong place to be honest with you because it is an incredible fishery.
- This piece of water, this water body, it is the only place in New Hampshire where you can fish all year round from a boat. Because of the rest of the waters, you know, they are pretty much frozen or not accessible.
- And so if this closed loop system goes into place, it's going to be unfortunate because we're going to lose a resource which is the bass fishing.

EPA Response to Section VII.5 Comments:

EPA acknowledges and appreciates that the individuals above attended and participated in the EPA public hearing on November 3, 2011 and provided testimony regarding the health of the Merrimack River. EPA agrees that the Merrimack River is an important public resource and has applied the appropriate standards of the Clean Water Act in establishing the terms of the Final Permit for Merrimack Station. Given that the above comments do not include specific recommendations or objections concerning the Draft Permit's limitations or other requirements, no specific changes have been made to the Final Permit as a result of these comments.

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1.0 Introduction and Chronology of Permit Conditions

This chapter of the response to comments document pertains to the many comments that were received relating to flue gas desulfurization (FGD) wastewater generated at Merrimack Station.

The regulatory landscape and the site-specific facts and information have shifted throughout this NPDES permit renewal process. While the previous owner of Merrimack Station (PSNH), on May 5, 2010, supplemented its renewal application to request authorization to discharge FGD wastewater under the NPDES program, the situation has recently changed. *See* AR-225. The current owner of Merrimack Station, Granite Shore Power (GSP), submitted a letter to EPA Region 1 on March 25, 2020, wherein the company stated:

> GSP Merrimack LLC is withdrawing the pending request for authorization in the new permit to directly discharge FGD wastewater to the Merrimack River . . ..

AR-1690, p. 2. The company makes clear that this decision is based on the forthcoming "revisions to the ELGs and the VIP for FGD wastewater" and significant reductions in the Station's capacity utilization. *Id.*

EPA, therefore, is removing all conditions and limits applicable to a discharge of FGD wastewater from the Final Permit. The Final Permit does not authorize discharge of this wastestream; pursuant to CWA section 301, any direct discharge of this wastestream into the Merrimack River from Merrimack Station is not authorized by Final Permit and is unlawful. The conditions and limits removed and affected will be discussed in further detail below.

Although the current owner of Merrimack Station, Granite Shore Power (GSP) has withdrawn its request for authorization, under its NPDES permit, to discharge FGD wastewater, *see* AR-1690, EPA Region 1 provides the following overview of the draft FGD limitations and requirements proposed since the existing 1992 Permit expired and the justifications supporting those determinations.

Merrimack Station consists of two coal fired, steam electric generating units. The coal combustion process generates a variety of air pollutants that are emitted from the facility's smoke stacks. In 2006, the New Hampshire legislature enacted RSA 125-0:11-18, which required the then owners of the station, Public Service of New Hampshire (PSNH) to install and operate a wet FGD system at Merrimack Station to reduce air emissions of mercury and other pollutants. *See* RSA 125-O:11(I), (II) and (III); RSA 125-O:12(V); RSA 125-O:13(I) and (II). PSNH was required to have the FGD system fully operational by July 1, 2013 and easily met that deadline, placing the scrubber into service in September 2011. *See* AR-846, p 123.

The wet FGD system that PSNH installed is a limestone forced oxidation scrubber system, where the flue gas emitted from the boiler stacks comes into contact with a liquid spray of limestone slurry. The liquid slurry absorbs sulfur dioxide and other sulfur compounds from the flue gas, as well as other contaminants including particulates, chlorides, volatile metals (e.g., arsenic (a metalloid), mercury, selenium, boron, cadmium, and zinc), total dissolved solids (TDS), nitrogen compounds and organics. PSNH reported that the scrubber system reduces mercury emissions by approximately 95 percent and sulfur dioxide emissions by over 90 percent. *See* AR-1215, p 10. The chloride concentration and clay inert fines of the FGD slurry must be controlled through a routine wastewater purge to minimize corrosion of the absorber vessel materials.

Acknowledging that the new scrubber system would result in generation of wastewater, in May of 2009 PSNH notified EPA that it planned to install a primary wastewater treatment system (PWWTS) consisting of physical/chemical treatment (i.e., chemical precipitation) and an Enhanced Mercury and Arsenic Removal System (EMARS) to treat the FGD scrubber wastewater purge. AR-636. Nearly one year later, PSNH supplemented its NPDES permit renewal application to request authorization to discharge FGD wastewater. AR-225.

2011 Draft Permit

Region 1 issued a draft permit to Merrimack Station on September 30, 2011 (2011 Draft Permit). The 2011 Draft Permit included technology-based limitations and conditions for the wastewater discharge expected from Merrimack Station's then recently constructed wet FGD scrubber system through a newly created internal Outfall 003C. *See* Draft Permit, pp. 6-7; 2011 Fact Sheet, pp. 16-17.

Discharges of wastewater from an FGD scrubber system to a water of the United States must comply with the requirements of a NPDES permit, *see* 33 U.S.C. §§ 1311(a) and 1342(a), and must satisfy federal technology-based treatment requirements as well as any more stringent state water quality-based requirements that may apply. At the time the 2011 Draft Permit was developed, the National ELGs which set technology-based limits for the discharge of certain pollutants by facilities in the Steam Electric Power Generating Point Source Category, *see* 40 CFR Part 423, did not yet include BAT limits for certain pollutants of concern in FGD wastewater. In the absence of applicable ELGs for FGD wastewater, technology-based limits may be developed by EPA (or state permitting authorities administering the NPDES permit program) on a BPJ, case-by-case basis. 33 U.S.C. § 1342(a)(1)(B); 40 CFR § 125.3(c) ("Where promulgated effluent limitations guidelines only apply to certain aspects of the discharger's operation, or to certain pollutants, other aspects or activities are subject to regulation on a case-by-case basis in order to carry out the provisions of the Act.").

For the 2011 Draft Permit, Region 1 conducted a BPJ evaluation in which it examined eleven candidate technologies to determine the BAT for treating wastewater resulting from Merrimack Station's FGD system. *See* 40 CFR §§ 125.3(a)(2)(iv) and (v), (c)(3). Region 1 proposed, based on BPJ, that the Station's newly installed PWWTS, coupled with biological treatment (designed to optimize the removal of selenium), was the BAT for limiting the discharge of pollutants present in FGD wastewater at Merrimack Station. *See* Region 1's 2011 Fact Sheet, Attachment E (AR-616). Therefore, based on the proposed BAT treatment system, Region 1 included effluent limits for FGD wastewater in the 2011 Draft Permit, including specific limits for various metals (*e.g.*, mercury, arsenic, selenium), chlorides, and total dissolved solids (TDS). Because these limits differed from those applied to low volume waste and other wastes deposited into the slag settling pond, Region 1 concluded that the FGD wastewater needed to be sampled at a separate internal outfall (Outfall 003C) prior to mixing with other wastes in the settling pond. *See id*. Once discharged through internal Outfall 003C into the slag settling pond, however, the FGD wastewater was to remain subject to the limits for TSS and O&G (which are the same for all the commingled wastes in the slag settling pond) at Outfall 003A.

In addition to the technology-based limits applied to Outfall 003C, Region 1 included water quality-based limits and reporting requirements for certain pollutants at Outfall 003A (slag settling pond, which would receive bottom ash transport wastewater, storm water, boiler blow-down, treated metal cleaning waste, landfill leachate and other miscellaneous and low volume wastes). These permit requirements were informed by the 2010 NH DES Antidegradation Analysis, which accounted for the addition of FGD wastewater into the slag settling pond. *See* AR-209.

Merrimack Station's 2011 Draft Permit was placed on Public Notice from September 30, 2011 through February 28, 2012 and a Public Hearing took place on November 3, 2011. The Region received numerous comments regarding the FGD requirements of the 2011 Draft Permit from: PSNH (AR-846), Utility Water Act Group (UWAG) (AR-841), Ohio Utilities Group (AR-1131), Conservation Law Foundation (CLF) (AR-851 and AR-853, Koon Report), Duke Energy (AR-1126), Electric Power Research Institute (EPRI) (AR-844), and Environmental Groups consisting of Defenders Of Wildlife, Earthjustice, Environmental Integrity Project, National Wildlife Federation, and Sierra Club (AR-866).

2014 Revised Draft Permit

After the public comment period for the 2011 Draft Permit concluded, Region 1 learned that PSNH had installed and, in June of 2012, begun operating Vapor Compression Evaporation (VCE) treatment technology to treat and reduce the volume of FGD wastewater at Merrimack

Station so that direct discharge of the wastewater to the Merrimack River was not necessary. *See* AR-638; AR-303; AR-1135, p. 18. This secondary wastewater treatment system (SWWTS) consists of a falling-film evaporator (or brine concentrator), forced circulation crystallizers and an Oberlin belt press filter, which evaporate the PWWTS effluent to a solid waste stream, leaving only a small liquid residual.[1]

Given this new information, Region 1 completed a new BPJ, case-by-case analysis of BAT for Merrimack Station and "determined that the Facility's existing primary FGD wastewater treatment system (which includes physical/chemical treatment components and the EMARS absorber), combined with its [now] existing secondary FGD wastewater treatment (which includes the two-stage evaporation system which can be operated to achieve [zero liquid discharge] ZLD) are the [new proposed] BAT." AR-1135 (Fact Sheet for 2014 Revised Draft Permit), pp. 40-41. On this basis, EPA issued the 2014 Revised Draft Permit on April 18, 2014, in which it proposed a zero-discharge limit for pollutants in FGD wastewater based on the VCE technology outlined in the Region's BPJ determination. Under this approach, the internal outfall (Outfall 003C) created for FGD wastewater in the 2011 Draft Permit was no longer necessary and was removed from the Revised Draft Permit.

Region 1 also re-evaluated the basis of the water quality-based limits for Outfall 003A (slag settling pond) mentioned above and found that there was no reasonable potential to violate water quality standards for arsenic, mercury, and selenium, (*see* AR-1086 (data and calculations)), because PSNH was operating its wet FGD scrubber system without discharging to the slag settling pond. Therefore, the water quality-based reporting requirements and limits were removed from Outfall 003A in the 2014 Revised Draft Permit.[2]

The 2014 Revised Draft Permit, associated fact sheet, and administrative record was available for public review and comment beginning April 18, 2014. Consistent with 40 CFR § 124.14(a)(1), Region 1 provided a two-stage comment period for the 2014 Revised Draft Permit. AR-1137. In total, the combined comment period lasted 187 days, ending on October 22, 2014. The Region received numerous comments regarding the FGD requirements of the 2014 Draft Permit from: PSNH (AR-1215 and 1231), UWAG (AR-1222), Environmental Groups consisting of CLF, Earthjustice, Environmental Integrity Project, and Sierra Club (AR-1220), Southern Company (AR-1218), Upper Merrimack River Local Advisory Committee (AR-1224), EPRI (AR-1223), and Lowell Regional Wastewater Utility (AR-1232).

2017 Reopened Public Comment

Both the 2011 Draft Permit and the 2014 Revised Draft Permit were developed in the absence of

[1] Using VCE technology, PSNH proceeded with meeting its obligation under New Hampshire law to have the FGD wet scrubber operating no later than July 1, 2013 and was able to maximize qualification for the state law economic incentives for expedited cuts in Merrimack Station's mercury air emissions without reliance on the issuance of a final renewed NPDES permit authorizing discharge of FGD wastewater.

[2] The 2014 Fact Sheet states that the conditions removed from Outfall 003A are the reporting requirements for chloride and aluminum and the effluent limits for aluminum, arsenic, mercury and selenium, which were based on water quality considerations. 2014 Fact Sheet, pp. 52-53 (AR-1135).

national BAT ELGs for FGD wastewater and, therefore, technology-based effluent limits for FGD wastewater in these draft permits were based on BPJ determinations. On November 3, 2015, however, EPA promulgated revised ELGs for the Steam Electric Power Generating Point Source Category ("2015 Final Rule" or "2015 ELGs"). *See* 80 Fed. Reg. 67838 (Nov. 3, 2015).

The new 2015 ELGs update effluent guidelines that have been in place since 1982, reflecting technology improvements in the steam electric power industry over the last three decades. The 2015 Final Rule includes requirements that reduce pollutants of concern such as mercury, arsenic, and selenium that are released into America's waterways by coal ash, air pollution control waste (including from FGD scrubber systems), and certain other wastestreams from steam electric power plants. Under the 2015 Final Rule, new requirements for existing power plants are to be phased in between 2020[3] and 2023. More specifically, the 2015 ELGs, which became effective January 3, 2016, provide BAT limitations for FGD wastewater and replace the need for site-specific BPJ assessments to develop technology-based BAT requirements for this wastestream. *See* 2017 Statement, pp. 48-52 (AR-1534) (identifying new requirements for FGD wastewater under the 2015 Rule and potentially implications for Merrimack Station).

By 2017, this rulemaking and other regulatory changes, new data, information, and arguments pertinent to certain aspects of the permit appeared to raise substantial new questions concerning the permit. On August 4, 2017, EPA Region 1 reopened the comment period to allow additional comment to address the new regulations and other new information. *See* 2017 Statement (AR-1534); 2017 Public Notice (AR-1533). The comment period was extended 74 days, ending on December 18, 2017. AR-1692. EPA received FGD-related comments from: PSNH (AR-1548), CLF (AR-1573), and EPRI (AR-1600).

Several important developments related to the 2015 Rule occurred throughout 2017, including the Agency's decision to reconsider certain limits on FGD wastewater, the Fifth Circuit's vacatur and remand of limits applicable to FGD legacy wastewater[4], and the Agency's September 2019 Proposed Revisions to the ELGs (proposed revisions to both FGD and BATW limitations). See Response to Comment V.1 for an overview of these legal and regulatory changes.

2020 Final Permit

As previously stated, on March 25, 2020, the current owner of Merrimack Station, Granite Shore Power (GSP), submitted a letter formally withdrawing its request for authorization to discharge wastewater generated from its FGD system. AR-1690. Therefore, the Final Permit, like the previous 1992 Permit, does not authorize the Permittee to discharge FGD wastewater directly to the Merrimack River. As a result, the description of Outfall 003A in the Final Permit no longer includes FGD wastewater.

As a result, the following conditions and limits have been removed from the Final Permit:

- The Draft Permit's Outfall 003C and any related internal limits;

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[3] See Response to Comment Section IV.1, which outlines the rulemaking challenges and the Agency's 2017 Rule postponing the compliance date for certain provisions of the 2015 Rule from 2018 to 2020.

[4] *See Southwestern Elec. Power Co. v. U.S. Env'l Prot. Agency*, 920 F.3d 999, 1015 (5th Cir. 2019) (*SWEPCO*).

- The water-quality based reporting requirements for chloride, aluminum, arsenic, mercury and selenium, at Outfall 003A; and
- The water-quality based effluent limits for aluminum, arsenic, mercury and selenium, at Outfall 003A.

Additionally, and to be clear, removal of the authorization to discharge FGD wastewater into the Merrimack River does not affect any of the facility's practices in transporting FGD wastewater off-site to publicly owned treatment works (POTWs), nor does it affect or preclude the reuse of FGD wastewater to condition fly ash. See Section V.2 of this Response to Comments document for discussion of the facility's appropriate practice of conditioning fly ash and related landfill disposal. As confirmed by statements in GSP's March 25, 2020 letter, EPA expects that withdrawal of its request to authorize discharges under its NPDES permit, simply means that the facility will continue its current practices with regard to FGD. AR-1690, p. 2. These current management practices result in no discharges of FGD wastewater to the Merrimack River from the Station, allow for operation of VCE technology without NPDES coverage, and are in compliance with section 301 of the CWA.

As is always the case, Merrimack Station is able to request NPDES coverage for FGD discharges in the future through a permit modification or permit renewal process. Nothing in this Final Permit precludes such actions.

Finally, to the extent that the numerous comments received relate to 1) the direct discharge of FGD wastewater into the Merrimack River, 2) Region 1's development of site-specific BAT limits for FGD wastewater, or 3) the applicability of the 2015 Rule to applying limits to FGD wastewater, those comments are no longer relevant to EPA's Final Permit for Merrimack Station and therefore do not merit any response.[5] EPA notes, however, that the Agency has benefitted from the numerous comments that provided education to both EPA and the public regarding the complexities of VCE technology and its use and effects at Merrimack Station.

2.0 Concerns about Hauling FGD Wastewater to Local Publicly Owned Treatment Works

Comment VIII.2.1	AR-866, Environmental Groups, p. 2

Comment: PSNH is currently disposing FGD effluent off site. EPA should investigate whether this wastewater is receiving treatment commensurate with its high concentration of total dissolved solids, including soluble metals, chlorides, and sulfates.

[5] All substantive comments related to FGD discharge are located in the following comment letters, which are also listed in EPA's discussion above:
2011 - AR-846, AR-841, AR-1131, AR-851, AR-853, AR-1126, AR-844, and AR-866.
2014 - AR-1215, AR-1231, AR-1222, AR-1220, AR-1218, AR-1224, AR-1223, and AR-1232.
2017 - AR-1548, AR-1573, and AR-1600.
Again, because EPA is no longer authorizing FGD discharge under this NPDES permit, these comments are not relevant and no longer warrant a response.

Comment VIII.2.2	AR-1218, Southern Company, pp. 5, 6, 7

Comment: In the face of Region 1's proposed discharge prohibition, Merrimack Station will have no choice but to continue this practice for so long as the neighboring POTW facilities will accept the purge liquor. This option presents another "catch 22" for Merrimack as the revised NELG rule may place stringent pre-treatment standards (i.e., PSES and PSNS limits) on FGD discharges that will prohibit this practice. The purge liquor is extremely concentrated due to volume reduction and may not meet the proposed rule's arsenic, mercury, selenium, or nitrite/nitrate pre-treatment standards for acceptance by a POTW facility.

Comment VIII.2.3	AR-1220, Environmental Organizations, pp. 7-10

Comment: ***EPA Should Use Its Authority to Prevent Negative Water Quality Impacts from Merrimack Discharging Its FGD Wastewater to POTWs that are Not Equipped to Handle Such Wastewater***

EPA's fact sheet states that PSNH could circumvent a zero-liquid discharge standard for its FGD wastewater by not operating the VCE and crystallizer system but instead sending the FGD wastewater to a local publicly owned treatment works. Fact Sheet at 49. PSNH itself acknowledges that POTWs are not designed to remove the toxic pollutants present in FGD wastewater from Merrimack, such as mercury and selenium. 2011 Draft Permit, Attachment E at 14. Moreover, EPA notes that a number of toxic pollutants including persistent, bioaccumulative toxins, are present in FGD wastewater and will not be treated effectively in a POTW. Fact Sheet at 49 ("It is unclear whether these pollutants receive any treatment at the POTWs. These constituents are generally expected to pass through a typical municipal sewage treatment plant."). EPA has proposed to address this regulatory gap in the proposed ELG rule, but in the meantime there are currently no pretreatment standards for many of the pollutants present in the FGD wastewater from Merrimack. See 78 Fed. Reg. at 34,477 (noting that "all of the pollutants proposed for regulation under BAT/NSPS pass through," including arsenic, mercury, and selenium).

Unfortunately, PSNH has a record of shipping its scrubber wastewater off-site to POTWs. Indeed, in its rush to qualify for economic incentives for operating its scrubber, PSNH shipped Merrimack's scrubber wastewater off-site because it did not have a NPDES permit authorizing its discharge. Fact Sheet at 24. PSNH has continued shipping some of Merrimack's wastewater off-site, even after the VCE and crystallizer system was built and operational. Id. at 24-25. Most disturbingly, as recently as February 2013, PSNH was still sending off-site wastewater that had not gone through the VCE and crystallizer system. Id. at 25 (noting that in February 2013, PSNH sent 186,000 gallons of wastewater from Stream A to Hooksett and 106,000 gallons to Allenstown). PSNH refused to explain to EPA why it has been sending this wastewater to POTWs, particularly wastewater not run through the VCE and crystallizer system, and instead offered an opaque statement that it was a "business decision" based on several factors.

It is inconsistent with the purpose of the Clean Water Act for PSNH to circumvent the zero-liquid discharge limit at its own outfall by sending the wastewater to a POTW that will discharge the pollutants, untreated, into a waterway. This would merely change the location of the discharge; it would not eliminate the discharge. EPA should work to discourage such a circumvention of zero-liquid discharge and take all available actions to eliminate the environmental risks associated therewith. This is especially important given that multiple downriver municipalities in New Hampshire and Massachusetts depend on the Merrimack for drinking water.

To prevent Merrimack Station from sending FGD wastewater to POTWs that cannot treat the toxic pollutants in the FGD wastewater, EPA should take actions regarding both Merrimack Station's NPDES permit and the POTWs' NPDES permits. EPA should include a clause in the final Merrimack Station NPDES permit providing that EPA will reopen the permit to include the new pretreatment standards for FGD wastewater established by the forthcoming ELG rule. EPA should then reopen and revise Merrimack Station's NPDES permit as soon as the new pretreatment standards for FGD wastewater are finalized. In addition, EPA should require PSNH to submit to EPA Region 1 a report at the end of each month providing detailed information on any FGD wastewater sent to a POTW for treatment, including the name and location of the receiving POTW, the amount and pollutant characteristics of the wastewater, and such other information as is necessary.

In addition, EPA should also take actions relating to the POTWs' NPDES permits to address this problem. First, EPA should determine whether the POTWs receiving FGD wastewater from the Merrimack Station are violating their NPDES permits by doing so (and should immediately inform the POTW operators of its intent to undertake this determination). Between 2012 and 2014, Merrimack Station sent FGD wastewater to 5 POTWs: S. Portland, Attleboro, Lowell, Hooksett, and Franklin. Fact Sheet at 24-25. As the table below indicates, it is our understanding that EPA Region 1 is the permitting authority for all of these facilities except the S. Portland POTW.

Table 1. POTWs that Receive FGD Wastewater from Merrimack Station and Have NPDES Permits Issued by EPA Region 1

POTW	NPDES Permit Date	Permit Number	Expired?
Attleboro	6/9/2008	MA0100595	Yes
Franklin	6/19/2009	NH0100960	Yes
Hooksett	8/5/2013	NH0100129	No
Lowell	9/1/2005	MA0100633	Yes

As the agency that issued the NPDES permits for these facilities, EPA should determine whether receiving Merrimack Station's FGD wastewater results in a violation of any permit terms, such as terms prohibiting the pass through of pollutants and/or prohibitions on the discharge of toxic amounts of pollutants or toxic components that will result in demonstrable harm to aquatic life. EPA should also investigate whether the POTWs are complying with any reporting requirements that may be triggered by the receipt of FGD wastewater from Merrimack Station, such as requirements to inform EPA Region 1 when new pollutants are introduced from an indirect discharger or when there is a substantial change in the pollutants introduced to the POTW.

Second, if EPA concludes that the current NPDES permits for these POTWs do not include terms that adequately address the receipt and discharge of FGD wastewater, then EPA Region 1 should modify the permits for these 4 POTWs and include new permit conditions to prohibit or adequately treat FGD wastewater from Merrimack Station. 40 C.F.R. § 122.63(a)(2) authorizes EPA to modify a NPDES permit under the following circumstances:

> Information. The Director has received new information. Permits may be modified during their terms for this cause only if the information was not available at the time of permit issuance (other than revised regulations, guidance, or test methods) and would have justified the application of different permit conditions at the time of issuance.

The NPDES permits for the Attleboro, Franklin, and Lowell POTWs were issued prior to 2012, when the Merrimack scrubber came online and began generating scrubber wastewater, and when Merrimack began sending this wastewater to POTWs. All of the information in the record regarding shipments of FGD wastewater from Merrimack to these 3 POTWs constitutes information "not available at the time of permit issuance," 40 C.F.R. § 122.63(a)(2), since the POTW permits were issued before the scrubber wastewater was generated and shipped to the POTWs. Additionally, EPA states in the Fact Sheet that it believes that limits may be needed because the POTWs are not designed to adequately treat the toxic metals in the FGD wastewater, and thus the information "would have justified the application of different permit conditions," id., namely, limits on receiving FGD wastewater.

Third, EPA should insist that each POTW that has received FGD wastewater from Merrimack Station revise its local pretreatment standards to prohibit Merrimack Station from sending FGD wastewater to the POTW. POTWs must adopt local pretreatment requirements to address local conditions and submit the plan for approval by the relevant permitting authority. See 40 C.F.R. § 403.8. The POTW is required to issue a permit, or the equivalent of a permit, to each industrial source discharging to the POTW. EPA should follow through on its suggestion, Fact Sheet at 49, of using local pretreatment standards to address the indirect discharge of FGD wastewater, which contains dangerous toxic pollutants that cannot be adequately treated by POTWs. As noted above, EPA has already found, in the proposed ELG rule, that toxic pollutants in FGD wastewater (including arsenic, mercury, and selenium) pass through POTWs in the absence of effective pretreatment, see 78 Fed. Reg. at 34,477, and EPA must not allow POTWs to continue to discharge Merrimack's FGD wastewater without adequate treatment or in a manner that causes or contributes to a violation of state water quality standards. EPA should make it clear in the Fact Sheet for this permitting action that the measures relating to POTWs described above will apply to any POTW that has not yet received indirect discharges from Merrimack Station may receive such discharges in the future.

Finally, EPA should urge the State of Maine to take similar actions regarding the S. Portland POTW, namely: investigate whether receiving FGD wastewater from Merrimack Station violated any terms of the existing NPDES permit; revise the NPDES permit to include permit terms to prohibit receiving FGD wastewater if such terms do not exist in the current permit;

require the S. Portland POTW to revise its local pretreatment standards, and include such revised conditions in any permit or similar document that the POTW has issued to PSNH. EPA should also ensure that Maine, and other states in New England, take these actions regarding any POTWs that receive FGD wastewater from Merrimack Station in the future.

Comment VIII.2.4	**AR-1232, Lowell Regional Wastewater Utility, pp. 1-3**

Comment: Lowell Regional Wastewater Utility (LRWWU) owns and operates Duck Island Wastewater Treatment Facility (WWTF), a municipal sewage treatment plant that accepts domestic, commercial, and industrial wastewaters from Lowell and its four surrounding towns. The Duck Island WWTF also accepts domestic and commercial septage, as well as industrial hauled waste, including FGD wastewater from Merrimack Station….

LRWWU's NPDES Permit Compliance

Environmental Organizations: "*EPA should determine whether the POTWs receiving FGD wastewater from the Merrimack Station are violating their NPDES permits by doing so….*"

LRWWU: LRWWU has not violated its NPDES permit as a result of accepting FGD hauled wastewater from Merrimack Station. LRWWU takes seriously its responsibility to meet NPDES permit conditions and protect water quality in the Merrimack River. We would not accept this wastewater if it jeopardized our compliance and the river's health.

LRWWU's Pretreatment Standards

Environmental Organizations: "*EPA should insist that each POTW that has received FGD wastewater from Merrimack Station revise its local pretreatment standards to prohibit Merrimack Station from sending FGD wastewater to the POTW.*"

LRWWU: LRWWU's Industrial Pretreatment Program (IPP), and EPA-approved program, monitors and regulates all significant industrial discharges to the Duck Island WWTF, including the FGD wastewater from Merrimack Station. The purpose of LRWWU's IPP is to prevent pass-through and the interference at the Duck Island WWTF. Pass-through refers to a receiving stream discharge containing constituents that violate NPDES permit conditions. Interference refers to constituents in wastewater or sludge that disrupt the wastewater treatment process or wastewater sludge disposal. Please refer to excerpts below from Part 40 of the Code of Federal Regulation (CFR) for definitions of pass-through and interference.

It is important to recognize that the **presence** of trace metallic ions in wastewater, receiving stream discharges, or wastewater sludges does not necessarily constitute "pass-through" or "interference." In order for pass-through or interference to occur, the "**quantity or concentration**" of a particular constituent must be great enough to cause a permit violation, a process upset, or a restriction in the use of sludge. LRWWU's IPP consistently achieves its objectives of protecting the Duck Island WWTF, the Merrimack River, and the environment form pass-through and interference.

Definitions:

"**Pass-through**" is defined in 40 CFR 403.3(p) as "*a discharge which exits the POTW into waters of the United States in quantities or concentrations which, alone or in conjunction with a discharge or discharges from other sources, is a cause of a violation of any requirement of the POTW's NPDES permit (including an increase in the magnitude or duration of a violation).*"

"**Interference**" is defined in 40 CFR 403.3(k) as "*a discharge which, alone or in conjunction with a discharge or discharges from other sources, both: (1) inhibits or disrupts the POTW, its treatment processes or operations, or its sludge processes, use or disposal; and (2) therefore is a cause of a violation of any requirement of the POTW's NPDES permit (including an increase in the magnitude or duration of a violation) or of the prevention of sewage sludge use or disposal…*"

Presence of Pollutants in FGD Wastewater

Environmental Organizations: "*EPA notes that a number of toxic pollutants including persistent, bioaccumulative toxins, are present in FGD wastewater….*"

LRWWU: Over the past three years, LRWWU has periodically analyzed the FGD wastewater that it has accepted from Merrimack Station. Analytical data indicated the presence of trace concentrations of dissolved metals, and nothing else of concern. The metallic concentrations are always less than one part per million (ppm), often a tiny fraction of a single ppm. Trace levels of dissolved metal are common in many liquid wastes, including domestic and commercial sewage.

The presence of low concentrations of dissolved metals does not necessarily represent a threat to human health or the environment. The bio-toxicity of dissolved metals is dependent upon may factors, all of which are considered when water quality and sludge standards are developed. These conservative federal and state standards limit the amount of dissolved metals that can be accepted into the Duck Island WWTF and discharged to the Merrimack River. In all cases, LRWWU complies with these environmental standards.

Fate of Pollutants in FGD Wastewater

Environmental Organizations: "*EPA notes…that POTWs are not designed to remove the toxic pollutants present in FGD wastewater from Merrimack, such as Mercury and Selenium… These constituents are generally expected to pass through a typical municipal sewage treatment plant.*"

LRWWU: The Duck Island WWTF is not specifically designed to remove trace amounts of Mercury, Selenium, or other dissolved metallic ions that are typically found in domestic, commercial, and industrial wastewaters. At the concentration levels found in Duck Island's waste streams, metal ions either remain dissolved in the water phase or partition into wastewater sludge (solids). Dissolved metallic ions are discharged to the Merrimack River, while those that aggregate in wastewater sludge are disposed with the sludge.

Because many of the dissolved metallic concentrations found in wastewater are near or below detection limits, the removal efficiencies often cannot be calculated. In these instances, literature values for typical removal efficiencies are utilized. The 2004 EPA Local Limits Development Guidance Appendices (Appendix R, Page 2) list median removal efficiencies for Mercury (60%) and Selenium (50%). These literature values indicate that roughly half of the trace amounts of these two metals are discharged to a receiving stream, and the other half are disposed in wastewater sludge.

Revision of LRWWU's NPDES Permit

Environmental Organizations: "*EPA should issue a final NPDES permit for Merrimack Station that …revises that NPDES permit for each POTW receiving FGD wastewater from Merrimack, if the existing permit does not adequately address FGD wastewater.*"

LRWWU: LRWWU's NPDES permit should not be revised to address FGD wastewater because LRWWU properly manages this waste stream through the implementation of its IPP. The presence of trace concentrations of dissolved metallic ions in FGD wastewater, the non-detectable or barely-detectable concentrations levels of these metallic ions in LRWWU's Duck Island WWTF influent and effluent, and LRWWU's consistent compliance with pretreatment standards indicate that LRWWU's NPDES permit adequately addresses FGD wastewater.

LRWWU's Acceptance of FGD Wastewater

Environmental Organizations: "*EPA must not allow POTWs to continue to discharge Merrimack's FGD wastewater without adequate treatment or in a manner that causes or contributes to a violation of state water quality standards*."

LRWWU: LRWWU's is meeting all of the conditions of its NPDES permit and is properly managing its IPP. Therefore, LRWWU should be allowed to continue receiving FGD wastewater from Merrimack Station.

Comment VIII.2.5	**AR-1231, PSNH, p. 20**

Comment*:* ***The ESIGs' Comments and Justifications Seeking to Compel EPA to Prohibit Continued Shipments of FGD Waste Water to POTWs as a Compliance Option for Merrimack Station are Wrong***

The [(Earthjustice, Environmental Integrity Project, Sierra Club, and the Conservation Law Foundation) (collectively, the "Environmental Special Interest Groups" or "ESIGs")] ESIGs lack a basic understanding of POTW operations and the NPDES permits these facilities possess. The entirety of the ESIGs' comments suggest actions that either already have been undertaken by the various POTWs accepting waste water from PSNH or are outside the scope of EPA's regulatory authority. PSNH's consultant, GZA GeoEnvironmental, Inc. ("GZA"), addressed and responded to each of the ESIGs' POTW comments.[13] GZA's comments, along with the October 20, 2014 comments Lowell Regional Wastewater Utility ("LRWWU") filed with EPA, invalidate each of the ESIGs' comments on this topic and prove that the ESIGs' comments should be disregarded by EPA in this permit renewal proceeding.

[13] GZA's comments, entitled "Response Comments to August 14, 2014 Letter from Conservation Law Foundation/Earthjustice/Environmental Integrity Project/Sierra Club to USEPA Region 1" (October 2014), are attached hereto as Exhibit 2. [see below]

Comment VIII.2.6	**AR-1231, PSNH, Exhibit 2 from GZA - in response to ESIG ("Environmental Organizations") comments, specifically those italicized and underlined**

Environmental Organizations: Page 7, First Paragraph

> **EPA Should Use Its Authority to Prevent Negative Water Quality Impacts from Merrimack Discharging Its FGD Wastewater to POTWs that are Not Equipped to Handle Such Wastewater**
>
> EPA's fact sheet states that PSNH could circumvent a zero-liquid discharge standard for its FGD wastewater by not operating the VCE and crystallizer system but instead sending the FGD wastewater to a local publicly owned treatment works. Fact Sheet at 49. *PSNH itself acknowledges that POTWs are not designed to remove the toxic pollutants present in FGD wastewater from Merrimack, such as mercury and selenium. 2011 Draft Permit, Attachment E at 14. Moreover, EPA notes that a number of toxic pollutants including persistent, bioaccumulative toxins, are present in FGD wastewater and will not be treated effectively in a POTW. Fact Sheet at 49 ("It is unclear whether these pollutants receive any treatment at the POTWs. These constituents are generally expected to pass through a typical municipal sewage treatment plant.").* EPA has proposed to address this regulatory gap in the proposed ELG rule, but in the meantime there are currently no pretreatment standards for many of the pollutants present in the FGD wastewater from Merrimack. See 78 Fed. Reg. at 34,477 (noting that "all of the pollutants proposed for regulation under BAT/NSPS pass through," including arsenic, mercury, and selenium).

PSNH/GZA: Merrimack Station's treated FGD wastewater contains concentrations of certain pollutants of concern (POCs) (e.g., arsenic, mercury, and selenium) at levels in the parts per billion and parts per trillion range. These levels are one and two orders of magnitude less than typical concentrations of pollutants common to treated wastewater from significant industrials users (SIUs), such as metal finishers, medical laboratories, hospitals, textiles, electronics, industrial launderers, etc. POTWs have the ability to remove a variety of pollutants including nonconservative (e.g., BOD, TSS, oil & grease) and conservative (e.g., metals) pollutants. Common biological and physical processes employed by POTWs have the ability to remove most pollutants, in particular arsenic, mercury, and selenium. Based on published removal rates (EPA Guidance for Local Limits Development Document - July 2004), removal rates for these three metals typically range from 45% to 60% in POTWs. Biological treatment processes tend to assimilate metals in the biomass and/or convert dissolved metals to insoluble chemical forms that are subsequently removed through physical gravity settling processes inherent to all municipal treatment facilities.

These removal capabilities represent one critical input in a POTW's approach to determining the Maximum Allowable Headworks Loading (MAHL) for its particular treatment process. It is a fundamentally and universally accepted fact that all POTWs remove a significant percentage of pollutants contributed by non-domestic sources. In particular, all toxic metals of concern are removed generally in a range of 30% to 70% at POTWs.

In October 2010, PSNH provided comments to EPA setting out a BAT analysis for the treatment of FGD wastewaters at Merrimack Station. A comment suggesting that publicly owned treatment works (POTWs) are not designed to remove toxic pollutants present in FGD wastewater from Merrimack Station was included in the record. This assertion was included to highlight the fact that the primary wastewater treatment system designed specifically for the treatment of FGD wastewaters would achieve better pollutant removals than POTWs. POTWs do provide incremental removal of already very low levels of metals. Merrimack Station's primary treatment system provides a higher removal rate of pollutants, but PSNH acknowledges that additional treatment is provided through the POTW treatment process despite the fact that the effluent from the primary wastewater treatment system already complies with water quality standards in the Merrimack River at Merrimack Station.

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> To prevent Merrimack Station from sending FGD wastewater to POTWs that cannot treat the toxic pollutants in the FGD wastewater, *EPA should take actions regarding both Merrimack Station's NPDES permit and the POTWs' NPDES permits*. EPA should include a clause in the final Merrimack Station NPDES permit providing that EPA will reopen the permit to include the new pretreatment standards for FGD wastewater established by the forthcoming ELG rule. EPA should then reopen and revise Merrimack Station's NPDES permit as soon as the new pretreatment standards for FGD wastewater are finalized. In addition, EPA should require PSNH to submit to EPA Region 1 a report at the end of each month providing detailed information on any FGD wastewater sent to a POTW for treatment, including the name and location of the receiving POTW, the amount and pollutant characteristics of the wastewater, and such other information as is necessary.

PSNH/GZA: Action on the part of EPA, such as amending the NPDES permits of Merrimack Station and/or the various POTWs, to prevent treated FGD wastewater from being managed at local POTWs is unwarranted and would lead to further incongruent standards for the steam electric generating industry compared to other industrial dischargers. The concentrations and mass of POCs in Merrimack Station's treated FGD wastewater are extremely miniscule and insignificant. A comparison of wastewaters received from other typical, non-domestic and domestic sources further illustrates this fact. For example, the average concentration of common metals in domestic septage is similar or greater than treated FGD wastewater generated at Merrimack Station. The average concentration of arsenic is typically in the range of 0.17 mg/1 in septage[1] compared to values typically below 0.03 mg/1 in treated FGD wastewater. Considering the removal efficiencies typically achieved at POTWs, the resulting mass of pollutants in the POTW's effluent attributable to Merrimack Station's treated discharge is insignificant.

The following sections address and disprove the purported "actions" the Environmental Organizations assert EPA should carry out to further regulate PSNH's FGD waste stream.

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Environmental Organizations: Page 8, Second Paragraph

> In addition, EPA should also take actions relating to the POTWs' NPDES permits to address this problem. *First, EPA should determine whether the POTWs receiving FGD wastewater from the Merrimack Station are violating their NPDES permits by doing so (and should immediately inform the POTW operators of its intent to undertake this determination). Between 2012 and 2014, Merrimack Station sent FGD wastewater to 5 POTWs: S. Portland, Attleboro, Lowell, Hooksett, and Franklin.* Fact Sheet at 24-25. As the table below indicates, it is our understanding that EPA Region 1 is the permitting authority for all of these facilities except the S. Portland POTW.
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> **Table 1. POTWs that Receive FGD Wastewater from Merrimack Station and Have NPDES Permits Issued by EPA Region 1**

POTW	NPDES Permit Date	Permit Number	Expired?
Attleboro	6/9/2008	MA0100595	Yes
Franklin	6/19/2009	NH0100960	Yes
Hooksett	8/5/2013	NH0100129	No
Lowell	9/1/2005	MA0100633	Yes

> As the agency that issued the NPDES permits for these facilities, EPA should determine whether receiving Merrimack Station's FGD wastewater results in a violation of any permit terms, such as terms prohibiting the pass through of pollutants and/or prohibitions on the discharge of toxic amounts of pollutants or toxic components that will result in demonstrable harm to aquatic life. EPA should also investigate whether the POTWs are complying with any reporting requirements that may be triggered by the receipt of FGD wastewater from Merrimack Station, such as requirements to inform EPA Region 1 when new pollutants are introduced from an indirect discharger or when there is a substantial change in the pollutants introduced to the POTW.

PSNH/GZA: Contrary to the tone of, and requests for action within, the Environmental Organizations' comments, PSNH did not carelessly decide to transport FGD wastewater to POTWs, nor did the POTWs unsystematically accept the wastewater from Merrimack Station. Instead, PSNH and the various POTWs accepting FGD wastewater from Merrimack Station collaborated extensively to determine the best and most reasonable concept of transporting and managing treated FGD wastewater to ensure that no environmental criteria was being or would be exceeded. This analysis specifically included evaluations to verify that pass-through, inhibition, and/or interference violations would not likely occur. There is no legitimate challenge that can be advanced with respect to this issue.

It is not customary, nor is it necessary, for EPA to determine whether POTWs receiving treated FGD wastewater are violating their permits. NPDES permits issued by POTWs include a general condition that requires POTWs to determine what types and quantities of pollutants they can accept without causing environmental impact (i.e., pass-through, inhibition, and interference). POTWs with SIUs are required to develop scientifically-derived and legally defensive local limits using EPA-approved protocols (i.e., modeling pollutant impacts to a variety of performance, sludge management, and pass-through criteria). The fundamental principle associated with this approach dictates that the local limits derived from this process ensure that the POTW's discharge has no significant impact on the environment. The process for establishing local limits is described with greater specificity in the next section.

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> *Second, if EPA concludes that the current NPDES permits for these POTWs do not include terms that adequately address the receipt and discharge of FGD wastewater, then EPA Region 1 should modify the permits for these 4 POTWs and include new permit conditions to prohibit or adequately treat FGD wastewater from Merrimack Station.* 40 C.F.R. § 122.63(a)(2) authorizes EPA to modify a NPDES permit under the following circumstances:

PSNH/GZA: No such action on the part of EPA is necessary. All NPDES permits (individual and general) issued to the POTWs contain conditions that ensure that each POTW evaluate its ability to control all sources of wastewater contributed to their system. There is a prescribed and uniform methodology for POTWs to follow to detemine the need and extent of controls for non-domestic (i.e., industrial) wastewater sources. The approach involves the development of an Industrial Pretreatment Program, including local limits. The permits issued to POTWs do not include specific terms that address the receipt of certain non-domestic wastewater sources. Rather, the NPDES permits mandate that the POTW assess their ability to accept non-domestic wastewater based on a prescribed methodology, as generally described below:

• EPA recommends that POTWs base their local limits on the maximum allowable headworks loading (MAHL)[2] calculated for each POC. A pollutant's MAHL is determined by first calculating its allowable headworks loading (AHL)[3] for each environmental criterion; the most stringent AHL would be the MAHL.

• The MAHL approach enables POTW s to calculate local limits taking into account the portion of the MAHL that is readily controllable (i.e., from industrial users (IUs)) and the portion that is not as easy to control (i.e., from domestic sources and background concentrations). The maximum allowable industrial loading (MAIL) is the portion of the MAHL available to IUs. It is based on sampling data from the collection system and at the POTW. Local limits are based on the allocation of MAILs as uniform concentrations that apply to all IUs, as mass allocations provided individually to each IU, or some combination of the two options.

• Calculating MAHLs is not the appropriate method to evaluate all pollutants. Pollutants may create collection system conditions that can be harmful to workers such as fires, explosions, corrosion, flow obstructions, high temperature, and toxic fumes. To address these issues, EPA recommends that POTWs consider various options. Developing and implementing local limits with the MAHL approach requires the following five basic steps:

1. Determine the POCs[4]
2. Collect and analyze data
3. Calculate MAHLs for each POC
4. Designate and implement the local limits
5. Address collection system concerns

It is evident from some comments that there is a poor understanding of the Industrial Pretreatment Program mechanics. The local limits established by the POTW based on system specific criteria apply to all discharges. That is, separate local limits cannot be established for individual users.

The POTWs that have evaluated the acceptance of treated FGD wastewater have completed analysis that demonstrates compliance with all environmental criteria including protection of water quality standards.

Environmental Organizations: Page 9, Third Paragraph

> The NPDES permits for the Attleboro, Franklin, and Lowell POTWs were issued prior to 2012, when the Merrimack scrubber came online and began generating scrubber wastewater, and when Merrimack began sending this wastewater to POTWs. *All of the information in the record regarding shipments of FGD wastewater from Merrimack to these 3 POTWs constitutes information "not available at the time of permit issuance," 40 C.F.R. § 122.63(a)(2), since the POTW permits were issued before the scrubber wastewater was generated and shipped to the POTWs*. Additionally, EPA states in the Fact Sheet that it believes that *limits may be needed because the POTWs are not designed to adequately treat the toxic metals in the FGD wastewater, and thus the information "would have justified the application of different permit conditions,*" id., namely, limits on receiving FGD wastewater.

PSNH/GZA: Treated FGD wastewater from Merrimack Station contains extremely low levels of POCs, specifically arsenic, mercury, and selenium. Typical industrial users contribute POCs in the milligram per liter (parts per million) range while treated Merrimack Station FGD wastewater typically exhibits pollutants in the microgram per liter (parts per billion) and nanograms per liter (parts per trillion) range. POCs at these concentrations and associated low masses (pounds per day) contribute insignificantly to the MAIL of a typical POTW.

For example, Merrimack Station has an agreement in place with the Lowell Regional Wastewater Utility (LRWWU) to accept treated FGD wastewater. Working cooperatively with LRWWU, PSNH determined (i.e., self-certified) that the POCs in its hauled waste stream did include arsenic and mercury.[5] Lowell conducts extensive monitoring to determine all of its POCs and its ability to accept the maximum quantities of these pollutants on a daily basis. These monitoring data are then input into a model that calculates MAHLs and MAILs. Subtracting out the "uncontrolled" domestic contribution, it results in an allowable loading rate for all other nondomestic wastewater source. To illustrate the relatively low levels of POCs contributed by PSNH's treated waste stream, contributions to the LRWWU of hauled waste from Merrimack Station was generally less than 1% of capacity for arsenic and mercury. Specifically, arsenic and mercury have been less than 0.6% and 0.08% of the MAIL, respectively, as conservatively calculated for these two POCs. Merrimack Station's impact to the LRWWU is insignificant with respect to the facility's capacity and ability to manage treated FGD wastewater and ensure that pass-through, inhibition, and interference does not occur.

Persons knowledgeable with the Industrial Pretreatment Program process recognize that introducing a different waste stream does not constitute "new knowledge," but simply requires a revised assessment to determine impacts (if any) to the system and to determine if revised local limits are necessary. To complete this assessment, Lowell has established a comprehensive internal monitoring program that has produced a representative and statistically valid database that determines the significance or insignificance of industrial wastewater contributions. In the case of Merrimack Station and its FGD wastewater, impacts to POTW operations and local limits were determined to be negligible.

Environmental Organizations: Page 9, Fourth Paragraph

> Third, EPA should insist that each POTW that has received FGD wastewater from Merrimack Station *revise its local pretreatment standards* to prohibit Merrimack Station from sending FGD wastewater to the POTW. POTWs must adopt local pretreatment requirements to address local conditions and submit the plan for approval by the relevant permitting authority. See 40 C.F.R. § 403.8. The POTW is required to issue a permit, or the equivalent of a permit, to each industrial source discharging to the POTW. EPA should follow through on its suggestion, Fact Sheet at 49, of using local pretreatment standards to address the indirect discharge of FGD wastewater, which contains dangerous toxic pollutants that cannot be adequately treated by POTWs. As noted above, EPA has already found, in the proposed ELG rule, that toxic pollutants in FGD wastewater (including arsenic, mercury, and selenium) *pass through POTWs in the absence of effective pretreatment*, see 78 Fed. Reg. at 34,477, and EPA must not allow POTWs to continue to discharge Merrimack's FGD wastewater without adequate treatment or in a manner that causes or contributes to a violation of state water quality standards. EPA should make it clear in the Fact Sheet for this permitting action that the measures relating to POTWs

PSNH/GZA: Based upon the determinations and analyses described above, there is definitely no legal requirement, nor is there any material reason, for any POTW to revise its Industrial Pretreatment Program to accommodate treated industrial wastewater from Merrimack Station, or for that matter, from another IU. As requested by the Environmental Organizations, and in accordance with applicable regulations and the requirements of their respective NPDES permits, each POTW has already: (1) established any local limits necessary for POCs; (2) issued a permit (or equivalent) to Merrimack Station after evaluating its proposed FGD waste stream; and (3) determined the quality of the treated wastewater from Merrimack Station to be in full compliance with all applicable rules and regulations.

From 40 CFR 403.03, "(T)he term Pass Through means a Discharge which exits the POTW into waters of the United States in quantities or concentrations which, alone or in conjunction with a discharge or discharges from other sources, is a cause of a violation of any requirement of the POTW's NPDES permit (including an increase in the magnitude or duration of a violation)." Analyses performed by the POTWs demonstrate that the concentrations and mass of pollutants in treated FGD wastewater will not result in pass through where permits have been issued referencing EPA's definition and standard practices.

Environmental Organizations: Page 10, First Paragraph

> Finally, EPA should urge the State of Maine to take similar actions regarding the *S. Portland POTW*, namely: investigate whether receiving FGD wastewater from Merrimack Station violated any terms of the existing NPDES permit; revise the NPDES permit to include permit terms to prohibit receiving FGD wastewater if such terms do not exist in the current permit; require the S. Portland POTW to revise its local pretreatment standards, and include such revised conditions in any permit or similar document that the POTW has issued to PSNH. EPA should also ensure that Maine, and other states in New England, take these actions regarding any POTWs that receive FGD wastewater from Merrimack Station in the future.

PSNH/GZA: Similar to the State of New Hampshire and Commonwealth of Massachusetts, EPA and the State of Maine likely see no reasonable basis for deviating from EPA's established guidance regarding the development of an Industrial Pretreatment Program and Local Limits for the reasons stated herein. As explained above, the agency's guidance and regulations already require POTWs to evaluate their ability to control all sources of wastewater contributed to their system through the calculation and utilization of MAHLs and MAILs. The actions proposed by the Environmental Organizations are superfluous.

[1] Septage data from Allenstown NH POTW (9/24/13) provided by NHDES

[2] A MAHL is the estimated maximum loading of a pollutant that can be received at a POTW's headworks without causing pass through or interference. It is the most protective (lowest) of AHLs (see definition) estimated for an individual pollutant.

[3] An AHL is the estimated maximum loading of a pollutant that can be received at a POTW's headworks that should not cause a POTW to violate a particular treatment plant or environmental criterion. AHLs are developed to prevent interference or pass through.

[4] A POC is any pollutant that might reasonably be expected to be discharged to the POTW in sufficient amounts to pass through or interfere with the works, contaminate its sludge, cause problems in its collection system, or jeopardize its workers.
[5] Selenium is not a POC in the LRWWU wastewater system because selenium is not introduced to the Lowell POTW in a mass quantity (or concentration) that meets the criteria of a POC. Selenium is typically measured at below detection limits at various points at the POTW including the headworks. Receipt of FGD wastewaters from Merrimack Station has not impacted this reality.

EPA's Response to Section VIII.2:

As explained in Section 1 of Chapter VIII above, the New Hampshire legislature enacted RSA 125-0:11-18 in 2006, which required PSNH to install and operate a wet flue gas desulfurization (FGD) system at Merrimack Station to reduce air emissions of mercury and other pollutants. The scrubber was installed and placed into service in September 2011. The former owner of Merrimack Station, PSNH, reported that the scrubber system reduces mercury emissions by approximately 95 percent. *See* AR-1215, p. 10. However, by operating the FGD scrubber to remove pollutants from the flue gas, it also generates wastewater containing the pollutants removed from those emissions. PSNH installed a two-step treatment process to remove those pollutants.

The first step occurs within the Station's primary treatment system where chemicals are added to bind much of the material waste and the resultant solids are physically removed. The wastewater is then passed through an Enhanced Mercury and Arsenic Removal System (EMARS), a proprietary technology designed to reduce mercury and arsenic levels beyond concentrations typically achieved with traditional physical/chemical treatment. Second, a vapor compression evaporation system (VCE) system consisting of a falling-film evaporator (or brine concentrator) and forced circulation crystallizers is used to remove the remaining liquid, resulting in solid waste that requires disposal. The system currently operates as a zero liquid discharge system; however, at times, the Station has needed to transport treated FGD wastewater to local publicly owned treatment works (POTWs) for disposal. PSNH has sent wastewater from its primary and secondary treatment systems to various POTWs in New Hampshire, Massachusetts and Maine. *See* 2014 Fact Sheet, pp. 23- 26. The Station has never directly discharged FGD wastewater into the Merrimack River, the discharge canal, or the slag settling pond, because it is not authorized to discharge FGD wastewater under its previous NPDES permit.

On March 25, 2020, the current owner of Merrimack Station, Granite Shore Power (GSP), submitted a letter formally withdrawing its request for authorization to discharge wastewater generated from its flue gas desulfurization (FGD) system. *See* AR-1690. See Chapter VIII.1 above for a complete discussion of this issue. Ultimately, the Final Permit, like the previous permit, does *not* authorize the Permittee to discharge FGD wastewater directly to the Merrimack River. GSP has indicated, however, that they have sent several shipments of FGD wastewater to the Lowell Regional Wastewater Utility—a municipal POTW in Lowell, Massachusetts, and the Allenstown Wastewater Treatment Facility in New Hampshire—over a period of several days in November 2018. Since GSP took ownership of the Station in late 2017, there have been no other FGD wastewater hauling events. While GSP explained that it does not intend to use this method of disposal on a routine basis, EPA acknowledges that it has the flexibility to do so in the future, so long as the facility meets any applicable pretreatment requirements. March 6, 2020 phone conversation notes between EPA and GSP (AR-1708).[6]

In the comments identified above (Comments VIII.2.1-.4), commenters expressed concern about potential adverse environmental impacts resulting from such shipment of FGD waste to nearby POTWs.[7] As a primary note, many of the issues raised in these comments were submitted prior to promulgation of the 2015 ELGs and are premised on the lack of national pretreatment standards for FGD wastewater. Since these comments were submitted, the 2015 Rule was finalized and included new pretreatment standards applicable to FGD wastewater. The presence of these new standards renders several of the issues not relevant.

With regard to comments related to the Lowell Regional Wastewater Utility (LRWWU, "Lowell POTW" or "the Utility"), this Utility presents a prime example of how the pretreatment program within the NPDES program functions and ensures that indirect discharges to POTWs are adequately managed. The NPDES permit for the LRWWU, issued September 25, 2019, requires the Utility to "implement the Industrial Pretreatment Program in accordance with the legal authorities, policies, procedures, and financial provisions described in the Permittee's approved Pretreatment Program, and the General Pretreatment Regulations, 40 CFR § 403" and that they "must assure that applicable National Categorical Pretreatment Standards are met by all categorical industrial users of the POTW. These standards are published in the Federal Regulations at 40 CFR § 405 et seq." Part 403, cited in the Lowell Final Permit, also requires that national categorical pretreatment standards be met, 40 CFR § 403.6, which would include the pretreatment standards for the Steam Electric Category promulgated as part of EPA's 2015 National Rulemaking. *See* 40 CFR § 423.16 (includes standards for FGD wastewater, among other wastestreams). As EPA stated in the 2015 Final Rule, "Pretreatment standards are self-implementing, meaning they apply directly, without the need for a permit. In this rule, the pretreatment standards for existing sources must be met by November 1, [2020]." 80 Fed. Reg. 67838, 67882 (Nov. 3, 2015); *see also* 40 CFR § 423.16(e).

Therefore, all POTW's that receive indirect discharges from a categorical industrial user like Merrimack Station, including the LRWWU, must assure that all wastewater meets the applicable National Categorical Pretreatment Standards. This means that the FGD wastewater trucked to the Lowell or other POTWs must meet the requirements of 40 CFR § 423.16(e) for existing sources, including limits on arsenic, mercury, selenium, and nitrate/nitrite as nitrogen beginning November 1, 2020. *Id.* And as EPA noted in its 2014 Fact Sheet,

> [p]rior to the applicability of the new categorical pretreatment standards, FGD wastewater delivered to a municipal sewage treatment plant would be subject to

[6] EPA also notes that with respect to hauling treated FGD wastewater to local POTWs in the State of New Hampshire, Merrimack Station was authorized by NHDES to take such actions via a series of Industrial Wastewater Indirect Discharge Request Approvals in August of 2011. See AR-946.

[7] Other comments received indirectly related to Merrimack Station's practice of occasionally hauling FGD wastewater to local POTWs. *See, e.g.,* Comments from PSNH and UWAG. These other comments are either 1) adequately addressed through EPA's response herein or 2) no longer relevant because they focused on the issue of whether FGD discharges would be authorized under the NPDES permit and the associated BAT limits. To the extent that the other comments relate primarily to the authorization of FGD discharges, they are no longer relevant to this permit proceeding. See Chapter VIII.1 above.

> local pretreatment program requirements, including any local limits developed to prevent pass through of, and/or interference with, the treatment plant. *See* 40 C.F.R. § 403.5(c); 78 Fed. Reg. 34460, 34543.

2014 Fact Sheet, p. 49 n.37 (AR-1135). Of course, all POTWs that discharge into a surface water are required to meet all state and federal requirements, including satisfying water-quality standards.