ENVIRONMENTAL APPEALS BOARD
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C.

In re: Mirant Kendall, LLC **Mirant Kendall Station**	)	**NPDES 06-12**
NPDES Permit No. MA0004898	)	

MIRANT KENDALL'S SUPPLEMENTAL PETITION FOR REVIEW

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I. Introduction and Overview of Supplemental Petition

Mirant Kendall, LLC, petitions for a hard, searching review of a NPDES renewal permit issued by EPA Region 1 for the Mirant Kendall Station on the Charles River in Cambridge, Massachusetts. Region 1 (the "Region") has abused the permit renewal process and relied on slanted and incorrect interpretations of the record to issue permit terms that are insupportable upon fair consideration of the record. The Region has committed numerous clear errors of law, fact, science, discretion and policy.

Mirant Kendall puts this request forth so strongly for two basic reasons. First, Mirant Kendall's existence depends on this Board's review. The Region does not dispute and the record attests that this NPDES renewal permit would reduce the Station's previously authorized thermal discharges and would force major curtailments of the Station's operations. The consequent, severe revenue reductions would threaten a permanent shutdown as well as contribute significantly to New England's electricity reliability problem.

Second, Mirant Kendall proposed and the record supports alternative permit conditions - including use of a diffuser outfall for a portion of the discharge - that would greatly improve aquatic habitat in the lower Charles River basin and substantially reduce the frequency of elevated in-stream temperatures and the associated curtailments forced by the renewal permit. The Region has not rejected the diffuser, but deferred a decision for arbitrary and irrational reasons.

The Board now has the opportunity and the duty to provide a fresh look, unbiased by the Region's commendable but overreaching Clean Charles program. The Board

should remand this permit proceeding to the Region with instructions to correct its errors and to issue a lawful and appropriate NPDES permit.

A. The Permit And Related Proceedings

1. Issuance of The Permit and Related Determinations

a. NPDES Renewal Permit and 1988 NPDES Permit

Region 1 of the U.S. Environmental Protection Agency (the "Region") issued NPDES Permit No. MA0004898 (the "NPDES renewal permit")[1] on September 26, 2006 as the renewal of a NPDES permit last issued by the Region on August 17, 1988 (the "1988 NPDES permit").[2] The 1988 NPDES permit was administratively continued after the expiration of its original, five-year term. As this appeal has stayed the effect of the NDPES renewal permit, the 1988 NPDES permit continues in full effect to this date.[3]

b. MassDEP Renewal Permit

The NPDES renewal permit was jointly and concurrently issued by the Massachusetts Department of Environmental Protection ("MassDEP") as the renewal of a state surface water discharge permit under the Massachusetts Clean Waters Act, M.G.L. c.21, §§ 26-53. By agreement between Mirant Kendall and MassDEP, the NPDES renewal permit also is entirely stayed and the 1988 NPDES permit also remains in full effect to the extent that they are state permits.

c. Mass DEP WQC and MCZM Conditional Concurrence

The Region's issuance of the NPDES renewal permit was preceded by and is dependent on (1) a Water Quality Certification issued by MassDEP on September 13, 2006 (the "MassDEP WQC")[4] pursuant to § 401 of the Clean Water Act, and (2) a conditional concurrence ("MCZM's conditional concurrence")[5] issued on September 15,

2006 by the Massachusetts Office of Coastal Zone Management ("MCZM") pursuant to the Coastal Zone Management Act.

2. **Mirant Kendall's Petition for Review and Supplemental Petition**

Petitioner Mirant Kendall, LLC ("Mirant Kendall") is the permittee under the NPDES renewal permit, and as a successor to rights of the Cambridge Electric Light Company, under the 1988 NPDES permit.

On October 30, 2006, Mirant Kendall timely filed a petition for review of the NPDES renewal permit. Mirant Kendall and the Region concurrently filed a joint scheduling motion which the Board granted by an order issued on November 22, 2006. By that order the Board granted leave for Mirant Kendall to file this supplemental petition.

3. **Related Proceedings**

a. MassDEP Adjudicatory Hearings

Mirant Kendall also has filed two administrative appeals that are currently pending at MassDEP's Office of Appeals and Dispute Resolution in a case pre-screening stage. First, on October 4, 2006 it filed a timely claim (MassDEP Docket No. 06-156) for an adjudicatory hearing on the MassDEP WQC. Second, on October 26, 2006 Mirant Kendall filed a timely claim (MassDEP Docket No. 06-165) for an adjudicatory hearing on the NPDES renewal permit to the extent that it is a surface water discharge permit under state law.

By operation of MassDEP's regulation at 310 C.M.R. 1.01(6)(h), the appeal in MassDEP Docket No. 06-165 currently is stayed pending resolution of Mirant Kendall's petition to this Board.[6] The hearing officer has also issued an order to show cause why

the appeal on the MassDEP WQC in MassDEP Docket No. 06-156 should not also be stayed pending resolution of Mirant Kendall's petition to this Board.[7] Mirant Kendall and MassDEP[8] both have filed responses to the order to show cause and a decision is pending.

b. MCZM's Conditional Concurrence

Mirant Kendall also filed a timely notice of appeal of MCZM's conditional concurrence with the Secretary of the U.S. Department of Commerce.[9] That appeal initially was not accepted because the Region had not compiled the consolidated administrative record for Mirant Kendall to file with its appeal to the Secretary of Commerce. The Secretary extended the time for filing that appeal to December 29, 2006, however, to accommodate the Region's delay.[10]

In the meantime MCZM issued correspondence on November 8 and November 22, 2006 which entirely superseded and replaced MCZM's conditional concurrence of September 15, 2006.[11] In consequence, Mirant Kendall determined not to refile its appeal of MCZM's conditional concurrence, but reserved its rights in all other proceedings to contest whether the Region issued the NPDES renewal permit in violation of the Coastal Zone Management Act and EPA's own regulations.[12]

c. Docket NPDES 06-13

The Conservation Law Foundation of New England, Inc. ("CLF") and the Charles River Watershed Association ("CRWA") have also filed a timely petition with the Board for review of the NPDES renewal permit, and by the order of the Board, were granted leave to file a supplemental petition in Docket NPDES 06-13.

B Outline of the Supplemental Petition

The purpose of this Supplemental Petition is to provide the Board with ample reason to grant review of the NPDES renewal permit and to order the Region to reconsider its decisions. After this introduction and an executive summary of the Supplemental Petition, a background section provides an overview to guide the Board's review of the protracted proceedings and extensive administrative record underlying the renewal permit. That section will:

(1) Summarize the history of the Mirant Kendall Station (the "plant" or the "Station"), the electric and steam generating plant located on the Charles River in Cambridge, Massachusetts that is covered by the permit under appeal;

(2) Describe the setting of the Station in the lower Charles River basin, including the effects on that basin of the dams and other impediments to attaining water quality standards in the basin;

(3) Describe the Region's Clean Charles 2005 initiative, including its incomplete efforts to develop a Total Maximum Daily Load designed to address eutrophication and nuisance algae in the basin (the "Nutrient TMDL");

(4) Describe Mirant Kendall's successful project from 1999 to 2002 to repower and upgrade the Station, which tripled its generating capacity while reducing allowable air emissions and without requiring any increase in authorized water withdrawals or thermal discharges;

(5) Describe Mirant Kendall's proposals, including the proposed diffuser outfall and the BTU Loading Approach, to reduce the thermal impacts of its cooling water discharge;

(6) Summarize the NPDES permit renewal process over the time period from 1998 to 2006, including the submission in February 2001 of Mirant Kendall's supplemental application to modify the NPDES permit, the extensive information exchanges from 1999 through 2003, the issuance of the draft NPDES renewal permit in June 2004, Mirant Kendall's and others' comments on the draft permit in October 2004, the Region's refusal to consult with Mirant Kendall about the terms of this final permit, and the issuance of the final permit on September 26, 2006; and

(7) Summarize the key requirements of the NPDES renewal permit, and how they will affect the ability of the Station to function and survive.

Following that background section and a summary of the Board's powers to review and order corrections to the permit, Mirant Kendall will present the issues which it believes the Board should review and which evidence clear errors of law, fact, policy, science or discretion.

C. Reservations Regarding Administrative Record

As of the date of this Supplemental Petition, the Region has not completed the compilation of the administrative record for the NPDES renewal permit. The portions of the record provided so far to Mirant Kendall, while very extensive, clearly evidence major omissions. For example, the index to the existing compilation omits Mirant Kendall's extensive comments dated October 14, 2004 on the draft NPDES renewal

permit; omits an information request sent by the Region under § 308 of the Clean Water Act on September 1, 2004 as well as Mirant Kendall's extensive responses dated October 29, 2004; and omits most of the materials from the Nutrient TMDL as they are pertinent to the NPDES renewal permit.

Mirant Kendall understands that the Region is obligated to complete and file the relevant portions of the administrative record with its response due by April 9, 2007 to the petitions for review filed by Mirant Kendall, CLF and CRWA.[13] Mirant Kendall will cooperate with the Region to assure that filing is fully adequate. To that end, during November, 2006 Mirant Kendall initiated requests to several federal and state agencies under the federal Freedom of Information Act or the Massachusetts Public Records Act in order to elicit records pertinent to the NPDES renewal permit proceedings.

Also, the incomplete state of the administrative record means that certain analyses contained within this Supplemental Petition are dependent on data which Mirant Kendall submitted to the Region as part of the NPDES permit renewal process, but which do not yet appear on the Region's index.[14] Mirant Kendall anticipates that all of those data submissions ultimately will appear in the record.

Mirant Kendall reserves all rights to urge the Region to include additional records into the administrative record, as pertinent, and to seek relief from the Board if the Region excludes records which are properly included. Further, Mirant Kendall reserves all rights to provide further support for its initial petition and this Supplemental Petition based on any additional records that emerge as the Region completes the compilation of the administrative record and as the Region and other agencies respond to Mirant Kendall's pending requests.

D. Reservations Regarding Replies, Briefing, and Oral Argument

Mirant Kendall reserves all rights to seek the Board's leave to reply to the Region's forthcoming responses to the supplemental petitions by Mirant Kendall, CLF and CRWA. Mirant Kendall also reserves all rights to seek the Board's leave to respond to the initial and supplemental petitions of CLF and CRWA, to file briefs regarding any issue, and to present oral argument.

II. Executive Summary

The NPDES renewal proceeding for Mirant Kendall's generating station on the Charles River in Cambridge, Massachusetts has been extraordinarily long and complex. Both Mirant Kendall and the Region expended enormous time on the process and explored many difficult issues as they arose in the very complicated and intensely valued context of the lower Charles River basin.

The resulting permit issued by the Region is commensurately long and complex. Indeed, experienced hands both inside and outside the Region concur they have never seen anything like it. The incredibly detailed zone of passage and habitat and the seasonal temperature limitations set out in Attachment A to the renewal permit - in-stream temperature standards applicable for as few as four days and taken to the tenth of a degree! - leapfrog to an extreme new plane of NPDES permitting methods.

That feat and the lengthy deliberations, however, do not mean the permit is free from clear errors. This Supplemental Petition shows that the Region committed clear errors on multiple fronts. In broadest summary:

- The Region improperly curtailed substantive interactions with Mirant Kendall and made critical determinations after the close of the comment period without providing Mirant Kendall or the public with the opportunity to comment.
- The Region made selective use of unrepresentative data to make determinations contradictory to the significantly more representative evidence in the record.
- The Region's in-stream compliance scheme is unnecessary and is grossly overbroad in relationship to the objectives it seeks to achieve, and that overbreadth would force crippling and unnecessary curtailments of the Stations' operations.
- The Region improperly rejected numerous efforts by Mirant Kendall to develop alternatives and in doing so, improperly rejected the use of a diffuser outfall that would reduce in-stream temperatures and would restore a significant portion of the habitat in the lower basin.

- The Region struck off on its own interpretation of best technology available for impingement reduction in direct contravention of EPA's Phase II Rule for cooling water intake structures, but in doing so, issued a permit with unlawfully vague requirements and with improper delegations of authority to the state.

- The Region imposed a biological monitoring program that goes unlawfully beyond any reasonable impacts of the Station and is patently intended to force this one discharger to bear the burdens of studying problems caused by others.

Mirant Kendall's objections also must be understood in the context of the following;

- That the Station has existed for more than 50 years with permitted discharges at levels no higher than it now seeks, and actual discharges near those permitted levels without any evidence or even claims by the Region, until after the close of the public comment period, that the Station had caused any harm, much less appreciable harm.

- That the Station just went through a major upgrade that tripled its generating capacity while reducing its air emissions.

- That the Station's operations would be so substantially curtailed by the NPDES renewal permit that its ability to survive is seriously threatened.

- That the Region's approach to this renewal permit was openly driven by its Clean Charles initiative rather than by an objective process.

For all of those reasons and more as described infra, Mirant Kendall urges the Board to review the NPDES renewal permit with an especially zealous eye for assuring that the terms of the permit and its consequences indeed are consistent with law and with EPA policy.

III. Background

A. Mirant Kendall Station

1. Ownership and Generating Capacity

Mirant Kendall Station was constructed in the late 1940s by the Cambridge Electric Light Corp. As described in the Fact Sheet the Region issued on April 29, 1988 with the draft of the 1988 NPDES Permit, at that time:

> The Kendall Square Station of the Cambridge Electric Light Company is a 68 MW Electric Generating Station. It also generates steam, which is sold to district heating customers. The station is located north of the Longfellow Bridge in Cambridge, MA. Operation of this facility began in 1949.

1988 Fact Sheet, p.2.[15] The Station had three steam turbine units as its principal generators.

Subsequently the Station was acquired by Southern Energy Kendall, L.L.C. (a subsidiary of Southern Energy, Inc.) which initiated a "repowering and upgrade project" approximately in 1999. Southern Energy Kendall, L.L.C. was renamed Mirant Kendall, LLC, and Southern Energy, Inc. was renamed Mirant Corp. after the Southern Company (Southern Energy, Inc.'s parent company) spun off Southern Energy, Inc. and its subsidiary companies into a separate publicly traded company in April 2001. Mirant Corporation and certain of its affiliates, including Mirant Kendall, LLC, emerged in January 2006 from reorganization proceedings under Chapter 11 of the Bankruptcy Code.

Mirant Kendall completed the repowering and upgrade project in 2002 (excepting the portions dependent on receiving approval through a modified NPDES permit). The upgrade included the additions of a dual-fueled combustion

turbine generator; a heat recovery steam generator; water purification facilities; upgraded air emissions controls; and roof-top "Fin Fan" air cooling units to help dissipate a portion of the thermal load created by the increased generation. Including generation from the three original steam turbine units and from jet engine generating units that do not involve use of cooling water, the project increased the Station's maximum generating capacity to 283 MW.[16]

2. Cooling Water Intake, Discharges and Permits

The Station has a once-through cooling water system. Six pumps withdraw water from the Broad Canal, an adjacent channel connected to the Charles River, via three unit-specific cooling water intake structures located on the Canal (collectively, the "CWIS").[17] After passing through condensers used to cool the steam exiting the steam turbine units, the heated cooling water is discharged to the Charles River through two parallel outfall pipes (Outfalls 001 and 002) located below the water's surface on the seawall along the river just east of the Station. Id.

The Station has operated its cooling water system under a series of permits issued by EPA, MassDEP and others since it commenced operations. With respect to the NPDES program and MassDEP surface water discharge permitting, EPA and MassDEP first issued NPDES Permit MA0004898 for the Station on March 27, 1975 (the "1975 NPDES permit"); renewed that permit on September 27, 1982 (the "1982 NPDES permit"); and renewed it again on August 17, 1988 with the 1988 NPDES Permit.[18] Each of those permits was concurrently issued under federal and state law.

Those successive permits, specifically as provided by the 1988 NPDES permit which remains in effect, authorized the Station to withdraw water from the Broad Canal through the existing intake structure, which was determined to constitute "best technology available" under § 316(b) of the Clean Water Act.[19] The Station is authorized to discharge up to 80 MGD of cooling water through Outfalls 001 and 002 as a daily maximum, and up to 70 MGD as a monthly average.[20] The maximum permitted temperature of the discharge is 105° F, and the maximum temperature permitted increase above the intake temperature is 20° F.[21]

3. Operation of the Upgraded Plant Under the 1988 NPDES Permit

As summarized in the Background section on the NPDES renewal permit process below, Mirant Kendall's repowering and upgrade project included requests to modify the Station's NPDES permit (a) to authorize discharge of a portion (up to 50%) of the cooling water through a new diffuser outfall laid on the river bottom within the lower Charles River basin, and (b) to authorize discharge of ultra-filtration and reverse osmosis water treatment reject water ("UF/RO reject water") from the new water purification facilities.

Those requests have not yet been granted because (a) the NPDES renewal permit does not authorize the proposed diffuser outfall, and (b) the authority included in the NPDES renewal permit to discharge the UF/RO reject water has been stayed along with the rest of the permit.

Nevertheless, Mirant Kendall completed the other components of the upgrade project in 2002 and has operated at the higher generation capacity,

including operation of the new water purification facilities. That is because it can and has operated the Station at its full new generation capacity within the thermal limits imposed by the 1988 NPDES permit, and because it has been authorized by the Massachusetts Water Resources Authority and the City of Cambridge to discharge the UF/RO reject water to the local and regional sewer systems, albeit at considerable expense, until such time as the Station receives final authority to discharge the reject water to the river.

B. Lower Charles River Basin, Clean Charles 2005, and the Nutrient TMDL

1. Lower Charles River Basin and Water Quality Stressors

Centuries ago the lower Charles River basin was a broad tidal estuary between Boston and Cambridge. Over the past many decades, it has become a non-tidal, urban recreational basin controlled by dams, locks, seawalls, and other permanent infrastructure. It also has suffered from years of industrial pollution and urban run-off from combined sewer overflows and other sources, and contains large loads of residual pollutants including heavy metals and nutrients within its sediments.

The basin's resulting environmental problems include a longstanding "salt wedge" in the lower depths of the basin due to salt water intrusion through the locks at the New Charles River Dam. The salt wedge produces a persistent, large zone of low dissolved oxygen and elevated salinity where there is no viable habitat for aquatic life. The Region is well aware of these issues, and the record includes its commendably complete summary of the water quality problems in the basin. Determinations Document, at pp. 43-49.

As a result of these problems, MassDEP regularly includes this segment of the Charles River in its list of impaired waterways under § 303(d) of the Clean Water Act.[22] MassDEP's attainment monitoring has found that this water body segment violates the Massachusetts Water Quality Standards for excessive nutrients, toxic pollutants and multiple other pollutant parameters.

MassDEP has never, however, listed the lower Charles River as out of attainment of the temperature limits within the Massachusetts Water Quality Standards. Indeed, even though the Station has operated since 1949, and during many years of intense and often productive efforts to improve water quality in the Charles River, the Station's discharge was never identified as the cause of water quality problems, until now. No fish kills have ever been attributed to the Station. MassDEP and EPA regularly issued and renewed NPDES permits authorizing thermal discharges as per the 1988 NPDES permit, which included findings that the Station's discharge had caused no appreciable harm.[23] Also, with no apparent concern they allowed that permit to remain in effect for more than 13 years beyond its initial expiration date.

Indeed, even when the Region issued the draft NPDES renewal permit in June, 2004 it did not find that the Station's thermal discharge had caused appreciable harm. Determinations Document, passim; MK Comments, Comment F1. Rather, the Region determined that the other stressors within the basin - including pollutant loadings from other sources and the effect of the dams and the salt wedge - combined to cause major degradation of water quality. Determinations Document, at pp. 43-49. To be sure, the Region listed those

major stressors to argue that the fish and aquatic life in the basin are so stressed by those problems that they must be protected from additional thermal stress. Id. But notably, the Region made no finding of past harm from the Station and made no findings concerning what portions of such stress or impairments are attributable to the Station's discharge. Id.

The Region's September 2006 Response to Comments on the draft NPDES renewal permit belatedly addressed whether the Station's thermal discharge has caused appreciable harm. Based on new data analyses performed after the close of comments on the draft NPDES renewal permit, the Region now asserts that the Station's thermal plume excludes river herring from an "unacceptably large" area of the lower basin.[24] Mirant Kendall vigorously contests that new finding and believes, for the reasons provided infra, that this Board should review and remand that critical issue.

For this Background section of the Supplemental Petition, the point is only that the Board should clearly understand that for more than 50 years, the Station's thermal discharge had never been associated with any evidence or findings of harmful impacts.

2. Clean Charles 2005

In 1995, the Region announced an "ambitious initiative" called "Clean Charles 2005" to restore the river so that it would be fishable and swimmable by Earth Day 2005.[25] Under that initiative, recently re-named the "Clean Charles River Initiative,"[26] the Region has coordinated a broad range of efforts that have

successfully brought major improvements, particularly for recreational users of the lower Charles basin.

As one measure of those improvements, in April 2006 the Region graded the health of the river as a "B+" for 2005, reflecting the Region's determination that in 2005 the river met boating standards 97% of the time and swimming standards 50% of the time.[27] The river also has improved to the point where fishery agencies have commenced efforts to revive the shad population.[28]

3. The Diffuser Outfall Proposal

Mirant Kendall has strongly supported and commends the Charles River initiative. Indeed, Mirant Kendall designed its upgrade and repowering project with a conscious effort to help improve water quality in the lower basin. Specifically, a principal purpose for Mirant Kendall's proposed installation of a diffuser outfall along the river bottom is to physically break up the salt wedge, thereby raising dissolved oxygen levels and restoring substantial habitat for yellow perch and other aquatic life forms.[29] Also, use of the proposed diffuser outfall would diminish temperature differentials caused by the Station's thermal discharge as compared to having that discharge occur exclusively from Outfalls 001 and 002 along the Cambridge seawall.[30]

The Region has acknowledged those likely benefits to the proposed diffuser outfall.[31] In issuing the NPDES renewal permit, however, the Region determined not to approve use of the proposed diffuser due to assertedly unresolved concerns that operation of the diffuser outfall might contribute to seasonal growth of nuisance algae.[32] In doing so, the Region disregarded Mirant

Kendall's proposed controls on use of the diffuser outfall that would avoid any such effects.[33] For the reasons discussed infra, Mirant Kendall believes this Board should review and remand that determination.

For this Background section of this Supplemental Petition, the point is just for the Board to understand this: that the Region's refusal to approve the proposed diffuser outfall has sacrificed acknowledged, long-term benefits of fostering habitat and fish populations in the lower basin. Instead, the Region chose to avoid an unquantified risk that use of the diffuser outfall might contribute to seasonal algae issues that the Region acknowledges are caused by nutrient loads and constrained river flows rather than by the operations of the Station.

4. Nutrient TMDL and Modeling of the Proposed Diffuser Outfall

As one major component of the Clean Charles 2005 initiative, in 2002 the Region initiated the Charles River basin Eutrophication TMDL (the "Nutrient TMDL"). The purpose of the Nutrient TMDL is to address water quality and aesthetic impairments resulting from the occurrence of algal blooms in the basin.[34] The Region's TMDL development included the use of river monitoring data collected under the Region's annual river monitoring program, consideration of the substantial river monitoring data collected by Mirant Kendall as part of its Station upgrade and repowering project and NPDES permit renewal proceedings, and the development by TetraTech, the Region's contractors, of a hydrodynamic and water quality model (the "TMDL model") to evaluate causes and improvement strategies for the nutrient issues in the lower Charles River.[35] The

Nutrient TMDL project also included the establishment of a Technical Advisory Committee ("TAC"), on which Mirant Kendall's representatives were invited to participate and did.[36]

From the start of the Nutrient TMDL project, the potential effects and benefits of Mirant Kendall's proposed diffuser outfall were an explicit subject of consideration.[37] For example, the Modeling Framework to Support Total Maximum Daily Load (TMDL) Development for the lower Charles River, Massachusetts, dated December 3, 2002 and prepared by EPA's modeling contractor, included an entire task entitled "Evaluation of Methodologies to Represent the Proposed Powerplant Diffuser" and stated that the impact of the proposed diffuser "must be considered in the development of the TMDL."[38] The issues presented by the proposed diffuser outfall also became the subject of extensive discussion within the TAC established by EPA regarding the Nutrient TMDL.[39]

The Nutrient TMDL did not proceed as quickly as the Region had intended. At the Region's kick-off meeting in September, 2002, the plan was to develop the model and produce the TMDL by mid-2004.[40] Instead, as documented by a series of communications between representatives of Mirant Kendall and the Region, the Region persistently proposed and then rescinded dates for public meetings for the TAC.[41] Ultimately it held no TAC meetings between the end of 2002 and December, 2005.[42] The Region provided the continued message, however, that the TMDL would consider the effects of the proposed diffuser, as in an e-mail from the Region's Nutrient TMDL

project manager dated March 27, 2003 indicating explicitly that the Region TMDL model would run a test case of the diffuser operating at full capacity.[43]

It appears, however, that the Region decided during 2004 not to implement the "diffuser configuration" that it had put into the TMDL Model. An internal memorandum from the Nutrient TMDL Project Manager dated April 8, 2004 indicated that while the TMDL model "is fully capable of fulfilling this need," that modeling component was not yet being incorporated into the TMDL project itself.[44] On the same date, representatives of Mirant Kendall met with the Region to discuss the proposed diffuser.[45] The Region informed Mirant Kendall that would not propose in the draft NPDES renewal permit to authorize the proposed diffuser outfall because the Region still had concerns due to the absence of adequate modeling about the potential effects of the proposed diffuser outfall on algae conditions, and the Region recommended that Mirant Kendall should undertake further modeling. The Region did not inform Mirant Kendall, however, that the Region was not pursuing its prior undertaking to conduct such modeling.

Hence, in Mirant Kendall's comments on the draft NPDES renewal permit, Mirant Kendall offered to support this Region's modeling effort. It was not until the Region finally prepared to distribute the TMDL model report and the draft TMDL in October, 2005[46] that Mirant Kendall learned that the Region had decided not to use the capacity of the TMDL model to model the diffuser.

The Region then informed Mirant Kendall again that approval of the diffuser was possible, but depended on further modeling. In its letter and attachment dated January 11, 2006,[47] the Region detailed an exhaustive set of modeling analyses it stated must be performed by Mirant Kendall in order for the

Region to consider approval of the proposed diffuser outfall, and authorized Mirant Kendall to utilize the TMDL model developed by the Region.

Mirant Kendall arranged to obtain an appropriate version of the TMDL model developed by the Region's contractors. Through an exchange of correspondence and emails, as well as several meetings,[48] Mirant Kendall and the Region agreed on the first round of efforts by Mirant Kendall to use the TMDL model for that purpose. Mirant proceeded during the spring and summer of 2006 to use that model, exactly as it had been set up by the Region's contractors, to model the proposed diffuser outfall. By submissions in July and September, 2006, Mirant Kendall submitted the results of the Region's own TMDL model, which indicated that operation of the proposed diffuser outfall would not contribute to and could improve nuisance algal conditions in the lower Charles River basin.[49]

In the Region's Response to Comments, the Region seeks to explain why it has rejected those conclusions from its own TMDL model.[50] For the reasons discussed infra, Mirant Kendall believes that this Board should review that determination and remand these issues to the Region for consideration under the Board's guidance.

For this Background section of the Supplemental Petition, the point is only that the Board should clearly understand this: that the Nutrient TMDL and the Region's and Mirant Kendall's modeling efforts under the Region's TMDL model are inextricable from the Region's consideration of Mirant Kendall's proposed diffuser outfall under the NPDES renewal process. The potential effects of the

proposed diffuser on eutrophication issues in the Charles were an integral component of the permit renewal process,[51] and the Region and its contractors conducting the TMDL modeling exercise indisputably became involved in those issues.[52]

The Board should also appreciate that Mirant Kendall had ample reason to believe the Region's explicit communications that it would quantify the potential impacts of the proposed diffuser outfall, that the Region silently back-tracked from that undertaking, and that Mirant Kendall undertook nonetheless to make up for those shortfalls by using the Region's own TMDL model to address the pertinent questions.

C. NPDES Permit Renewal Process

1. Station Upgrade and Repowering Project - Initiation and Other Permitting of the Diffuser and Barrier Net Proposals

The Station's NPDES renewal permitting process was just one component of Mirant Kendall's overall project to upgrade and repower Mirant Kendall Station between 1999 and 2002. That project involved a wide variety of environmental reviews and permitting requirements, including approvals from the:

- U.S. Army Corps of Engineers ("USACOE").
- MCZM with respect to coastal zone consistency.
- Massachusetts Energy Facilities Sitting Board ("EFSB");
- MassDEP with respect to air emissions, waterways licensing (for structures located within historic flowed tidelands), and water

withdrawals under the Massachusetts Water Management Act, M.G.L. c. 21G;

- Massachusetts District Commission ("MDC"), which subsequently was merged into an agency known as the Massachusetts Department of Conservation and Recreation ("DCR"), for structures along the Cambridge seawall; and
- City of Cambridge's Conservation Commission with respect to activities affecting wetlands resource areas.

The scale of the project also required review under the Massachusetts Environmental Policy Act, M.G.L. c.30, § 61 et seq. ("MEPA"), which led to the filing of an environmental notification form and draft[53] and final environmental impact reports during 1998 through 2000, public comments on those filings (including comments by the Region and MassDEP),[54] and ultimately a certificate from the Secretary of the Executive Office of Environmental Affairs in Massachusetts on June 20, 2000 determining that the Final Environmental Impact Report for the project satisfied the requirements of MEPA.[55]

From the outset, the proponents of the upgrade and repowering project understood that questions would arise concerning the potential effects of the Station's Broad Canal cooling water intake structure and the thermal discharges. In addition to the prior existence of the Region's Clean Charles 2005 initiative, EPA's concurrent efforts to develop new rules for cooling water intake structures under § 316(b) of the Clean Water Act and the concurrent controversies concerning thermal discharges from the Brayton Point Station in Somerset,

Massachusetts made it plain that the upgrade and repowering project could not occur without commitments to mitigate impacts of the cooling water intake and discharge.

Accordingly, starting well before any permit applications were filed, the project's sponsors contacted the regulatory agencies and CRWA to assess potential mitigation efforts.[56] Those preliminary discussions quickly focused on the problems caused by the salt wedge, and included references to the successful but no longer funded program by the MDC during the 1980s to break up the salt wedge using aerators installed on the river bottom. Indeed, the CRWA takes credit for initially suggesting that the Station's upgrade and repowering project should seek to remedy the salt wedge by installing a new diffuser outfall along the river bottom.[57]

As a direct outgrowth, the project proponent investigated and designed two principal measures to mitigate the water quality impacts of the Station. See Draft Environmental Impact Report[58] dated November, 1999, which described: (a) a proposal to construct the diffuser outfall along the river bottom of the lower Charles River basin, and (b) a proposal to construct a fine-mesh barrier net as a modification to the cooling water intake structure along the Broad Canal.

Throughout the remaining permitting process, up until the issuance of the draft NPDES renewal permit by the Region in June, 2004, those two features of the upgrade and repowering project consistently were approved or even required by each agency that considered those proposals, including but not limited to MassDEP.[59] Mirant Kendall described those approvals in MK Comment E1 and

provided copies of the approvals in MK Comment Exhibit Nos. E1-1 to E1-8. To be sure, as the Region notes in the RTC at E5, some of those approvals were conditioned on receiving a NPDES renewal permit authorizing the barrier net and the diffuser outfall. Still, clearly the environmental advocates, including CRWA, and the environmental agencies, including MassDEP and the Region,[60] saw great promise in the opportunity to remedy the salt wedge with the diffuser and to mitigate the impingement effects of the cooling water intake structure.

2. February 2001 Supplemental NPDES Permit Application

Accordingly in February 2001, Mirant Kendall submitted an extensively documented two-volume supplemental application to the Region for the renewal of the NPDES permit.[61] The supplemental application requested continuation of the variance under § 316(a) of the Clean Water Act and proposed alternate effluent limitations under that authority. It also sought several modifications, including:

- authority to discharge up to 50% of the cooling water through the proposed diffuser outfall;
- authority to discharge the UF/RO reject water to the River;
- change of the existing 70 mgd average monthly flow limit to 70 mgd as an annual average; and
- approval of the proposed barrier net system as best technology available under § 316(b) of the Clean Water Act.[62]

The February 2001 supplemental application responded to the information needs that the Region and others had described in the pre-application meetings and

communications back through 1998, and included the results of extensive monitoring and sampling on the River for the years 1999 and 2000,[63] as well as the results of a hydrodynamic model of the River prepared by Edinger Associates to demonstrate the thermal impacts of the Station under a variety of meteorological and Station operating conditions.

3. Permit Renewal Proceedings Up to Issuance of Draft NPDES Renewal Permit in June, 2004

After Mirant Kendall's submission of the February 2001 modification request, until the Region's issuance of the draft NPDES renewal permit in June, 2004, representatives of Mirant Kendall and the Region engaged in comprehensive discussions and information exchanges arising from the myriad questions raised by the Region, MassDEP and an interagency group the Region convened to consider the renewal permit. The key components of those discussions include the following.

a. River monitoring and sampling data

Throughout this period, Mirant Kendall funded a still ongoing, comprehensive program of river monitoring and sampling to provide data about the actual river temperatures, fish distribution and abundance. Most of Mirant Kendall's submissions are included in the Administrative Record.[64] As shown in the Determinations Document and the RTC[65] the Region has considered Mirant Kendall's monitoring and sampling data and has heavily but selectively used it to support its determinations.

b. Mirant Kendall's Hydrodynamic Model; In-Stream Compliance Limits

After reviewing the February 2001 modification request, the Region and MassDEP requested Mirant Kendall to use the Edinger model to conduct additional modeling under additional conditions specified by the interagency group.[66] Mirant Kendall conducted the requested modeling and filed a report in the spring, 2001.[67] During subsequent discussions, the Region requested substantial additional modeling.[68]

At that point, Mirant Kendall determined that it was not feasible to satisfy the Region's escalating demands for more modeling without respect to cost. More important, it had become clear through the discussions that the Region and MassDEP were unwilling to rely upon modeling projections to develop a renewal permit containing only "end-of-pipe" limitations such as contained within the 1988 NPDES permit, and intended to impose in-stream, real-time monitoring methods to provide real-time control of the Station's operations. MassDEP had so indicated with its comments of June, 2000 on the FEIR, which stated:

> DEP will require that a temperature monitoring program for Maximum Temperature and Change in Temperature Over Ambient be developed that will have instantaneous feed back to the station. To ensure that standards are met, Kendall Square must demonstrate that it can cut back the BTU output through its discharges should standards violations be imminent. If a viable monitoring program and feed-back system cannot be put into place to safeguard against standards violations, DEP will not sign a 401 Water Quality Certification.

DEP Comment letter, at p. 5.[69] Accordingly, because the Region and MassDEP had determined that in-stream monitoring and real-time temperature controls on the plant would become part of the renewal permit, Mirant Kendall and agencies' discussions moved towards attempting to reach an acceptable set of in-stream limits rather than continuing to argue over open-ended modeling questions.

Mirant Kendall provides that history, and in particular the agencies' insistence upon in-stream controls, because the Region alleges in the RTC that Mirant Kendall chose to accept in-stream compliance regime in lieu of end-of-pipe controls based on modeling.[70] In fact, Mirant Kendall never had or made that choice; the in-stream monitoring regime was imposed upon it by the agencies.

c. BTU Loading Approach and RFI Response

As the discussions evolved between Mirant Kendall, the Region and MassDEP, it also became apparent that the particular temperatures the Region was considering for an in-stream compliance regime could force drastic curtailments of the Station's operations during the summer. Mirant Kendall responded by seeking to engage the Region in a cooperative effort to develop a system of in-stream limits that would take account of the operating requirements of a steam generating facility in the competitive market place for electricity generation. Specifically, Mirant Kendall developed and submitted a proposal in December 2002 that exemplified what became denominated as the "BTU Loading Approach."[71]

The concept of the BTU Loading Approach is for the NPDES permit to require the Station to curtail its operations down to specified BTU discharge levels once specified in-stream temperature thresholds are reached. Otherwise, the plant will be forced to curtail its entire operations in order to avoid the risk of "contributing" to in-stream exceedances. The curtailments would commence at in-stream temperature thresholds set lower than the temperature targets the Region seeks to maintain in the river, which would ensure that the plant's operations were not the cause of exceedances of those targets. The plant would still need to curtail its operation, but it would be able to

operate more consistently and with more certainty than under the compliance regime the Region then was considering and ultimately has imposed.

Initially, the Region evinced some interest in the BTU Loading Approach. The agencies requested further information, clarifications and modifications, which Mirant Kendall provided by its "RFI Response" of September, 2003.[72] That filing analyzed 12 distinct varieties of potential in-stream compliance regimes, and also demonstrated that several of them would impose crippling curtailments on Mirant Kendall's summertime operations to the point where the Station could not cover its annual fixed and variable operating costs. The RFI response also, however, proposed variations of the BTU Loading Approach that Mirant Kendall believed could be followed to achieve both the Region's and Mirant Kendall's objectives.

The Region rejected that version of the BTU Loading Approach for reasons described in the Determinations Document, at pp. 69-72. In the Determinations Document, however, the Region proposed an alternative form of the BTU Loading Approach and requested comment. In the MK comments, Mirant Kendall suggested further refinements and requested the opportunity to work with the Region in an effort to reach consensus on this important opportunity to reduce heat to the river with less severe operating impacts on Mirant Kendall.[73]

The Region never took up those suggestions, however, and rejected the entire BTU Loading Approach for the reasons stated in the RTC of September 2006.[74] For the reasons provided infra, in this Supplemental Petition, Mirant Kendall believes the Board should review and remand the Region's rejection of the BTU Loading Approach.

For this Background section of the Supplemental Petition, Mirant Kendall seeks only for the Board to appreciate this: that Mirant Kendall tried hard to find a workable mechanism that would allow its operational needs to co-exist with a system of protective in-stream temperature standards.

d. Proposed Diffuser Outfall

During the period leading up to the issuance of the draft NPDES renewal permit in June, 2004, the Region and Mirant Kendall also continued to discuss the proposed diffuser outfall, both in the context of the Nutrient TMDL as described supra and in the context of the impending issuance of a draft permit. In particular, by a letter dated December 17, 2003, Mirant Kendall responded to the Region's concerns that operations of the diffuser outfall might contribute to nuisance algal conditions.[75] In that letter, per the Region's request, Mirant Kendall proposed a system for monitoring the algal levels in the lower basin and modifying or curtailing the use of the diffuser accordingly.

e. Barrier Net Proposal

Also during this period, EPA promulgated § 316(b) regulations, 40 C.F.R. §§ 122.21r (1)(ii),(2),(3),(5); § 122.44(b)(3); §§ 123.25(a)(4), (36); § 124(d)(1)(ix); Pt. 125, Subpart J, *published at* 69 Fed. Reg. 41,576-41,693 (July 9, 2004). That set of regulations, known as the "Phase II Rule," is designed to set uniform, nationally applicable technology standards for cooling water intake structures ("CWIS") at existing power plants such as Mirant Kendall. The Phase II Rule was signed on February 16, 2004, almost four months *before* the draft permit was issued; was published in the *Federal Register* on July 9, 2004 (just 26 days after Region 1 issued the draft permit);

and became effective on September 7, 2004 (prior to the closure on October 15, 2004 of the comment period on the draft NPDES renewal permit).

The Phase II Rule (the "Rule") sets performance standards for reduction of "impingement" mortality (mortality that can occur when larger organisms are trapped against the CWIS) and, for some facilities, entrainment (the passage of organisms through the facility). The entrainment standards do not apply to facilities which, like Mirant Kendall, are located on a water body with the flow characteristics of a lake or reservoir. 40 C.F.R. § 125.94(b)(2). The Rule also does not dictate which technology or other measure must be used to meet the performance standard. Instead, it recognizes that permittees should have the flexibility to choose the design and construction technology, operational measure, or, in appropriate cases, restoration measures best suited to meeting the standard most cost-effectively at the particular site. See 40 C.F.R. § 125.94(a)(1)-(5). The Phase II Rule provides incentives for facilities to use what EPA Headquarters has determined are the most effective and well-demonstrated technologies. For example, the Rule provides that permittees who show that they have achieved or will achieve a design through-screen velocity of 0.5 feet per second ("fps") or lower need not prepare the "Comprehensive Demonstration Study" ("CDS") otherwise required,[76] or engage in verification monitoring to show that the performance standard has been achieved. 40 C.F.R.§ 125.94(a)(1)(ii); see also See 69 Fed. Reg. 41,601. It also allows permittees to request establishment of less stringent site-specific alternative performance standards, where the permittee can show that the cost achieving the standard would be substantially greater than the economic benefits. 40 C.F.R. § 125.94(a)(5)(ii).

Necessarily, implementing this comprehensive framework for identifying the "best technology available" ("BTA") for CWIS requires some additional time to conduct the necessary evaluation of alternatives and development of compliance approaches. Thus, the Phase II Rule establishes a timetable for completing that analysis which, for plants like Mirant Kendall, requires submission of the necessary information as expeditiously as practicable, but not later than January 7, 2008. 40 C.F.R. § 125.95(a)(2)(ii). The Rule and accompanying guidance provide that, in the interim, permit writers may either establish CWIS requirements based on their best professional judgment regarding what applicable law would require, or (2) "where the requirements of the Phase II Rule are of sufficient magnitude to make additional proceedings desirable," to reopen the permit process to allow development of the information required by the Rule. 40 C.F.R. § 125.95(a)(2)(ii); EPA, 316(b) Phase II Question and Answer Document (Aug. 19, 2004) ("316(b) Q&As"), Q&A 2, pp. 2-3.

In short, the new Rule provides alternatives for addressing impingement mortality and entrainment effects, and establishes a timetable for Mirant Kendall to comply that is distinct from this concurrent NPDES renewal process. The consequences and the Region's misapplication of the new rule present contested issues in this petition, infra.

4. June 2004 NPDES Renewal Permit, The Determinations Document, And MK Comments

In April, 2004 the Region and Mirant Kendall met to discuss the Region's intention to issue a draft permit in the near term. At that meeting, the Region made clear that the draft permit would not propose the BTU Loading Approach or the diffuser outfall. The Region indicated, however, that the draft permit would not close the door on those options, and indeed, the Determinations Document claimed that the diffuser outfall

remained a potential option and also requested comment on a form of the BTU Loading Approach.

The Region also took the positions that the stalled Nutrient TMDL development process was independent from the NPDES renewal process, and that it would not defer issuance of the draft or final NPDES renewal permit pending completion of the Nutrient TMDL (originally intended to come to completion by mid-2004). The Region did not, however, disclose that it was reconsidering whether even to utilize the component of its TMDL model that was designed to model the effects of the proposed diffuser.

The Region issued the draft NPDES permit in June, 2004, and Mirant Kendall and others filed comments by the due date in October, 2004. Concurrently with the comment period, the Region also sent an information request to Mirant Kendall under § 308 of the Clean Water Act, to which Mirant Kendall responded on October 29, 2004.[77]

5. Permit Renewal Proceedings Up to Issuance of Final Permit In September, 2006

After the Region's issuance of the draft renewal permit in June, 2004, the Region has declined every opportunity to work with Mirant Kendall to try to develop the BTU Loading Approach or any other approach that would combine protections of water quality with Mirant Kendall's ability to maintain reasonable operations at the Station.

a. River Monitoring and Sampling - 2004 and 2005

During 2004 through 2006, Mirant Kendall has continued the river monitoring and sampling program it had annually conducted starting in 1999. Mirant Kendall provided 2004 and 2005 data and its interpretations[78] to the Region after the close of the public comment period on the draft NPDES permit. The Region has included those results in the Administrative Record, as Mirant Kendall had requested.[79]

Mirant Kendall also requested that the Region treat Mirant Kendall's interpretations of the 2004 and 2005 data as comments on the draft NPDES permit, because those interpretations could not have been submitted prior to the close of comments. The RTC does not respond to those results and interpretations as comments on the draft NPDES permit. Nevertheless the Region relies heavily in the RTC on its own review and interpretation of those data from Mirant Kendall's 2004 and 2005 sampling.[80]

Mirant Kendall believes it was improper for the Region to rely so heavily on such analyses without responding directly to Mirant Kendall's interpretations and without providing Mirant Kendall the opportunity to review and comment on the Region's interpretations of Mirant Kendall's data. For the reason discussed infra this Board should remand the NPDES renewal permit to the Region so that the Region can consider Mirant Kendall's comments on the Region's critical misinterpretations of those data.

b. Mirant Kendall's Operational Status

At the time Mirant Kendall submitted the MK Comments in October 2004, the company's business circumstances had led it to file requests with the regional independent system operator, ISO-NE, for permission to close the Station, and ISO-NE had largely granted that request. See MK Comments, Comments M1, M2 at pp. 154-155.

Subsequent business circumstances changed and the Station has remained open and operational, as Mirant Kendall informed the Region by a letter dated June 2, 2005.[81] As of the date of this Supplemental Petition, Mirant Kendall has no plan to reduce its operations at the Station excepting as may result from the NPDES renewal permit.

6. The NPDES Renewal Permit

The final NPDES renewal permit issued by the Region on September 26, 2006 largely rejected the MK Comments and made few significant changes from the draft renewal permit.[82] The principal change was to reduce the in-stream temperature limits even further, which will significantly increase curtailments of Station operations.

As issued, the final permit contains the following main elements.

a. Zone of Passage and Habitat

The center piece of the NPDES renewal permit is the establishment of a three-dimensional zone - the "Zone of Passage and Habitat" or "ZPH." The ZPH encompasses a portion of the lower basin from upstream of the Longfellow Bridge downstream to and including the locks at the Old Charles River Dam and at the New Charles River Dam.[83] The ZPH is to provide a sometimes shifting area comprising 50% of the waterbody where the Kendall Station could not cause or contribute to exceedances of seasonal temperatures that the Region selected to protect fish passage and habitat.[84] The permit distinguishes the area of the ZPH from a partly included Zone of Dilution, ("ZD"), located on the Cambridge side of the river and including Outfalls 001 and 002.[85]

b. In-stream Temperature Limits

The permit specifies seasonal, in-stream temperatures which must always be maintained within the ZPH. The Region established the in-stream temperature levels in reliance on multiple sources, including academic literature, comments from natural resource agencies and the public, and the results of the Region's and Mirant Kendall's river monitoring and sampling. Mirant Kendall, the Region and the Region's interagency group expended enormous effort, particularly during 2000 to 2003 and the time period prior to issuance of the draft NPDES Permit, attempting to come to agreement on an

appropriate selection of temperatures that would be adequately protective for the balanced indigenous population.

For the reasons discussed infra, Mirant Kendall believes that the Region committed clear error in many of its final determinations about selecting the in-stream temperature levels. In general, Mirant Kendall believes that the Region relied too heavily on incorrect interpretations of laboratory studies of the effects of temperature on fish, and made clearly erroneous analyses of the relationship between the indicator species and the temperatures demonstrated by actual field data in the Charles River and other water bodies.

c. In-Stream Monitoring Stations

The compliance regime in the permit depends on the requirement for Mirant Kendall to place and maintain a system of nine in-stream monitoring stations at the locations depicted on Attachment B to the permit. Each monitoring station would provide continuous, real-time temperature data from top to bottom at the water column at each station.[86] At each monitoring station, instantaneous water temperature would be measured at least once per hour and transmitted by radio to Mirant Kendall, which would record the results, calculate averages in four-hour or 24-hour or other averaging records as specified, and put the results on a website required by the permit. [87]

d. Temperature Compliance Requirements in the ZPH

The permit establishes a complex temperature compliance scheme.[88]

First, two of the nine monitoring stations, the upstream and downstream Stations Nos. 1 and 9, are not compliance points (although the temperatures at Station No. 1, the

background buoy near the B.U. Bridge, are used to establish the background temperatures from which the limit on in-stream temperature rise must be calculated).[89]

The seasonal temperature limits on Attachment A to the permit must be met at each of four monitoring points at each of Stations 2, 3 and 8, which makes 12 monitoring points of compliance. They also must be met at three monitoring points at Station 4, except at the 2 foot depth. That makes a running total of 15 compliance points.

The temperature limits also must be met by at least eight contiguous monitoring points out of the 16 monitoring points at Stations 3 to 6. As the limits also must be met at Station 3 (4 points) and at 3 points at Station 4, as just summarized, this 50% requirement means that at least one additional contiguous monitoring point from Stations 4 through 6 must meet the limits. That makes a running total of 16 compliance points.

The permit also requires full-time attainment of the temperatures limits at at least two, contiguous monitoring points at Station 7. That makes a total of 18 compliance points.

The permit also requires compliance by at least 18 compliance points, as described, during each of six 4-hour blocks during the day. That makes at least 108 temperature compliance events per day (18 compliance points times six 4-hour blocks).

Finally, the permit also requires compliance with "additional special day-time limits, "additional special night-time limits, "and "maximum temperature differential limits" under a complex arrangement provided in Attachment A to the permit. Accordingly, the number of daily, in-stream compliance events, for which an exceedance of any one of which would constitute a permit violation and expose the Station to the full

penalties under the Clean Water Act, is well in excess of that figure of 108 temperature compliance events per day.

To make compliance even more complex, the NPDES renewal permit also provides that a temperature monitoring point will not count as a temperature compliance point during any 4-hour block when the dissolved oxygen ("DO") level measured by the monitoring equipment shows a level below 5.0 mg/l.[90] As a result of the salt wedge, DO levels in the lower depths at Monitoring Stations 2, 3, 4, 5, 6, 7 and 8 regularly remain below 5.0 mg/l. Accordingly, temperature compliance at the deeper monitoring points at those Monitoring Stations would not count towards the minimum number required for compliance.

When that occurs, however, compliance still is required at eight contiguous monitoring points from among the 16 monitoring points comprising Stations 3, 4, 5 and 6. Therefore, additional monitoring points at Monitoring Stations 5 and 6, which are located within the supposed ZD, still would have to comply with the ZPH temperature limits.

This "DO requirement," combined with the Region's denial of Mirant Kendall's proposal to break up the salt wedge and raise DO levels along the bottom of the lower basin by using the diffuser outfall, would have enormous consequences for Mirant Kendall's operations. On the basis of a background condition, it extends the ZPH well into the ZD, and does so at the monitoring points closer to the surface where water temperatures are higher because - unless and until the salt wedge is mitigated - the monitoring points at the lower depths at Monitoring Stations 5 and 6 also are likely to exhibit DO levels below 5.0 mg/l.

In consequence, the Kendall Station often will not be allowed to discharge into the ZD, even when it would not cause or contribute to temperature exceedances at any of the Monitoring Stations 2, 3, 4, 7 or 8, and even though the Station does not cause or exacerbate (and proposes to break up) the salt wedge.

The Region established an uncompromising position: it would violate the Clean Water Act and the permit for the Station to discharge at any time that in-stream temperatures at any portion of the ZPH reach the temperature levels specified in Attachment A. The permit provides no allowances for summertime conditions where the in-stream temperatures are elevated above the compliance levels in the ZPH due to causes unrelated to the Station. Nor does it provide any permission to discharge under conditions when the Station's discharge would contribute only minimally to already elevated temperatures.

As an example, the permit does not allow for even one excursion among the daily 108 4-hour compliance points. Therefore, even if the in-stream temperatures within the ZPH were within limits throughout the ZPH excepting for one four-hour block at one monitoring point at one monitoring station during the day, there would be a permit violation. That would be so, as Mirant Kendall has commented, even though most of the ZD would be in compliance with the temperature limits on such an occasion, thereby fully satisfying the purpose of the ZPH.[91]

The Region's Response to Comments acknowledges that overbreadth, but seeks to excuse it on the bases (1) that no regulatory compliance regime can "correspond perfectly" to the real world, (2) that it is too difficult to develop a more responsive

compliance regime, and (3) that Mirant Kendall can seek to modify the permit later if the permit is unnecessarily restrictive.[92]

For the reasons provided infra, Mirant Kendall believes the Board should review the Region's overbroad compliance regime and remand the permit to the Region to work with Mirant Kendall to design an in-stream compliance system that more accurately matches the Region's goals and the biology of the balanced indigenous population (the "BIP").

e. 316(a) Variance and End-Of Pipe Limits

The NPDES renewal permit also contains end-of pipe thermal limits, the same as provided in the 1988 and prior NPDES permits - 105° F with a temperature differential of 20° F from the intake temperature. The permit also grants a variance under § 316(a) of the Clean Water Act, as had the 1988 NPDES Permit and its NPDES predecessors, to the extent the permit authorizes some exceedances of the state water quality standards within the ZD.

The practical effects of the variance and those end-of pipe temperature limitations, however, are entirely nullified by the temperature limits in the ZPH and by the DO requirement. In the RTC, the Region asserts that the permit variance allows Mirant Kendall to use the Cambridge side of the river, the ZD, for its thermal discharge. That claim is entirely hollow. It is not possible to discharge on the Cambridge side at the allowable end-of-pipe limits, or even at much lower levels, without elevating the temperatures within major portions of the ZPH, such as the locks at the exit from the lower basin (Monitoring Station 7). The DO Requirement also heavily confines the opportunity to discharge into the ZD. In practice, the temperature compliance regime in

the moveable ZPH and the DO requirement entirely supersede the variance and the end-of pipe discharge limitations.[93]

f. Barrier Net System

In light of the new Phase II rules, the Region could have reopened the permit process to allow for full implementation of the new Phase II rule. Alternatively, it could have gone forward with the permit process, but found that the existing intake structure constituted BTA for the short interim period until the necessary analyses could be conducted. Instead, in the draft NPDES renewal permit issued in June, 2004, the Region proposed to determine that the "best technology available" for the CWIS along the Broad Canal was a fine mesh barrier net system of the type Mirant Kendall's February, 2001 Supplemental Application had proposed as a means of addressing both impingement mortality and entrainment. On to that technology, the Region also grafted performance standards taken from the Rule and a host of other design and operating conditions going beyond Mirant Kendall's proposal.

In the final NPDES renewal permit, the Region modified its proposal somewhat, without addressing most of the issues raised by Mirant Kendall in its comments. The final permit still requires use of a fine mesh barrier net to reduce impingement mortality, contains performance standards for impingement mortality reduction, and requires Mirant Kendall to submit a post-permit plan covering the design, location, and operation of the fine mesh barrier net system. The permit does not, however, specifically approve any particular system. The NPDES renewal permit also retains an unrealistic schedule for implementing the barrier net and extensive and unwarranted monitoring requirements.

The Region retained the requirement for fine mesh, which typically is used only to reduce entrainment of organisms too small to be impinged on a standard 3/8 inch mesh screen, even though, based on its selective review of the Phase II Rules, the Region determined that federal rules do not require Mirant Kendall to reduce entrainment. The Region reached the conclusion that no entrainment controls are warranted under federal law because it determined, appropriately, that the lower Charles River is impounded and has characteristics that require the basin to be treated as a lake or reservoir under the Phase II rules.

Nevertheless, the NPDES renewal permit still requires compliance with performance standards for entrainment because MassDEP's water quality certification imposed entrainment requirements independently of federal law.[94]

g. Monitoring Program and Reporting Requirements

The NPDES renewal permit also requires an extremely extensive and expensive monitoring program and associated reporting requirements. These requirements are set up in Part I.A.14 from p. 16-32 of the NPDES renewal permit, and comprise the following main elements:

- Continuous in-stream temperature monitoring as summarized above, using nine new monitoring stations required to be installed from far upstream to far below stream of the discharge, including a monitoring station within Boston Harbor. The monitoring data must be collected in real time and posted to a website.
- Facility operations data, including hourly data on megawatt production.
- Hourly meteorological data.

- On a monthly basis, boat-mounted, towed water quality surveys to produce complete water quality contour maps of the lower basin. After two years, the monthly surveys are reduced to quarterly surveys.
- Weekly sampling for nutrients during June through October at three monitoring stations identified on Attachment B to the NPDES renewal permit.
- For at least one year, monthly sampling of in-stream total residual chlorine at three different monitoring stations.
- Weekly collections of fin fish by use of beach seine at four locations in the lower basin shown on Attachment H to the NPDES renewal permit for the months from July through the end of November or until river herring are no longer collected for two consecutive weeks.
- Push-net sampling of fin fish at nine sampling locations in the lower basin at least five times per month from the third week of June through the end of October, with two sampling events per station per occasion.
- Gill or Fyke net sampling weekly from March through November of the first year, and then every two weeks for each following year, at two locations identified on Attachment H to the NPDES renewal permit.
- Ichthyoplankton sampling weekly from March through August at five stations shown on Attachment A to the NPDES renewal permit.
- Three times per week from April through June, enumeration of river herring from the lock at the New Charles River Dam and from the upstream dam in Watertown, Massachusetts.

- An annual river herring sonic tracking program for adult river herring collected at the lock at the New Charles River Dam.
- A one-time study of the effectiveness of the barrier net system at the cooling water intake structure, once that system is installed.
- Weekly monitoring of the area near outfall 001 during April, May and June to document the presence, abundance, and behavior of fish.
- As a separate requirement in Part I.A.12 at pp. 14-15 of the NPDES renewal program, daily visual inspection of the Broad Canal, the ZD, and the barrier net system to identify "dead" fish, defined as fish exhibiting a "loss of equilibrium." If more than 25 dead fish are identified within a 24-hour period, the permittee must notify regulatory agencies, make an effort to collect the dead fish, conduct additional monitoring, curtail certain operations, and file a later report.
- Weekly monitoring of fish impinged at the cooling water intake structure.
- Weekly sampling between June and October for phytoplankton at three monitoring stations shown on Attachment B to the NPDES renewal permit, including duplicate samples at six different light levels at each station, and concurrent water chemistry sampling.
- A separate biological monitoring program, to be proposed and approved after the permit becomes effective, designed to evaluate the entrainment impacts of the cooling water intake structure. This program is required by MassDEP's WQC, and is subject to review and approval only by MassDEP.
- An annual evaluation by the permittee of the effectiveness of the monitoring program.

- An annual monitoring report summarizing all of the information collected during the prior year.

It is apparent from this list that the Region has taken the opportunity of Mirant Kendall's NPDES permit renewal to move the burdens of a desirable biological study of the lower Charles River basin onto one permittee. For the reasons described infra, Mirant Kendall believes this Board should review the monitoring program, determine that it is overbroad and excessive in the circumstances, and remand the permit to the Region for reconsideration.

h. Flow Limits and UF/RO Reject Water

In its February 2001 application, as described supra, Mirant Kendall had requested authority to change its flow limitation from 70 mgd as a monthly average to 70 mgd as an annual average. During the course of the NPDES renewal discussions, Mirant Kendall changed that request so that the 70 mgd flow limitation would remain as a monthly average for the months of April, May and June, as a measure to minimize entrainment and impingement during that most critical time of year. The NPDES renewal permit granted Mirant Kendall's revised request.

Mirant Kendall had also requested authority to discharge the UF/RO reject water. The NPDES renewal permit includes Part I.A.3, authorizing discharge of the UF/RO reject water through internal Outfall 009. For reasons described infra, Mirant Kendall believes the Region erred in some of the monitoring requirements for Outfall 009.

7. Effect of the NPDES Renewal Permit on Station Operations

Were the NPDES renewal permit to become effective in its current form, it certainly will force very extensive spring and summertime curtailments of the Station's

operations. Mirant Kendall clearly described that consequence and potential solutions in its RFI Response that it provided to the Region in September, 2003.[95] The RFI Response included the results of modeling of possible in-stream compliance regimes very similar to what the Region proposed in the draft NPDES permit in June, 2004 and finalized, but made more drastic, in the final NPDES renewal permit. And in the MK Comments, Mirant Kendall renewed its demonstration that the Region's proposed in-stream compliance regime would have crippling impacts on the Station's abilities to operate and survive.[96]

In response, the Region did not contest Mirant Kendall's showing, but instead, sought to minimize those impacts by acknowledging only that Mirant Kendall "will be faced with the potential for significant days of curtailed operations in the summer." RTC, Response to Comment K2, at p. K3. Mirant Kendall must concur with the Region that a permanent shutdown is "significant."

The Region also acknowledged that Mirant Kendall had proposed measures, in particular, the proposed diffuser outfall, which would significantly mitigate the impacts of the temperature regime on Mirant Kendall's ability to operate. RTC, Response to Comment K3, at p. K5. For the reasons described infra, Mirant Kendall believes that the Region committed clear error in issuing the final permit without first working with Mirant Kendall to develop permit provisions that would allow the Station to operate consistently with protective in-stream temperatures.

For the purposes of this Background section, the point for the Board is to recognize that in issuing the final permit, the Region spurned Mirant Kendall's efforts to work towards a compromise. In fact, by further reducing the in-stream temperature limits

to 81° F, the final permit actually would force more days of curtailments than the draft permit.

Specifically, Mirant Kendall has analyzed the number of days that the in-stream temperature limits contained within the NPDES Renewal Permit were exceeded during the summers of 2005 and 2006. In each of those years as in prior years, Mirant Kendall deployed in-stream thermistors at fixed locations within the area of the ZPH. Mirant Kendall recorded the data and analyzed it by comparison to the compliance regimes provided under the draft NPDES permit and the final NPDES renewal permit, respectively.

The results are as follows:

Year	Number of Exceedance Days - Draft Limits	Number of Exceedance Days - Final Limits	Additional Days
2005	63	71	8
2006	38	44	6

This means that for the each of the past two years, for 50-75% of the days in June through mid-September, Mirant Kendall could not have discharged cooling water because, had it done so, it would have contributed to exceedances during at least one of the daily compliance events in the ZPH.

As described in the RFI Response, summertime curtailments of that magnitude will likely be fatal for the Mirant Kendall Station.

IV. The Board's Power of Review

The Board's powers to review the Region's determinations arise under 40 C.F.R. § 124.19(a) and are well-settled. Mirant Kendall recognizes that it must demonstrate that the Region's decisions involve clearly erroneous findings of fact or conclusions of law, or involve important policy considerations which the Board should review in its discretion. Mirant Kendall fully acknowledges the Board's expectation that it should exercise its powers of review "sparingly" and with deference to the Region's technical determinations.

The issues presented for review in this matter easily compel the Board's exercise of its powers of review here. The permit renewal process and the resulting NPDES renewal permit under appeal were extraordinarily complicated and contested, as outlined in the Background section of this Supplemental Petition. Due to its strong commitment to the Clean Charles 2005 Initiative, the Region had an unusually public and deep need to assert every potential power it could muster to assure that any water quality issues in the lower Charles River are not attributable to its renewal of Mirant Kendall's NPDES permit. Due to the fact that Mirant Kendall's very existence is at stake, Mirant Kendall had an equally strong need to make sure that the renewal permit requires only the most necessary curtailments of its operations. The resulting permit includes an unprecedented compliance mechanism - the ZPH, as enforced through the in-stream temperature and monitoring system described supra - as well as a hugely expensive river monitoring program largely unmoored from monitoring of the Station's discharge.

Those circumstances call for an independent review of the Region's determinations to ensure that all of the consequences of the permit - potentially including closure of the Mirant Kendall Station - are warranted by sound determinations from the Region.

V. Issues for Review

A. Permit Renewal Process

1. Failure to work with cooperatively with Mirant Kendall

Mirant Kendall and the Region each have expended enormous effort on the NPDES permit renewal process for the Kendall Station starting from at least 1998. Mirant Kendall genuinely appreciates that the Region's staff devoted at least thousands of hours to considering Mirant Kendall's numerous submissions as the process evolved. The hundreds of pages comprising the Determinations Document, the Response to Comments, and their associated exhibits and the draft and final permit themselves reflect an enormous commitment by the Region to developing a final NPDES permit that would assure that the permit helped to restore the lower Charles River basin. So Mirant Kendall has no complaint about the Region's level of effort.

Mirant Kendall does, however, complain very strongly that the Region largely shut Mirant Kendall out of the process at a stage when it should have worked much more cooperatively with Mirant Kendall. Mirant Kendall recognizes that the Region, as a regulatory agency subject to public review, is obligated to keep an arm's length relationship with the permittee and to provide open and on-the-record explanations for its decision.

Those obligations, however, did not prohibit the Region from meeting with Mirant Kendall and its consultants to work cooperatively and creatively to resolve issues and devise acceptable solutions. Mirant Kendall and its consultants have regularly experienced such creative cooperation with the Region and other regulatory agencies, including MassDEP, but for the Kendall Station that door slammed shut approximately in

the fall of 2003 as the Region started to put the draft NPDES permit together for public comment.

Mirant Kendall acknowledges that the Region, prior to that time, had participated in a series of meetings of Mirant Kendall to discuss the proposed diffuser, in-stream temperature limits, the hydrodynamic model and the other issues involved. During that time, the Region explicitly lauded the project proponent for its open and cooperative effort to work with the Region on its efforts to improve water quality in the Charles River.[97] And by a letter dated March 21, 2003, the Region affirmatively indicated that it would share a working draft of the draft NPDES permit with Mirant Kendall for discussion.[98] As described in the Background section, during this time the Region also took interest in Mirant Kendall's proposed BTU loading approach, and as late as November, 2003, met with Mirant Kendall to discuss the permit.

At that point, however, the door slammed shut. Contrary to its letter of March, 2003, the Region declined to share a working draft of the draft NPDES permit with Mirant Kendall. Mirant Kendall raised that failure in its comments on the draft permit.[99] The Region's response relied on the point, which Mirant Kendall acknowledges, that the Region had no legal duty to share its working draft with Mirant Kendall.[100] That response well illustrates the Region's attitude as the permitting renewal process proceeded: that it would not do more than the bare legal minimum, even when that means it would retract earlier commitments such as provided in its March, 2003, letter.

That failure to work cooperatively with Mirant Kendall is illustrated by numerous additional, critical and harmful examples. Under the BTU Loading Approach, there is great opportunity to reduce water temperatures without having such drastic impacts on

the Station's viability. The Region's Determinations Document in June, 2004 and Mirant Kendall's comments in October, 2004 set the stage for productive efforts to develop the BTU loading approach, as Mirant Kendall solicited in its comments.[101] Yet the Region rejected Mirant Kendall's attempts to develop an alternative BTU Loading Approach.[102] For the reasons discussed infra, Mirant Kendall urges the Board to review that determination and find it clearly erroneous. Here, the point is only to illustrate the Region's failure to engage a promising approach.

The Region also stepped away from any effort to work with Mirant Kendall to develop the diffuser outfall proposal until it was clearly too late. The Region retracted its commitment to model the diffuser outfall as part of the Nutrient TMDL modeling process without informing Mirant Kendall until October 2005, well after it made its demand.[103] The Region then retreated behind its request for impossibly broad modeling demonstrations,[104] and then misrepresented the modeling submissions Mirant Kendall submitted.[105] The Region places responsibility for its decision not to authorize the diffuser on Mirant Kendall, on the ground that Mirant Kendall has not carried its burden to prove that the diffuser outfall does not have the reasonable potential to exacerbate algal growth, as discussed infra. The point here is only that the Region plainly shifted from a position of cooperation to a position of defense, at a time when continued cooperation should have led to authorization of the diffuser outfall and the benefits it would bring to the lower Charles River basin.

A further illustration of the Region's shift towards adversity is that the Region never accepted Mirant Kendall's requests to meet to discuss the results of Mirant Kendall's river monitoring program from 2004 and 2005. Even though the Response to

Comments shows the Region relied heavily on those monitoring results for its finding of prior appreciable harm, among other findings, the Region never allowed any discussion of its analyses with Mirant Kendall.

The Region sought to excuse its refusal to work with Mirant Kendall on the basis that any significant changes based on post-comment period information could lend to its "procedural burden" of re-noticing the permit for public comment.[106] But at the same time, the Region was relying heavily on post-comment information to make the permit substantially more burdensome to the permittee.

Mirant Kendall submits the history of the Region's non-cooperation to the Board for its consideration as a policy matter that the Board should review as a matter of its discretion. Specifically, where, as the Region acknowledges, the effect of the final NPDES renewal permit will be to force very substantial, and potentially fatal, curtailments of the Station's operations, as a policy matter it is incumbent upon the Region to work cooperatively with the permittee to explore less drastic solutions. Where those solutions also have the potential for benefits to the water body, it was especially incumbent upon the Region to work cooperatively with Mirant Kendall rather than to retreat behinds its bare legal duties. Mirant Kendall urges the Board to review the Region's handling of the permit renewal process and remand the permit to the Region for further, cooperative consideration.

2. Failure to provide required opportunity to comment on finding of prior appreciable harm

The Region's belated finding of appreciable harm -- made only after the close of the public comment period -- deprived Mirant Kendall, and all others, of an opportunity to prepare and submit comments on this issue. While Mirant Kendall appreciates the fact

that the Region reviewed the pertinent data gathered and submitted after the close of public comments, it objects to the Region's failure to re-open the public comment period when the Region made new, critical determinations based on its analysis of that data.

Under the applicable law, the Region's finding of appreciable harm was the necessary and critical analysis for denying Mirant Kendall's proposed variance. Prior to the response to comments, the administrative record contained no analysis or evaluation of the appreciable harm issue. The Region's new finding of appreciable harm, therefore, goes well beyond merely supplementing or modifying a pre-existing analysis or methodology. Under these circumstances, the Region's decision not to submit its critical appreciable harm analysis to the scrutiny of public comment represents a clear procedural error that violates the Clean Water Act and the Administrative Procedure Act.

a. Relevant Background

As discussed above, in February 2001, Mirant Kendall submitted a renewal application for its existing NPDES permit. Among other things, the application sought a continuation of the former permit's variance with respect to the state mixing zone policy.[107]

Under the applicable law, Mirant Kendall is entitled receive its proposed variance if it demonstrates that the applicable state water quality standards are "more stringent then necessary to assure the protection and propagation of a balanced, indigenous community of shellfish, fish and wildlife in and on the body of water into which the discharge is made." 33 U.S.C. § 1326(a); see also 40 C.F.R. § 125.73 (containing same language providing variances from "applicable standards"). The applicable regulations provide that Mirant Kendall, as an existing discharger, can base its demonstration "upon

the absence of prior appreciable harm ...." 40 C.F.R. § 125.73(c)(1). While Mirant Kendall bears the burden of demonstrating the absence of prior appreciable harm, it is the Region's obligation to analyze the issue and to make a finding one way or the other. And in the current matter, the Region failed to even analyze this issue until after the comment period closed, thereby insulating its critical finding from public comment. The inability to comment is especially prejudicial given that the Region made a determination that there had, in fact, been prior appreciable harm, and that determination was necessary in order for the Region to deny Mirant Kendall's variance.

b. Public Comment and The Region's Response

Mirant Kendall specifically commented on the absence of any finding by the Region that the thermal component of Kendall Station's prior discharge caused appreciable harm, and that the absence of any finding on this issue entitled Mirant Kendall to its requested variance. MK Comments, Comment C3, at p. 18. In fact, Mirant Kendall commented that the Region had not even conducted any appreciable harm analysis as it was required to do under the statute and prior to denying Mirant Kendall's variance. MK Comments, Comment C5, at p. 19.

The public comment period closed on October 14, 2004. Prior to that date, Mirant Kendall had provided the Region with biological data from the Charles River that it had compiled for the years 1999 through 2003.[108] Simultaneously with the submission of its public comments, Mirant Kendall provided the Region with the then recently compiled data set from the summer of 2004. MK Comments, Comment C3, at p. 18. Then on August 30, 2005, Mirant Kendall submitted the data from 2005 to the Region.[109] The data from 2002 through 2005 contained, inter alia, the results of Mirant Kendall's

annual fish sampling project, which consisted of beach seine and push-net samplings at various stations in the lower basin of the Charles River.[110]

On September 26, 2006, the Region issued its response to comments. Those comments contained the Region's first ever, and by its own words "detail[ed]" and "extensive[]," attempts at an appreciable harm analysis. RTC, Response to Comment C3, at pp. C4-C24. The Region states that the data set of biological data covering the years 2002 through 2005 was sufficient for determining that Kendall Station "has caused appreciable harm to the alewife and blueback populations in 2004-2005" because these species were excluded from certain habitat due to certain in-stream temperatures. RTC, Response to Comment C3, at p. C5.

But instead of re-opening the public comment period on this new, critical analysis, the Region issued the NPDES renewal permit without affording the public, or Mirant Kendall, the opportunity to provide any comment on -- what turns out to be -- a highly flawed analysis.

c. New and Critical Findings -- Such as the Region's Finding of Appreciable Harm in this Case -- Must Be Subjected to Public Comment

The importance of the public comment period is that it provides significant benefits to the public, the Region, and this Board. For the public, including Mirant Kendall as the regulated entity, it provides for meaningful participation in the Region's decision-making process. Such comment is especially critical under the current circumstances because the NPDES renewal permit will severely undermine Kendall Station's commercial viability.[111] For the Region, the public comment period is critical for allowing it an opportunity to respond to and resolve issues in an efficient manner

prior to making a final decision, and prior to having to spend resources litigating issues before this Board or in Federal Court. Finally, the public comment period benefits this Board by assuring that all issues capable of being resolved, focused, or refined are done so at the regional level, thereby assuring that this Board's resources are only spent engaging issues that are ripe and unable to otherwise be resolved or compromised. Such policy is sound because it is the Region that is best equipped to respond to comments on its own analyses in the first instance.

It is well-established that when an agency conducts a critical analysis or makes a significant determination after the public comment period closes, it must re-open the public comment period. E.g., Ober v. EPA, 84 F.3d 304 (9th Cir. 1996); Idaho Farm Bureau Federation v. Babbitt, 58 F.3d 1392 (9th Cir. 1995); Center for Biological Diversity v. Norton, 240 F.Supp. 2d 1090 (D. Ariz. 2003).

In Idaho Farm, The U.S. Fish and Wildlife Service (the "FWS") added a snail species to the Endangered Species List. 58 F.3d. at 1395. The FWS referred extensively to a provisional U.S. Geological Survey ("USGS") report in the supplemental information accompanying its final listing decision. Id. at 1403 (noting that FWS "relied largely on the USGS study to support its final rule"). Petitioners asserted, and the Court agreed, that the FWS had not made the USGS report available to the public prior to close of the comment period. Id. at 1402. The Court first noted that the only type of material that can be added to the administrative record without having to re-open the public comment process was material that merely expands on or confirms prior determinations, or that uses a consistent methodology to analyze the previously released data. Id. at 1402 (approving of a D.C. Circuit decision that upheld EPA's use of new data where the

analytical methodology remained "constant"). The Idaho Farm Court then held that the USGS report did not fall into this category. Id. (explaining that "the USGS study did not merely supplement or confirm existing data"). The Court provided two reasons for this holding. First, it found that FWS "relied largely on the USGS study to support its final rule," Id. at 1403, and that "the USGS report was critical to [FWS'] decision to list the Springs Snail." Id. Second, the Court found that the "[o]pportunity for public comment is particularly crucial when the accuracy of important material in the record is in question." Id.

In Ober, the Court considered whether the EPA violated the Administrative Procedure Act when it accepted and relied on additional information submitted by Arizona after the comment period and in response to EPA's request for additional information. 84 F. 3d at 313. Petitioners first learned of the additional material when EPA announced its final decision. Id. The Court agreed that EPA's acceptance of the "post hoc" justifications submitted by Arizona violated the Clean Air Act and the Administrative Procedure Act. Id. In reaching this decision, the Court noted that the post-comment information was the necessary justification, "the backbone of the" final decision. Id. at 314. The Court noted that "[t]he challenged post-comment period justifications did not merely expand on prior information and address alleged deficiencies. Instead, they addressed the submitted Implementation Plan's failure to comply with an essential provision of the Clean Air Act. Therefore, they were relied on and were critical to the EPA's approval of the Implementation Plan." Id. Another basis for the Court's decision was that "the accuracy of the additional information submitted after the comment period is in question because Petitioners argue that many of the

asserted justifications do not in fact support rejection of the control measures. These justifications should have been available for public comment before the EPA proposed approval of the Implementation Plan." Id.

Finally, in Center for Biological Diversity v. Norton, the FWS designated critical habitat under the Endangered Species Act for the Mexican Spotted Owl. The FWS excluded a large portion of Native American land based on a management plan submitted by the tribe but not disclosed as part of the administrative record during the public comment period. 240 F. Supp. at 1106-1107. The Court explained that the FWS should have made the management plan for the excluded land available for review and comment. Id. This failure, the Court held, violated the Administrative Procedure Act because the FWS relied heavily on incomplete information and, based on its incompleteness, the accuracy of the management plan was questionable; therefore, the need for public comment was great. Id. at 1108. Consequently, the FWS' final decision was made "without observance of procedure required by law." Id.

In the current matter, it is not disputed that the Region made its finding of appreciable harm after the close of the public comment period. It also cannot seriously be disputed that this finding of appreciable harm, under 40 C.F.R. § 125.73(c)(1), was necessary and critical to the Region's denial of Mirant Kendall's variance. Standing alone, under the well-established law articulated by Idaho Farm, Ober, and Center for Biological Diversity, this fact is enough to have required the Region to re-open the public comment period, rather than issuing a final decision based on this critical analysis. This is true especially where the appreciable harm analysis did not add to, expand on, or modify existing analysis or methodologies in the administrative record. In this matter,

the administrative record is devoid of any instance where the Region engaged in any type of analysis to determine whether "the normal component" Mirant Kendall's discharge has caused any appreciable harm. Just as in Ober, where the material provided after the close of the public comment period addressed a "failure to comply with an essential provision of the Clean Air Act," the analysis of appreciable harm in this case was a necessary analysis that the Region had failed to previously make, and which was necessary in order to comply with the Clean Water Act.

Nor can it be denied that the Region heavily relied on its new analysis, which was extensive. The Region stated that it "decided to respond in some detail to Mirant Kendall's claim that there has been no appreciable harm from Mirant Kendall's thermal discharge. [The Region] and MassDEP consulted extensively in the preparation of Response to Comment C3...and the two agencies collaborated extensively in its production." RTC, Response to Comment C3, at p. C5. Not only was the analysis and collaboration extensive in terms of the analysis itself, but the Region heavily and extensively relied on this analysis throughout its Response to Comments. In fact, the Region relied in whole or in part on its appreciable harm analysis as set forth in response to comment C3 in other comments, including, among others, Response Comment to B2, at p. B5; Response Comment to B9, at p. B11; Response to Comment D13, at p. 22; and Response to Comment G1, at p. G2.[112] The extensive nature of this analysis, and the reliance on this analysis to respond to a wide range of Mirant Kendall's other original comments, required that the Region submit the analysis to public comment before issuing a final permit.

Furthermore, the very fact that Mirant Kendall has even raised significant questions with respect to the Region's appreciable harm analysis is another factor in favor of remand. This Board need not engage or rule on Mirant Kendall's concerns because, as discussed above, the law articulated by in Idaho Farm, Ober, and Center for Biological Diversity, is that the very fact that questions could be and were raised, about the post-comment materials was sufficient to strongly warrant in favor of a remand for public comment.

In short, the Region's appreciable harm analysis was based on the premises that (1) juvenile alewives avoid water with temperatures warmer than 81° F, (2) because of this avoidance, juvenile alewives were "excluded" from a 1.3 linear mile stretch of the lower basin, and (3) this exclusion constituted appreciable harm because the area of exclusion was a spawning area. See generally, RTC, Response to Comment C3, at pp. C5-C20. Later in this Petition, Mirant Kendall articulates the many fatal flaws with the Region's appreciable harm analysis. See infra. For purposes of this argument in favor of a re-opening, however, it summarizes some of the following fatal problems with the Region's analysis:

- The Region reached a conclusion that appreciable harm occurred because juvenile alewives avoided water warmer than 81° F, despite the fact that the 2004 and 2005 data do not demonstrate any avoidance of this temperature. In fact, on days when at least one sampling station was above 81° F, an equivalent number of juvenile alewives were caught above this temperature as were caught below it.

- Four times as many alewives were captured in this "area of exclusion" than were captured outside of it. Moreover, water temperatures in this area were not consistently and pervasively above 81° F, so even if that were a correct avoidance temperature for juvenile alewives, those juveniles could not have been excluded from the 1.3 mile linear stretch of the lower basin; and

- The Region never even analyzed whether the "exclusion" area was a viable spawning ground, and never even analyzed whether adult alewives (as opposed to

juvenile alewives) were somehow excluded from that area. In fact, the exclusion area is not a viable spawning ground, and even if it were, adults alewives have not been excluded from this area.

Finally, remand on this issue will serve the goals behind the public comment period, as described above. The Region's failure to re-open the public comment period has deprived Mirant Kendall the opportunity to comment on the critical justification for the Region's decision to issue a permit that severely curtails Kendall Station's commercial viability. The Region's failure to open up public comment period after its finding of appreciable harm has wasted its own resources in having to address this issue in the first instance in this appeal, rather than in the more efficient "notice and comment" forum, where many of these issues may have been resolved. And finally, responding to Mirant Kendall's public comments is a duty belonging to the Region, and this Board should not be burdened by reviewing the Region's appreciable harm analysis, at the present time, especially when the need for review could be eliminated -- in whole or in part -- by remanding the issue for public comment.

3. Failure to provide required opportunity to comment on interpretations of 2004 and 2005 river monitoring program

Beyond its finding of appreciable harm, the Region relied on interpretations and analysis of the 2004 and 2005 river data in reaching several additional critical decisions with respect to the NPDES renewal permit. None of these analyses were made public for comment prior to the Region's issuance of its Response to Comments and the final NPDES renewal permit. Because these analyses, just as the Region's determination of appreciable harm, constituted critical new findings that were the sole basis for much more restrictive permit limits, those analyses must be submitted to public comment, under the same legal requirements described, supra.

a. Analyses of 2004 and 2005 Data Were the Critical Bases for the Thermal Limits in the NPDES Renewal Permit.

The Region based the thermal limits in the NPDES renewal permit on the temperature it determined would cause avoidance among alewives and yellow perch. See generally, RTC, Response to Comment C17, at p. C63. The Region's analysis of the 2004 and 2005 data -- after the close of the public comment period -- was a critical and necessary basis for its determination that 81° F was an avoidance temperature for alewives and yellow perch.

Prior to the Region's analysis of the 2004 and 2005 data, the Region largely relied on scientific literature as a basis for its avoidance analysis. In fact, in its Response to Comments, the Region recognized that reliance on scientific literature alone was an insufficient basis for determining a sufficiently precise avoidance temperature for alewives and yellow perch in the Charles River.[113] The avoidance analysis that the Region performed on the 2004 and 2005 data, therefore, represented a new approach to determining an avoidance limit.

Under the well-established law, discussed supra, the Region's post-public comment period analysis of the 2004 and 2005 data with respect to the temperature avoidance issue must be remanded for public comment. As the Region itself has stated, that analysis was critical to its determination of the precise avoidance temperature underlying the NPDES renewal permit's limits, and it could not have made this determination solely on the basis of the scientific literature.

Furthermore, the Region's reliance on its avoidance temperature analysis is extensive. Throughout its Response to Comments document, it frequently cites that analysis to rebut Mirant Kendall's comments on the draft NPDES renewal permit.[114]

And finally, the validity of the Region's temperature avoidance analysis is open to serious debate. The legal principles discussed above are also clear the fact that questions can be raised with respect to the validity of the post-public comment period analysis is a factor that strongly favors re-opening of the public comment period so that the Region can address the many issues. The same flaws that are identified above with respect to the Region's finding of appreciable harm are equally applicable to the Region's analysis on avoidance temperatures. This is because the Region relies on the same analysis in its Response to Comment C3 to draw these two related but distinct conclusions.

b. The Decision to Impose a Much More Stringent In-stream Temperature Limit Was Based on an Analysis of the 2005 Data

The draft NPDES renewal permit proposed an in-stream temperature limit of 83° F, which is the numeric criterion for water temperature under the applicable state water quality standards. See draft NPDES renewal permit, Attachment A. This meant that each compliance point in the ZPH would have to be below 83° F, measured using a four-hour average, in order to be in compliance with temperature requirements during the summer season. Id. In its comments, Mirant Kendall made several arguments as to why this temperature and compliance scheme was over-protective. See generally, MK Comments C1-C50.

After the close of the public comment period, the Region analyzed actual in-stream temperatures from 2005 that were included in the 2005 Charles River data set submitted by Mirant Kendall. See RTC, Response to Comment C44, at pp. C129-C134. Based on this analysis, the Region determined that a thermal limit of 83° F at the compliance points in the ZPH would not assure that there would be sufficient available habitat below the Region's newly determined avoidance temperature of 81° F. Id. at

C129. And based solely on this conclusion, the Region imposed an 81° F thermal limit at certain compliance points in the ZPH during certain times of the day. Id.

Prior to this point, the Region had never performed this type of habitat availability analysis using any of the river data that Mirant Kendall had provided prior to the issuance of the draft NPDES renewal permit, or prior to the close of the public comment period. Accordingly, this new analysis was the sole basis for the Region's decision to impose an 81° F temperature limit at certain compliance points in the ZPH during certain times of day.[115]

As discussed above, well-established principles require that whenever an agency conducts an extensive analysis critical to its final decision after the close of the public comment period, it must submit that decision to public comment. Because the sole, critical basis for the Region's decision to impose new thermal limits in the NPDES renewal permit was its analysis of the 2005 data after the close of the public comment period, its analysis must be subjected to public comment.

And, as also discussed above, the fact that the Region's analysis is highly questionable provides an additional reason for remand and reopening on this issue. For example:

- The Region's new in-stream thermal limits are actually below the numeric criteria of the applicable state water quality regulations, and are below ambient levels regularly seen in the lower basin of the Charles River;[116] and

- The Region's methodology suffers from a serious flaw in that the analysis of water temperatures in the ZPH under the current permit, which does not have in-stream thermal limits or four-hour averaging periods as compliance requirements, cannot be the basis for predicting what water temperatures would be under the NPDES renewal permit that does contain such compliance requirements and that would result in temperatures being much cooler. In other words, the Region's determination that suitable habitat was not available in 2005 under the current permit has no bearing on whether there have been suitable habitat under the

original in-stream thermal limit of 83° F proposed by the draft NPDES renewal permit.

And finally, the impact of this new thermal limit is a relevant factor to consider when determining whether it should be submitted to public comment. Simply put, this new permit limit will increase the number of days in which Kendall Station will have to be shut-down. In this sense, Mirant Kendall is not seeking remand on a minor, technical change to the Permit that was based on analysis that took place after the public comment period. Rather it is seeking the ability to comment on the imposition of a new temperature limit that will have a substantive impact on its ability to operate and remain commercially viable.

4. Failure to use Nutrient TMDL model to consider effects of proposed diffuser

The Region's Nutrient TMDL indisputably involved issues that overlapped with issues central to the Station's NPDES renewal process. The effect of the Station's thermal discharge on algal blooms was central to both processes, as any cursory examination of the record in the NPDES renewal permit process reveals, as does review of the Region's draft TMDL issued in November, 2005.[117] The Region does not deny that overlap, and acknowledges that the Nutrient TMDL originally was intended to address the potential benefits of the proposed diffuser outfall.[118] Indeed, the Nutrient TMDL model developed by the Region included a "diffuser configuration" to enable it to assess that possibility, and EPA expressly indicated its intention to utilize that model for that purpose.[119]

Nevertheless, subsequently the Region determined not to model the proposed diffuser as part of its Nutrient TMDL, and it now asserts that neither EPA nor its TMDL

modeling consultants have performed simulations involving the proposed diffuser (other than "preliminary setup").[120] Further, the Region now asserts that the scope of the Nutrient TMDL is "separate" from the NPDES permit renewal process because now the TMDL is only intended to simulate existing conditions in the basin, not potential future conditions, and now is focused on controlling sources of nutrients. The Region also asserts that the draft TMDL was not used "in any way to develop the Draft [sic] Permit."[121]

Those assertions by the Region, however, evade the controlling points: that the Region had indicated it would utilize the TMDL model to evaluate the potential effects of the proposed diffuser; that the underlying purpose of the TMDL is to assess the eutrophication problem broadly and recommend solutions, of which the proposed diffuser is a major candidate; that the same staff person at EPA responsible for the Nutrient TMDL also is responsible for the eutrophication and diffuser-related issues in the permit renewal process; and that most of the persons involved in developing the Nutrient TMDL (staff from CRWA; the experts from the TAC whom the Region also solicited as experts on the draft renewal permit), considered that the diffuser outfall issues were also involved in the Nutrient TMDL.

Mirant Kendall stresses this overlap, and the fact that the Region backtracked from its commitment to use the Nutrient TMDL model to model the proposed diffuser in order, to show the Region's decided lack of cooperative effort to work with rather than against Mirant Kendall. Mirant Kendall requests that this Board exercise its powers of review of the NPDES renewal permit to determine, as a matter of policy at its discretion, that the Region's conduct warrants remand and reconsideration of the decision not to

authorize the diffuser outfall. Where that diffuser outfall would both increase habitat in the Charles River, as well as significantly reduce the curtailments otherwise required by the NPDES renewal permit, the Region had an obligation to follow through on its commitments and work more cooperatively with Mirant Kendall.

5. Unclear Attributions to MassDEP water quality certification

The joint issuance of the NPDES renewal permit by the Region under the Clean Water Act and by MassDEP under the Massachusetts Clean Waters Act, accompanied by the MassDEP WQC under state law and § 401 of the Clean Water Act, leave a muddled record concerning which portions of the permit are attributable to the MassDEP WQC as opposed to the portions attributable to the Region and subject to review by the Board. Mirant Kendall submits that all but one portion of the permit is subject to the Board's review.

First, the portion that appears attributable just to MassDEP is that agency's determination to establish entrainment standards for the barrier net system at the cooling water intake structure. Both the Region and MassDEP attribute those requirements exclusively to MassDEP.[122] Mirant Kendall has appealed the MassDEP WQC at the state level[123] and expects to receive an adjudicatory hearing on that and other issues in that forum.

The remainder of the permit issues, however, are subject to the Board's review. The Region in the RTC was explicit that all of the determinations on the permit were made by the Region itself.[124] The Region also indicated that MassDEP joined in those determinations, and noted that MassDEP had issued its WQC, but the RTC does not state

that EPA's determinations or the permit requirements (excepting the entrainment requirements) were imposed or required by the WQC.[125]

Turning to the WQC, there MassDEP joins in certain of the determinations in the RTC, but far from all. Specifically, it indicates that the "each of the variance-based thermal discharge limits and related conditions in the final permit is necessary to achieve compliance with" the CWA, the state Clean Waters Act, and the state water quality standards and related MassDEP regulations.[126] And it also indicates that the impingement-related and monitoring provisions of the final permit are, respectively, "sufficiently protective" and "adequate and appropriate" to assure compliance with the CWA, the state act, the state WQS and related regulations.[127]

MassDEP pointedly did not, however, identify which of those provisions rely on the Massachusetts Water Quality Standards, so it is not possible to determine whether those findings in the WQC are based on the state WQS or on MassDEP's interpretations of the other cited authorities. Further, with respect to the impingement and monitoring requirements, the MassDEP WQC does not claim those requirements are necessary to comply with the WQS; it only indicates they are adequate.

These deficiencies in the MassDEP WQC appear to stem from a conscious policy at MassDEP to avoid making the findings required under 40 C.F.R. 124.53(e), which calls for the certification, inter alia, to specify whether any of the conditions in the permit prepared by the Region could be made less stringent without violating water quality standards. See In re City of Fitchburg, 5 E.A.D. 93, 95-96 (EAB 1994). Accordingly, the Region cannot avoid the Board's review of its determinations by pointing to the MassDEP WQC, because both the RTC and the MassDEP WQC omit or avoid any

statement of which determinations (excepting the entrainment requirements) are attributable the MassDEP WQC.

Another reason all of the Region's determinations are subject to the Board's review is that all of MassDEP's determinations are under review at the state level.[128] In the event that any of those determinations are overturned or modified at that level, the Region's own determinations will stand alone and are subject to review by the Board.

Finally, review of the Region's determinations by the Board is necessary to avoid a Catch-22. MassDEP's regulations automatically stay state adjudicatory hearings on a state surface water discharge permit that also is a NPDES permit if there is an appeal of the NPDES permit to this Board. MassDEP's Office of Mediation and Dispute Resolution has already issued a stay under that rule.[129] Accordingly, were this Board to decline review of permit provisions that the Region imposed in claimed reliance on state requirements, and then uphold them as federally enforceable, Mirant Kendall would have been deprived of any meaningful review of those provisions.

6. Improper Reliance on MCZM's Conditional Concurrence

For the reasons established in Mirant Kendall's notice of appeal of MCZM's conditional concurrence, that conditional concurrence functioned as an objection to EPA's issuance of the NPDES renewal permit.[130] Specifically, MCZM explicitly conditioned its concurrence on a reservation of MCZM's right to object to the NPDES renewal permit retroactively, depending upon the outcome of its review of post-permit submissions by Mirant Kendall and post-permit determinations by the Region and MassDEP. Accordingly, the Region violated the Coastal Zone Management Act

("CZMA"), by issuing the final NPDES renewal permit on September 26, 2000 over an objection by MCZM.[131]

Mirant Kendall acknowledges that after the Region issued the NPDES renewal permit, MCZM issued correspondence that sought to supersede and replace its conditional concurrence.[132] That correspondence does not, however, remove the Region's violation of the CZMA. As the permit was issued in violation of the CZMA, the Board should remand the permit to the Region for reconsideration in view of MCZM's new position.

B. Temperature Issues

1. Erroneous Finding Of Prior Appreciable Harm

As discussed above, Mirant Kendall believes that the Region's finding of appreciable harm -- first made after the close of public comment period and critical under the applicable law for its denial of Mirant Kendall's variance -- must be submitted to public comment. That argument is only bolstered by the fact that, as is set forth in more detail below, there are so many flaws in the Region's analysis that its decision is clearly arbitrary and capricious.

a. Mirant Kendall's Biological Monitoring and Sampling Data, and its Public Comments with Respect to Appreciable Harm.

As discussed above, Mirant Kendall provided the Region with the results from its biological monitoring and sampling programs from 1999 through 2003 prior to the issuance of the draft NPDES permit.[133] Concurrently with its public comments on the draft Permit, Mirant Kendall provided the Region with the results from its 2004 biological monitoring and sampling program. MK Comments, Comment C3, at p. 18. During the public comment period, Mirant Kendall pointed out that the biological

sampling it had done in the Charles River demonstrated that the BIP had not suffered any appreciable harm due to Kendall Station's discharge, and therefore, it was entitled to a variance under § 316(a) of the Clean Water Act. MK Comments, Comment F1, at pp. 87-88. After the public comment period, Mirant Kendall provided the recently compiled data from its biological monitoring and sampling from 2004 and 2005.[134] Along with these submissions, Mirant Kendall provided detailed comments to the Region showing that the new data was consistent with the data from previous years in that it contained no basis for concluding that the BIP suffered any appreciable harm.[135]

The biological data that Mirant Kendall provided included results from its push-net, gill net and beach seine sampling from several stations in the lower basin of the Charles River.[136] These three sampling methods recorded both the number of fish caught during a particular sampling event, as well as the water temperature from the area where the fish were caught.[137]

b. The Region Makes an Appreciable Harm Determination After the Close of the Public Comment Period.

After the close of the public comment period, the Region analyzed the 2002 through 2005 biological sampling data submitted by Mirant Kendall, and made the critical determination necessary for denying Mirant Kendall's variance that appreciable harm had occurred to both alewives and bluebacks in 2004 and 2005. RTC, Response to Comment C3, at p. C20. The Region did not re-open the public comment period on this critical decision, but rather included it in its response to comments that were released simultaneously with the Renewal Permit.

The Region's conclusion of appreciable harm rests on the Region's finding that alewives (and to a lesser extent bluebacks) avoided water temperatures at or above 81° F.

RTC, Response to Comment C3, at p. C5. The Region concluded that avoidance of these temperatures caused "the bulk of the alewife population, and a very substantial portion of the blueback population, [to be] excluded, for long periods of time, from unacceptably large areas of the lower basin." RTC, Response to Comment C3, at p. C5. The Region never explained what it meant by "excluded" and it never identified the "long periods of time" when this exclusion occurred. Finally, the Region did not provide a clear explanation of what "unacceptably large area" constituted the area of exclusion. The Region did state that it found exclusion from an unspecified 1.3 linear mile stretch of the lower basin of the Charles River. RTC, Response to Comment C3, at p. C20. It appears that the Region is referring to the 1.3 linear mile area between the MIT and Old Locks sampling stations where Mirant conducted some of its push-net surveys because Old Locks is .5 miles downstream from Kendall Station's discharge, and MIT is .8 miles upstream. RTC, Response to Comment C3, at p. C11 (Table 3-1). While the Region found that bluebacks and alewives both suffered appreciable harm from exclusion, a majority of the Region's analysis was focused on alewives because the Region identified alewives as the most sensitive species with respect to temperature. See generally, RTC, Response to Comment C3.

The Region's analysis on appreciable harm suffers from several fatal flaws set forth in more detail below. These flaws include:

- **The 2004 and 2005 data contradict the conclusion that 81° F is an avoidance temperature for juvenile alewives.** The Region did not even perform a temperature avoidance analysis of the 2005 data for the 81° F temperature that it claims caused the avoidance that led to the appreciable harm. Instead, the Region made an erroneous analysis based on distance rather than temperature. In fact, when a temperature based analysis is performed on the data, comparing results among stations on days where one station was above 81° F and another below, it shows that the distribution of

alewives in the lower basin has no correlation with whether a sampling station was above or below 81° F. In fact, on days when one or more sampling stations in the lower basin were above 81° F, equivalent numbers of alewives (about 1-2 per event) were caught above 81° F as were caught below 81° F;

- **Even if 81° F was an avoidance temperature, there have not been any exclusions from unacceptably large areas of the Charles River attributable to that temperature.** Even if the Region's conclusion about the 81° F avoidance temperature were correct, the 2003 through 2005 data plainly show that there simply has not been any exclusion of alewives or bluebacks from the "1.3 liner mile stretch" of the lower basin, as the Region claims. Substantially more alewives were caught in the area from which the Region claims alewives were excluded than were caught outside of that area. Bluebacks were caught *on every date at every station* within the so-called exclusion area in 2005, a warm year of highest plant heat load.

- **The Region did not conclude and its analysis does not support the critical finding that adult alewives are excluded from unacceptably large areas of viable spawning habitat.** Another major flaw with the Region's analysis is that under its own criteria, appreciable harm only occurs if there is exclusion from unacceptably large areas of spawning and nursery habitat. The Region's analysis does not satisfy this standard in a couple of ways, one of which is that all of its conclusions with respect to temperature avoidance were based on studies of juvenile alewives and not spawning adults. In fact, the Charles River tagging and gill net data show that adult alewives are not excluded from passing through and spawning in the 1.3 linear mile stretch of the lower basin at issue, even assuming that that area constitutes viable spawning habitat, which it does not.

In addition to these fundamental flaws in the Region's analysis, there are several additional flaws with the Region's approach to this issue -- many of which by themselves are sufficient to completely undermine the Region's determinations. While Mirant Kendall provides its analysis on each of these issues below, it cannot be emphasized enough that the issues it presents below should be addressed by the Region in a notice and comment period. Such an opportunity will allow the record to be more fully developed on this critical inquiry, and may obviate, or at least limit, the need for future review.

c. The 2004 and 2005 Data Contradict the Region's Conclusion that 81° F is an Avoidance Temperature.

As stated above, the Region's appreciable harm analysis was based on its conclusion that the alewives and bluebacks generally avoid temperatures above 81° F.

If the Region's conclusion about temperature avoidance at 81° F were correct, then the Charles River data would show very few, if any, alewives being captured at temperatures at or above this level. But the data are precisely to the contrary. As described in more detail below, on days when one or more sampling stations were above 81° F, there were just as many (if not more) alewives caught at those stations above 81° F than there were alewives caught at stations below 81° F - about one or two fish per sampling event.

It cannot disputed that the Region failed to perform a temperature avoidance analysis that would have been necessary to confirm its hypothesis of avoidance at temperatures above 81° F. Performing such an analysis on the data to determine if it suggests that alewives avoid temperatures above 81° F is relatively straight forward.. It takes a comparison of catches at comparable sampling stations on days when at least one of those stations was above 81° F. For the data to support the conclusion that 81° F was an avoidance temperature, it would have to show that alewives avoided the stations over 81° F in preference for the stations that were below 81° F. But this is not the case:

Summary Comparison of Alewives Caught by Push Net in 2005 When Water Temperatures Exceeded 81° F at One or More Stations[138]

	# Sampling Events	# Alewives	# Alewives First Push	#Alewives / Event (CPUE)	# Alewives / First Push
Above 81°F	**34-35**	**40-47**	**25-31**	**1.18-1.34**	**0.81-0.89**
Below 81°F	**19-20**	**34-41**	**17-23**	**1.79-2.05**	**0.90-1.15**

Because the total number of alewives caught above 81° F was greater than or equivalent to the total number of alewives caught below 81° F on days when one or more sampling stations were above 81° F and there are no significant sampling biases against the "below 81° F" stations. The data do not support a conclusion that 81° F is an avoidance temperature for alewives.[139] If 81° F were truly an avoidance temperature, there would be a much more pronounced difference between the total number alewives caught and the CPUE at stations above 81° F as compared with stations below 81° F. In fact, the data exhibit the contrary, these fish voluntarily inhabited waters above 81° F just as readily as they inhabited waters below 81° F.

A similar way that the data discredit the 81° F avoidance finding is to focus in on the time period in the summer when temperatures first rose above the purported avoidance level of 81° F at one of the sampling stations in the lower basin. This type of focus is helpful because distribution of alewives in the cooler fall, when all stations were well below the Region's avoidance temperature, is necessarily due to factors other than a preference to avoid 81° F. In other words, it is necessary to focus on a time period when 81° F would be relevant to fish distribution in order to test whether the data do, in fact, support the conclusion that it is relevant. The importance of this fact is readily evident from the data itself - 80% of the alewives caught at the so-called "reference station" (Hyatt) outside the purported "exclusion area" in 2005 were caught there after temperatures everywhere were dropping into the 60s. Further, the catch on a single such day (September 30) accounted for 70% of the whole 2005 Hyatt total. The Region then used that catch, which dominated the overall statistics, to falsely argue about "exclusion"

at 81° F when, by definition, that catch occurred too late in the year to provide any information at all about that temperature value.

Juvenile Alewife Catch at All Push Net Stations July 11- September 14, 2005

Station	Distance from Discharge miles	Mean Water Temperature (Degrees F)	Total Alewives	Night Sampling Events	Mean Alewives/ Event
Hyatt	1.4	78.1	15	10	1.5
MIT	0.8	78.8	4	6	0.67
Old Locks	0.5	81.7	41	9	4.6
Boston	0.2	83.0	11	10	1.1
Mid-channel	0.1	83.7	5	10	0.5
Shallow Diffuser	0.05	84.4	7	10	0.7
Mean # Alewives at Stations Where Water Temps Averaged Below 81°F			**9.2**		**1.09**
Mean # Alewives at Stations Where Water Temps Averaged Above 81°F			**16.0**		**1.73**

Without the bias of cooler and irrelevant, Fall catches to skew the results, these data show that, contrary to the Region's position, it is the warmer stations in closer proximity to the discharge that had higher mean alewives per event, or catches per unit of effort ("CPUE"), for juvenile alewives in the summer months. The CPUE at stations that experienced mean summer temperatures above 81° F was 1.73, compared with a CPUE of 1.09 at stations that experienced mean summer temperatures below 81° F. Thus, both sets of stations averaged between one and two alewives per event.

Finally, it is possible to further isolate the insignificance of 81° F on alewife distribution by comparing catches on the same day at the Hyatt Station, MIT Station, and any of the Stations within half a mile of the discharge ("Discharge Station") when the

Discharge Station was above 81° F and at least one of the others was below 81° F. Hyatt Station is the furthest upstream from the discharge, and the MIT Station is about two-thirds of the distance upriver toward the Hyatt from the Discharge Stations. Because the Discharge Stations and MIT Station present similar deep water habitat for juvenile alewives (Hyatt is shallow) and because MIT and Hyatt present similar temperatures, a comparison of these three stations isolates the temperature effects. In other words, because temperature is almost identical at Hyatt and MIT, distribution of fish between these two stations must be explained by some other variable. And because the habitat at MIT and the Discharge Stations is similar, distribution of alewives between these two stations helps isolate temperature effects.

July 25, 2005

Station	Temperature	Alewives Caught
Hyatt	79.0° F	0
MIT	80.1° F	(not sampled)
Discharge	84.0° F	1

August 11, 2005

Station	Temperature	Alewives Caught
Hyatt	80.8° F	0
MIT	82.8° F	0
Discharge	85.2° F	1

August 18, 2005

Station	Temperature	Alewives Caught
Hyatt	77.7° F	1
MIT	79.6° F	0
Discharge	82.1° F	1

August 23, 2005

Station	Temperature	Alewives Caught
Hyatt	76.9° F	1
MIT	78.2° F	3
Discharge	83.5° F	3

September 1, 2005

Station	Temperature	Alewives Caught
Hyatt	77.9° F	0
MIT	78.4° F	0
Discharge	81.3° F	7

September 14, 2005

Station	Temperature	Alewives Caught
Hyatt	74.8° F	3
MIT	77.0° F	0
Discharge	81.1° F	5

If the Region's hypothesis were true, the above presentation of data would have had to show that when the Discharge Station was above 81° F and MIT was below 81°F, there were more alewives at MIT Station and its comparable habitat. And similarly, if, as the Region suggests, alewives preferred the Hyatt Station over the stations closer to the discharge because of its relatively cooler temperature, than there would be a comparable number of fish at the MIT Station because of its almost identical temperatures.

What the data show, however, is quite the opposite. Alewives were more abundant in the catch at the Discharge Station as compared to the MIT and Hyatt Stations even when temperatures at those stations were below 81° F and the temperature at the Discharge Station was above that level. This demonstrates that the alewives' distribution was not determined by avoidance of the 81° F temperature limit. The overall data suggest, as reported by Mirant to the Region in its October, 2004 "308 letter" response

that alewives clearly prefer the shallow, vegetated habitat with abundant benthic food at the Hyatt Station to the deep, oxygen-poor habitat at MIT Station, despite the fact that temperatures between the two stations are close to identical. This demonstrates that alewives may prefer Hyatt to other stations based on the other habitat variable besides temperature. Rather than supporting the Region's analysis, therefore, the River data demonstrate that alewives are distributed throughout the lower basin for reasons other than a general preference to avoid temperatures higher than 81° F.

d. Even if 81° F Was a Correct Avoidance Temperature, There Has Been No Exclusion from Unacceptably Large Areas of the Lower Basin Attributed to That Temperature.

Even if the data supported the Region's conclusion that 81° F was an avoidance temperature for alewives, there is nothing in the 2004 or 2005 data demonstrating that juvenile alewives were excluded from the "1.3 linear mile stretch" of the lower basin of the Charles River that the Region claims to constitute the "unacceptably large area" for purposes of its appreciable harm conclusion.

It is simply not true that alewives were excluded from the 1.3 linear mile stretch of the lower basin. The total number of alewives caught inside this 1.3 linear mile stretch during the mid-July to mid-September timeframe was 68, four times greater than the 17 alewives caught outside this area from 2003 through 2005 when the temperature at any of the sampling stations was greater than 81°F.[140] This fact alone is simple proof that there has not been any "exclusion" from this area. The Region cannot argue that these results are skewed because there were more sampling events in this area than outside of this area because "exclude" is an absolute term, meaning "to prevent or restrict the entrance of, [or] to bar from participation, consideration, or inclusion."[141] This means that for there to

truly be "exclusion" there would not be any fish, or there would be dramatically fewer fish, no matter how many sampling events were conducted. For this reason, the Region cannot bolster its faulty "exclusion" premise by pointing to CPUE.

It is also true that temperatures above 81° F did not occur consistently or pervasively in this area over the three years taken together, even though the plant ran at high heat load and only one of the years (2004) was cooler than normal. In other words, it is another flaw in the Region's reasoning to purport that there would not be exclusion from this 1.3 linear mile stretch when the water temperature throughout this area exceeded 81° F for "long periods of time" (whatever that means). The 2004 and 2005 data show that this is simply not true. In 2004 temperatures during all but two of the more than ten summer sampling events in this 1.3 linear mile stretch were below 81° F, which is the Region's criterion for avoidance.[142] For this reason, the Region cannot claim there was appreciable harm due to exclusion from this 1.3 linear mile stretch in 2004 based on the premise -- even if correct -- that alewives avoid water temperatures that exceed 81° F.

e. The Region's Failure to Find that Adult Alewives Have Been Excluded from an Unacceptably Large Spawning Area.

Even if the data did support the Region's theory that juvenile alewives have been excluded from an unacceptably large 1.3 linear mile stretch of the lower basin due to pervasive water temperatures over 81° F in that area, the Region would still not be able to make a finding of appreciable harm because such a finding based on purported "exclusion" requires a showing that adults are excluded from spawning habitat.

The Region states that its finding of appreciable harm is based on exclusion from unacceptably large "spawning and nursery" habitat. RTC, Response to Comment C3, at

p. C7. The Region's conclusion that exclusion from an area does not constitute appreciable harm unless that area is both a spawning and nursery habitat is compelled by the literature the Region relies upon with respect to its selection of this appreciable harm standard. The Region's sole reliance for its determination that exclusion from unacceptably large areas of habitat represents appreciable harm is the Draft Interagency 316(a) Technical Guidance Manual and Guide for Thermal Effects Section of Nuclear Facilities Environmental Impact Statements (EPA, May 1, 1977) ("Technical Guidance Manual").[143] The Technical Guidance Manual is clear that exclusion from "unacceptably large areas" cannot constitute appreciable harm if the discharge is in a "low potential impact area." Section 3.3.5.1, at p. 28. An area may be considered a "low potential impact area" if the applicant can demonstrate the following four criteria:

1. The occurrence of sport and commercial species of fish is marginal;

2 The discharge site is not a spawning or nursery area;

3. The thermal plume (bounded by the 2°C isotherm) will not occupy a large portion of the zone of passage which would block or hinder fish migration under the most conservative environmental conditions (based on 7-day, 10-year low flow or water level and maximum water temperature);

4. The plume configuration will not cause fish to become vulnerable to cold shock or have an adverse impact on threatened or endangered species.

Section 3.3.5.2, at p. 29. The Technical Guidance Manual's use of the disjunctive "or" in the second numbered paragraph means that an area can be a low impact area, if it either is (a) not a spawning area, or (b) not a nursery area. This interpretation (which was adopted by the Region) of the Technical Guidance Manual makes sense because exclusion from unacceptably large areas of a low impact area likely causes no harm.

The Region does not claim that Kendall Station's discharge is in an area described by numbered paragraphs 1, 3, or 4 quoted from the Technical Guidance Manual above. RTC, Response to Comment C3, at p. C8. The sole basis for the Region's decision that Kendall Station's discharge is not in a low impact area is its finding that the discharge is in a spawning and nursery habitat. RTC, Response to Comment C3, at p. C8. In order to base its finding of appreciable harm on exclusion, therefore, the Region must determine that (1) the area effected by the discharge is an area that is a viable spawning area to establish that the discharge is not in a low impact area,[144] and (2) adult alewives have been, in fact, excluded from spawning in that area.

The Region fails to establish either one of these factors with respect to the 1.3 linear mile stretch of the Charles River at issue. First, the Region made no determination that this entire 1.3 linear mile stretch is affected by the discharge. The Thermal Guidance Manual suggests that the area impacted by the discharge is any area where temperature is increased by a 2° C isotherm. Section 3.3.5.2, at p. 29. Because it failed to make even this preliminary required determination, the Region's appreciable harm analysis is flawed. Second, the Region failed to provide any analysis on whether this 1.3 linear mile stretch is a viable spawning area.[145] As set forth infra, the area of the lower basin affected by Kendall Station's discharge is not a viable spawning habitat because any spawning that takes place in that area results in eggs that either sink to the bottom and experience lethality due to the low dissolved oxygen and toxic sediment at those depths, or results in the eggs being advected out of the system into the harbor with absolutely no chance of returning to the nursery in the river system. In fact, if alewives were truly excluded from spawning in this area, it would actually benefit the population because

spawning would take place further upstream, giving the eggs a much greater chance for survival.

Finally, even assuming that the Region did demonstrate that the area affected by the discharge is viable spawning habitat, there is nothing in the Region's appreciable harm analysis supporting the conclusion that adult alewives are excluded from that area during the spawning season (or anytime else for that matter). In fact, Mirant's gill net catches every year since 2002 have captured adult alewives throughout this earea. The Region's entire "exclusion" analysis is based on a finding that juvenile alewives are excluded because of a purported avoidance by juveniles of water temperatures at or above 81° F. Nothing in the Region's analysis can be used to support the conclusion that spawning adult alewives avoid temperatures above 81° F, or have been excluded from any portions in the lower Charles River. In fact, even assuming that adult alewives, which are less sensitive to temperature effects, are excluded by temperatures above 81° F, the data are clear that (a) temperatures in the 1.3 linear mile stretch of the Charles River during spawning season for alewives (which generally ends by June) are below this level until after spawning has finished,[146] and (b) nothing in the record indicates that adult alewives are, in fact, excluded from this 1.3 linear mile area, considering that they have been observed in the immediate vicinity of Kendall Station's discharge during spawning season and at other times.[147]

f. Additional Unaddressed Flaws with The Region's Appreciable Harm Analysis

In addition to the fatal flaws discussed above, there are several other problems with the Region's appreciable harm analysis, which the Region has failed to adequately

address. By failing to take into account these additional issues, the Region's analysis on appreciable harm is, at best, incomplete, and, at worst, incorrect.

i. No Finding of Appreciable Harm to Bluebacks in 2003 When Temperatures in the ZPH Were Higher than in 2004 Casts Doubt on the Region's Methodologies.

It is significant that the Region did not conclude that there had been any appreciable harm to bluebacks in 2003. The Region's failure to make such a finding is wholly inconsistent with the fundamental principle behind the Region's appreciable harm analysis, which is that avoidance of higher river temperatures leads to exclusion. As discussed above, the Region's appreciable harm analysis was premised on its finding that blueback and alewives were excluded from habitat in 2004 and 2005 because most of those river herring avoided water temperatures at or above 81° F. But it is inconsistent for the Region to find appreciable harm due to thermal effects in 2004 but not for 2003, considering that temperatures at the sampling stations in 2003 were higher than in 2004.[148] If exclusion were truly due to thermal effects, as the Region claims, then bluebacks would have suffered more harm in 2003 than in 2004. But the Region did not make such a finding, and did not explain its failure to do so. This unexplainable inconsistency casts additional doubt on the Region's approach to analyzing appreciable harm.

ii. Erroneous Applications of the Appreciable Harm Regulation

The Region determined that it could consider "the cumulative impact" of Kendall Station's discharge "together with all other significant impacts on the species affected" in making its appreciable harm finding. RTC, Response to Comment C3, at p. C6. The

language that the Region quotes relates to a determination of whether the alternative effluent limit will protect and propagate the BIP. 33 U.S.C. § 1326(a); see also 40 C.F.R. § 125.73(c)(2)(i). The regulations are clear that a different standard applies in an appreciable harm analysis. The appreciable harm analysis must examine whether appreciable harm occurred because of "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. 40 C.F.R. § 125.73. The ability for the Region to consider other impacts under an appreciable harm analysis, therefore is much narrower than its ability to consider other impacts under an analysis of whether alternate limits assure the protection of the BIP. The Region erred, therefore, by applying the broader standard for considering "other impacts" applicable to the analysis of alternate effluent limitations to the separate appreciable harm analysis that has its own narrower standard for considering other impacts.

Furthermore, the Region's appreciable harm analysis is devoid of this requisite focus on or analysis of the effects from "the normal component" of Kendall Station's discharge. In fact, the Region's analysis wholly ignores, and fails to isolate, the effects of Kendall Station's discharge. The Region's analysis essentially compared CPUE at different sampling stations in the Charles River based on distance from the discharge, but never performed a temperature analysis on these stations and without regard to habitat differences. See generally, RTC, Response to Comment C3. Significantly, that temperature analysis did not even consider the effects of Kendall Station's discharge on river temperatures.

For example, in its appreciable harm analysis, the Region failed to identify the portions of the Charles River that it believed were impacted by Kendall Station's discharge in 2004 and 2005. The Region also failed to analyze the amount of influence on temperature that Kendall Station's discharge had on the sampling stations in 2004 and 2005. Absent this type of analysis, the Region has failed to adequately connect its finding of appreciable harm with Kendall Station's discharge as required by the applicable regulations.

Finally, when undertaking an appreciable harm analysis, the region "shall consider the length of time in which the applicant has been discharging and the nature of the discharge." 40 C.F.R. § 125.73(c)(2). For the past 57 years, there have never been any observed or reported impacts on the BIP from Kendall Station's discharge. The regulations require that the Region consider this fact, but there is nothing in the record or response to comments that indicates such a consideration was made.[149]

iii. Mirant Kendall Provided The Region With Data Explaining Why CPUE Was Higher at the Hyatt Station, As Opposed to Some of the Stations Closer to Kendall Station.

The Region admitted that there could be some reason unrelated to thermal effects as to why CPUE was higher at the upstream Hyatt Station as compared with the stations closer to Kendall Station's discharge, but said that Mirant Kendall had failed to suggest any such "credible alternative explanation...." RTC, Response to Comment C3, at p. C14.[150] This is not correct. Mirant Kendall has provided and the record contains plenty of information explaining why Hyatt -- for non-thermal reasons -- exhibits among the highest CPUE:

- **More plentiful preferred food source:** Mirant Kendall provided the Region with data showing the stomach contents of juvenile river herring.[151] This data suggested that juvenile alewives in particular preferred to eat aquatic insects and freshwater clam larvae that are more prevalent in the shallow habitat near Hyatt Station than in the other deeper, anoxic downstream stations.[152] The reason for this difference in preferred food source is that Hyatt Station has sufficient bottom vegetation, low salinity and dissolved oxygen levels to support this benthic community, whereas the stations downstream have toxic sediment at depth, too high a salinity for insects and a lack of sufficient dissolved oxygen at depth precluding development of this benthic community. The absence of benthos at depth greater than 15 feet in these areas was demonstrated in the February, 2001 Permit Renewal application.[153] It would be inconsistent for the Region to argue against these findings because the Region itself recognized that the toxic sediments that predominate the bottom of the lower basin downstream from Hyatt "are not likely to support a viable and healthy macroinvertebrate community that would in turn provide sustainable food source for finfish." RTC, Response to Comment E1, at p. E11.

- **Hyatt is located where the Charles River first broadens.** The broadening of the Charles River that first occurs at the Hyatt Station creates attractive habitat for juvenile river herring for at least two reasons. One is that the decreased water movement associated with this widening is attractive to juvenile river herring because it provides them an opportunity to expend the least amount of energy as they search for food. Second, the broadening of the River has a settling effect on other species, including the juvenile river herring's preferred food sources. Therefore, the Hyatt Station represents the first highly desirable habitat to juvenile river herring making their way down the river from upriver spawning grounds due to the fact that it allows them to expend the least amount of energy in their pursuit of a relatively abundant preferred food source.

- **Dissolved Oxygen at Depth:** As discussed infra, the downstream sampling stations all face significant problems with having sufficient dissolved oxygen at depth. In comparison, Hyatt Station has abundant dissolved oxygen at depth.[154] Having sufficient dissolved oxygen at depth ensures that juveniles can feed in their preferred depth of water during the day, and, as discussed above, sufficient dissolved oxygen along the bottom and low salinity allows the development of benthic communities that serve as a preferred food source.

- **Bottom Vegetation:** The river bottom at downstream stations generally is too deep to support vegetation, whereas the river bottom at Hyatt Station contains submerged vegetation. MK Comments, Comment D10, at p. 62. Besides supporting the preferred food source, this vegetation also provides juvenile alewives with desired cover.

- **Sampling Bias:** As set forth in more detail below, a statistically significant sampling bias effects the CPUE at Hyatt as opposed to other stations.

The Region's failure to even consider these factors in its appreciable harm analysis, despite recognizing that such factors may exist, and despite being in possession of the information to do so, was clear error.

iv. The 2004 Data Demonstrates that Distribution of Juvenile River Herring in the lower basin in Both 2004 and 2005 is Based on Factors Other than Preference for Temperatures Below 81° F

The 2004 sampling data is of extremely limited use in assessing whether juvenile alewives were excluded from habitat due to temperatures at or above 81° F because there were only two sampling days when juvenile alewives were caught when one or more stations were just at or above 81° F.[155] Overall, 2004 was a relatively cool year, and so it does not provide as reliable or extensive a data set in order to fully assess temperature avoidance of 81° F as 2005 does.

In fact, the 2004 data generally prove Mirant Kendall's point that the distribution of juvenile alewives in the lower basin is caused by factors other than avoidance of water warmer than 81° F. Given that -- with the exception of the two days noted above -- no juvenile alewives were caught on days when any of the sampling stations were above 80° F, a statistically significant majority of the juvenile alewives (118 out of 125) were captured on days when the temperatures at every sampling station were below 80° F. This necessarily means that factors other than avoidance of 81° F explains the distribution of juvenile alewives in the lower basin for 2004.[156] The fact that the general distribution of this population of juvenile river herring in 2004 (which was not due to avoidance of 81° F) correlates highly -- based on the Region's own analysis, RTC,

Response to Comment C3, at p. C12; Response to Comments C3-1 and C3-2 -- with the distribution of juvenile alewives in 2005 suggests that distribution of juvenile alewives in 2005 was also due to factors other than temperature avoidance.

v. The Region's Conclusion that Juvenile River Herring "Flourish" At Temperatures Below 80° F, Has No Bearing on an Appreciable Harm Analysis

The primary conclusion that the Region draws from its analysis of the 2004 and 2005 data is that juvenile alewives seem to "flourish primarily at temperatures below 80° F, and decline thereafter." RTC, Response to Comment C3, at p. 15. Even assuming that this conclusion was correct, it has nothing to do with determining an avoidance temperature for juvenile alewives. In other words, the identification of ideal or optimal conditions under which juvenile alewives "flourish" does not mean that anything other than those conditions constitutes appreciable harm, but this seems to be what the Region is assuming. In this sense, the Region's analysis of the data does not support a conclusion that there has been appreciable harm due to exclusion, but rather suggests that the Region's definition of appreciable harm is, in fact, the absence of optimal conditions. This is clear error.

vi. The Region Improperly Discards Data that Undercuts its Conclusions

When faced with data that undermine its conclusion, the Region discards it as an anomaly. For example, the numbers of "mean alewives/event" for the MIT Station in 2005 undercuts the Region's conclusion that CPUE's decline with proximity to the discharge. So, instead of trying to find out why the data did not fit or support its conclusion, the Region decided to discard it as an anomaly. RTC, Response to Comment C3, at p. C13. The Region explains that the MIT data must be discarded because there

were not as many sampling events at that station. RTC, Response to Comment C3, at p. C13. But the number of sampling events per station is irrelevant because the Region's own analysis is based on CPUE, which already takes into account different sampling events. Furthermore, the data from the MIT Station in 2005 exhibits a similar pattern as that from 2004, only a little more pronounced. In both 2004 and 2005, the data shows a dip in CPUE at MIT when compared with the Hyatt Station and the next closest stations to the discharge. RTC, Response to Comment C3, at p. C12. Given that the data for MIT was consistent with the trend in 2004, and given that fewer sampling events were accounted for by expressing its catches as CPUE, the Region's discarding of the data was improper, and undermines the scientific integrity of its approach.

vii. The 2005 Data are Superior to the 2004 Data for Assessing Temperature Avoidance at 81° F.

Without any explanation (other than the data is not consistent with its theory), the Region tries to downplay the 2005 data by stating that the push-net data "is probably an inadequate basis from which to draw independent conclusions...." RTC, Response to Comment C3, at p. C16. In fact, it is the opposite that is true. The 2005 data is a much more representative sample for assessing avoidance of 81° F because:

- River Temperatures were warmer in 2005, and so there are more data to be able to compare catches made above 81° F against catches made below 81° F, which is the only way to truly measure whether 81° F is an avoidance temperature. In fact, as discussed above, 2004 is a terrible year for such an avoidance analysis because there were only two sampling days when fish were caught when temperatures at any of the stations were above 81° F;

- The plant was operating throughout the push netting period in 2005 at higher heat load than 2004; and

- More alewives were caught in 2005, so there is a larger sample size to evaluate.

The only reason why the Region seems to be discounting the 2005 data is because that data is completely inconsistent with its conclusions that juvenile alewives avoid temperatures above 81° F. In 2005, as discussed above, the total number of alewives caught above 81° F is greater than or similar to the number of alewives caught below 81° F, and the CPUE for both sets of catches, one or two fish per event did not present significant variation (1.18-1.34 for events above 81° F, and 1.79-2.05 for events below 81° F) significant enough to support a hypothesis that 81° F is an exclusionary avoidance temperature.

The Region discounts the beach seine data from 2005 because that data is inconsistent with its hypothesis of 81° F being an avoidance temperature. This is because the density of catches was 47 times higher in the 80°-81° F range than in the 79°-80° F range. RTC, Response to Comment C3, at p. C18. In its narrative section, the Region neglects to mention that a much higher density of juvenile alewives were also caught between 82°-84° F than were caught in the 79°-80° F range. RTC, Response Comment to C3, at p. C18, Figure C3-13. Finally, the Region did note that four fish were found in just 280 square feet of sampling in water with temperatures between 86°-87° F. RTC, Response to Comment C3, at p. C18. This 2005 beach seines data, therefore, provides further support for the conclusion that 81° F is not an avoidance temperature.

The manner in which the Region attempts to discredit the beach seine data, in fact, proves Mirant Kendall's point. The Region states that beach seine data is not as reliable as push-net data because beach seine data is subject to "confounding factors," such as "food supply and cover." RTC, Response to Comment C3, at p. C9. But these confounding factors have no impact on a temperature exclusion analysis because a

juvenile alewife will not enter an area that is warmer than the avoidance temperature just because that area has food and cover. The Region's suggestion that juvenile alewives may have been in waters warmer than 81° F because of food supply and cover proves Mirant Kendall's point that there is no type of exclusion alleged by the Region, due to avoidance of 81° F temperatures.

viii. The Region Ignores that Sampling Bias Skews Results and Impacts its Analyses in a Statistically Significant Manner

The Region's appreciable harm analysis failed to consider the statistically significant impact of sampling bias between the Hyatt Station (where the most juvenile alewives were generally caught) and the downstream stations.

Sampling efficiency at the Hyatt Station is superior to almost every single downstream station. One reason for this is that the Hyatt Station is only about twelve feet or less, shallower than the downstream stations and a large school (e.g. of more than a thousand)of juvenile alewives cannot evade capture as easily by swimming below the push-net.

Another reason is based on the fact that push-net sampling events consist of two separate pushes of the net at each station. Because the shallow diffuser station is made narrow due to the presence of boat moorings, both pushes of the net cover the same water. After that initial pass, therefore, there is a reduced chance of catching any additional fish because the fish have either already been caught on the first push, or cleared the area to evade capture. In comparison, the Hyatt Station has no such constraints so there is a far greater chance of catching an equal or greater number of fish on the second pass, which covers a different area of the river than the first pass. The

sampling area covered by the Hyatt push-net samples, therefore, is larger than the area covered by the shallow diffuser station where two pushes over the same area are necessary. The results indicate that the second pass at Hyatt caught more fish about 40% of the time, whereas at shallow diffuser this was true only 22% of the time.

In fact, when this phenomenon is controlled by looking at only the CPUE of the first pass, as on the summary table at the beginning of this section, it becomes clear that CPUE between the above-and-below 81° F events converge to be almost identical.

ix. The Region Ignores that Apparent Out-Migration in the Fall Skew its CPUE and Temperature Comparison

The Region places much emphasis on the fact that lower temperatures generally exhibit a higher CPUE. RTC, Response to Comment C3, at p. C15. But the Region failed to consider that naturally occurring migration out of the Charles River during high flow events and then in the fall skews its results. For example, in 2005, approximately one third of the juvenile alewives caught below 75° F were caught in the downstream stations in the fall,[157] indicating that the distribution of these juveniles was influenced by their moving out of the Charles River. Because these juveniles were not distributed by avoidance temperature effects, they skew the Region's conclusion that low temperatures correlate with high CPUE because juvenile alewives prefer those lower temperatures.

x. 81° F is Well Within the Historic Ambient Range and Cannot Constitute a Significantly Harmful Temperature

It is not surprising that the above-analysis confirms that 81° F is not an avoidance temperature that would cause appreciable harm to river herring. This is because it is not unusual for ambient conditions in the Charles River to exceed 81° F during the summer months. In fact 81° F is within one standard deviation of the mean summer intake

temperature for the years including 1998-2004. Given this fact, the Region's appreciable harm analysis is flawed for an additional two reasons.

First, it is theoretically impossible for regularly recurring ambient conditions in any system to cause lasting harm to the BIP in that system. This is because the BIP in any particular system have adapted to and can tolerate -- within the bounds of tolerable harm -- the ambient conditions in that system. With respect to the Charles River, 81° F is well within the normal range of ambient conditions -- as noted above, 81° F is less than one standard deviation away from the mean summer temperatures for 1998 through 2004. Furthermore, in 2003, there were three exceedances of 81° F at upstream background locations in July-August of 81° F, and in 2005, there were 11 such exceedances.[158] The Region's appreciable harm analysis is flawed because it has failed to consider that the BIP in the Charles River had adapted to and can tolerate recurrent temperatures of 81° F given that that temperature is well-within the naturally occurring range of ambient conditions.

Second, even if 81° F could conceivably cause appreciable harm, the data would show that the relative abundance of juvenile alewives would be lower in years when there were exceedances of 81° F in the Charles River. But, in fact, the data are to the contrary. During the past three years, 2005 experienced the most exceedances of 81° F by both ambient conditions (11), and conditions in the ZPH (71). But despite these exceedances of 81° F, 2005 represented the strongest recently documented year for abundance of juvenile alewives in the Charles by all collection methods - about four times stronger than the cooler but otherwise comparable 2004. As is discussed in more detail below, Mirant Kendall submitted substantial additional data demonstrating relative strength and

abundance of alewives in years when there were multiple exceedances of the Region's "protective" temperature limit. Because the data do not support -- and in fact are to the contrary -- the conclusion that temperatures of 81° F cause appreciable harm, this Board should remand this matter to the Region so that the Region can address these fatal flaws with its appreciable harm analysis.

2. Erroneous Use Of Four-Hour Average Blocks For Compliance Purposes

The Region clearly erred when it required that compliance with the NPDES renewal permit's in-stream temperature limits be assessed using a four-hour averaging period. The Region's stated basis for imposing four-hour averaging was its speculation that a 24-hour averaging period would be insufficient to protect against temperature spikes or prolonged periods of elevated temperatures that might occur above the permit limits within a 24-hour period.

Significantly, the Region acknowledged that it did not analyze this issue, or review the data to see if its fears had any basis. RTC, Response to Comment C16, at p. C69. But the data clearly show that the Region's fears of temperature spikes and prolonged elevation of temperatures under a 24-hour averaging regime are unfounded. The four-hour averaging regime also is biologically irrelevant to the species of fish it purportedly is intended to protect.

a. Permit Provision at Issue

Footnote 7 of Part I.A.1 of the NPDES renewal permit requires that Kendall Station's discharge "not cause, or contribute to conditions that cause, in-stream water column temperatures to exceed the temperatures set forth in Attachment A." Attachment

A requires Mirant to calculate a four hour average temperature for each monitoring point at six specific times each day (3:59 a.m., 7:59 a.m., 11:59 p.m., 3:59p.m., 7:59 p.m., and 11:59 p.m.). A monitoring point will not be in compliance for temperature whenever any of its four hour average temperature readings exceeds the applicable temperature limit.

b. Charles River Data Contradicts the Speculation that Four Hour Averaging is Needed to Protect Against Temperature Spikes and Prolonged Elevations of River Temperatures

Mirant Kendall provided extensive comments on why 24-hour averaging was sufficiently conservative to ensure that protective temperatures were being maintained for the two species of fish (alewives and yellow perch) that the Region determined were the most sensitive species with respect to temperature. See e.g MK Comments, Comment C16, at pp. 27-28; Comment D3, at p. 57.

In its response to these comments, the Region stated that "the key support for a 4-hour average temperature limit is the realization that Kendall Station has the capacity to sharply raise temperatures in certain areas of the lower basin over a relatively short time." RTC, Response to Comment L2, at p. L7. The Region further stated that under a 24-hour averaging regime, Kendall Station's "discharge could cause pronounced short term swings in temperature beyond the natural variance" of a 2° F to 4° F change. RTC, Response to Comment L2, at p. L7. The Region also argues that under a 24-hour averaging regime, Kendall Station could "cause temperature spikes in the lower basin well above protective levels," RTC, Response to Comment L2, at p. L7, and that Kendall Station could "raise temperatures several degrees above the protective levels." RTC, Response to Comment L2, at p. L7. And, as the Region continues, the discharge "could

markedly raise the temperature of the basin, conceivably above the protected temperature limit for some time." RTC, Response to Comment C16, at pp. C58-C59.

It is significant to note, however, that the Region also stated that it had no actual basis for concluding that such temperature effects would be possible under 24-hour as opposed to four-hour averaging. RTC, Response to Comment C16, at p. C59. The Region stated that because it did not analyze this issue, it was taking a conservative approach. RTC, Response to Comment C16, at p. C59. The Region justified its failure to analyze this issue by explaining that analysis "of how different averaging times might affect temperatures" cannot be done without a thermal model. RTC, Response to Comment C16, at p. C59. The problem with this rationale is that analyzing the temperature difference in the ZPH between a 4-hour and 24-hour averaging regime is simple, and can be done with the data Mirant Kendall gave to the Region without any modeling whatsoever.

Mirant Kendall has provided the Region with continuous temperature data for the past several years from a thermistor located near what will be the two foot compliance point at Monitoring Station 3 under the NPDES renewal permit's ZPH.[159] The thermistor data indicate that this compliance point is generally the warmest of all of the mandatory compliance points in the ZPH.[160] Indeed, there will be several days in the summer when more than 50% of the lower basin would be below the Renewal Permit's limits, but Mirant Kendall would be unable to operate because this one compliance point would violate the Renewal Permit's limits for a single daytime four-hour period. The readings at this thermistor, therefore, generally represent the warmest temperatures for any mandatory compliance point in the ZPH.

Furthermore, the Region asserts that Kendall Station's discharge in the summer months of 2005 was at or approached historic levels. RTC, Response to Comment B1, at pp. B5-B6. Examining this thermistor data from 2005, therefore, provides a conservative approach to examining the differences in river temperatures between a four-hour averaging regime and a 24-hour averaging regime.

The comparison in river temperature between these regimes can be made by looking at the days in 2005 when there would have been a violation of a four-hour average, but the 24-hour average would have been below the permitted temperature of 83° F. There were fourteen such days for which thermistor data are avoidable in 2005.[161] Examining the temperature data from these days show precisely the type of variation in temperature that would happen in the ZPH under a 24-hour regime compared with a four-hour regime. The results could not more starkly contrast with the Region's unfounded speculation:

Speculation	**Reality**
Discharge could "cause temperature spikes in the lower basin **well above protective levels**," and could "**raise temperatures several degrees above** the protective levels...."	**There were no temperature spikes or temperature rises several degrees above the protective limits.** On thirteen of the fourteen days, temperatures did not even reach a single degree (Fahrenheit) above the permitted limit, and three days never even reached half a degree (Fahrenheit) above the permitted limit.[162] The high temperature on the single day that did exceed permitted limits by more than a degree was 84.7° F, which is less than two degrees above the permitted limit of 83° F.[163]
Discharge "could markedly raise the temperature of the Basin, conceivably above the protected temperature limit **for some time**."	**Temperature rises above 83° F were brief.** The de minimis rises above the permitted limits (described above) were brief. On most days, temperatures were

	below the permitted limit of 83° F for 18 hours.[164]
Discharge "**could cause pronounced short term swings** in temperature beyond the natural variance" of a 2° F to 4° F change.	**Natural variance was maintained.** The largest temperature variation in any single day was 3.9° F, which is within the Region's recognized "natural" temperature variation, and it took 12 hours for this rise to occur, which is hardly a "short term swing."

These results are not surprising given that Kendall Station's capacity to effect in-stream temperatures is limited by the principles of thermodynamics. The lower basin and the ZPH represents a relatively large body of flowing water, and while Kendall Station's discharge does effect in-stream temperatures, there is a limit on just how quickly and how much it can effect those temperatures. Kendall Station's capacity to effect in-stream temperatures becomes even more restricted under a 24-hour average, as can be seen from the above analysis. Simply put, the principles of thermodynamics that control the time it takes for the lower basin to heat up and cool down ensures that it is impossible to meet a 24-hour average temperature at any given compliance point and have temperature spikes or prolonged periods of time within that 24-hour period when a large part of the lower basin is above the renewal permit's limits.[165]

An examination of Kendall Station's heat loads from July 30 and August 1, 2005 (and the resulting temperatures in the lower basin) demonstrates Kendall Station's limited capacity to quickly heat the water. See EPA Doc. ##557, 560 in the 10/12/06 A.R. Index. On July 30, 2005, Kendall Station's heat load was 3736 mmBTUs, which is approximately 29% of its capacity. On 11:55 p.m. on July 30, the Boston thermistor recorded a temperature of 81° F. On July 31, Kendall Station's discharge remained at

approximately 4000 mmBTUs, and on 12:00 a.m. on August 1, 2005, the Boston thermistor registered a reading of 79.95° F. On August 1, 2005, Kendall Station increased its heatload from 4000 mmBTUs to 10,559 mmBTUs (which represents 78% of its maximum capacity) around 5:00 a.m. But despite this sharp rise in operations, the Boston thermistor did not register any temperature spikes. In fact, the maximum daily temperature on August 1 was 82.5° F, which is below the 83° F permit limits. Moreover, this 2.5° F temperature rise took over 12 hours (which is consistent with the natural, ambient diurnal variations) after Kendall Station more than doubled its discharge. This absence of any short, term temperature spikes beyond the 2-4° F natural variation (as recognized by the Region) despite the sharp increase in Kendall Station's discharge undercuts the Region's speculation on this issue that such sharp increases in Kendall Station's discharge can cause temperature spikes or unnatural variations.

Mirant Kendall provides this example not in order to present some sort of definitive analysis on this subject, but rather as an example of how the Region has failed to fully analyze this issue of whether temperature spikes could ever result from sharp increases in Kendall Station's operations, despite the fact that it had the data to do so. Given that the Region has the data to test its hypothesis (but admittedly has not), and given that Mirant Kendall's initial analysis shows that the data undermine the Region's hypothesis, this issue should be remanded.

c. Four-Hour Averaging Has No Biological Relevance

During the public comment period, Mirant Kendall made several detailed and specific objections to the draft permit's use of four-hour averages on the basis that those

averaging periods had no biological relevance to both species of fish (alewives and yellow perch) that they were intended to protect.

With respect to yellow perch, Mirant Kendall commented that its monitoring data demonstrated that this species is absent from the upper water column in the ZPH during both the daytime and nighttime.[166] MK Comments, Comment D10, at p. 61. The Region never disputed these findings. For this reason, the use of four-hour averaging at compliance points located near the river's surface are not necessary to protect yellow perch.

Mirant Kendall also commented how alewives demonstrate diurnal behavior, meaning that their activity patterns vary between day and night. MK Comments, Comment D3, at p. 55. Mirant Kendall explained how its river data confirmed that juvenile alewives are absent from the upper water column during the daytime hours, but around sunset begin to appear near the surface in order to feed. MK Comments, Comment D3, at p. 55. Based on this conclusion, requiring compliance with four-hour temperature averages at compliance points near the surface during the daytime hours is not necessary to protect alewives from possible temperature effects. MK Comments, Comment D3, at p. 55. Similarly, the other four-hour block averages are also mismatched to fish behavior depending on when sunrise and sunset occur. MK Comments, Comment D3, at p. 55.

Mirant Kendall proposed that 24-hour averaging would ensure that juvenile alewives would not be adversely effected by temperature when they ascend to the surface to feed at night. MK Comments, Comment D3, at p. 57. The basis for this conclusion is that the documented 24-hour average temperatures from various thermistors in the

Charles River demonstrate that in-stream temperatures are generally at their warmest during the daytime hours. MK Comments, Comment D3, at p. 57. This means that on the warmest days, when daytime temperatures exceed the NPDES renewal permit's in-stream thermal limits, the nighttime temperatures must necessarily be cooler than the in-stream thermal limits in order to meet a 24-hour average. MK Comments, Comment D3, at p. 57. In this sense, a 24-hour average is still even more protective than necessary considering that it will ensure surface temperatures during the night -- the only time when juvenile alewives are present at the surface -- will be lower than the temperature limits established by the Renewal Permit. MK Comments, Comment D3, at p. 57.

In its response to Mirant Kendall's comments, it is significant to note that the Region agrees with Mirant Kendall that alewives exhibit "a diurnal pattern in resource use," RTC, Response to Comment D3, at p. D4, and that "the summertime Draft Permit limits were developed to protect nighttime use of the waterbody's surface by juvenile river herring." RTC, Response to Comment D3, at p. D5.[167] This recognition, coupled with a failure to provide any other reasoning why daytime limits would be needed, standing alone, is sufficient to support Mirant Kendall's argument that four-hour averaging periods at compliance points near the river's surface during daytime hours are unnecessary, and that the other four hour blocks are also arbitrarily mismatched depending on the time of sunset and sunrise.

i. Four Hour Averaging Is Not Needed to Protect In-Migration

The Region attempts to justify four-hour averaging by stating that 24-hour averaging is inappropriate in the springtime because "the daytime target temperature needed for alosid passage into the system may not be met" if cooler nighttime

temperatures were averaged with warmer daytime temperatures. RTC, Response to Comment D3, at p. D4. There are two reasons why, even if this analysis were correct, it does not provide a rational basis for the Renewal Permit's four-hour averaging regime. First, this analysis would only justify four-hour averaging in the springtime during the spawning migration, which is generally complete by June. This argument, therefore, cannot justify four-hour averaging after this date. Second, the Region's analysis does not support the requirement of four-hour averaging at compliance points near the River's surface because the Region recognizes that in-migrating river herring are preferentially distributed deeper in the water column during the day.[168]

The Region's conclusion that 24-hour averaging would not be protective of the in-migrating river herring also is contradicted by the significant temperature data in the record. The Region assumes -- without identifying any supporting data -- that under a 24-hour averaging regime, the daytime temperatures at depth in the ZPH would exceed the maximum temperature limits more frequently than under a four-hour averaging regime. RTC, Response to Comment D3, at p. D4. This assumption is contrary to the temperature data from the Charles River. River Data from 2005 is particularly relevant to this point because 2005 is a year when the Region asserts Kendall Station's operations were at or near an all-time high, and ambient temperatures in 2005 were warmer than those in other years, including 2004.[169] In 2005, from April 1 to June 7 there were no exceedances of the NPDES renewal permit's thermal limits under either a 4-hour averaging regime or a 24-hour averaging regime at the 15 foot points at the thermistors located on the Museum of Science Locks and at the New Charles River Dam. Moreover, the variance in temperatures between the maximum four-hour average, and the 24-hour

average was extremely slim.[170] Because temperatures at these critical in-migration points would have been identical under both a four-hour regime and 24-hour regime (due to the lack of exceedances under both regimes), the Region cannot claim that a four-hour regime is necessary to protect in-migration.[171]

ii. Four Hour Averaging is Not Necessary to Ensure that Temperature Limits Are Met at the Surface at Night

The Region's second argument in an effort to make four-hour averaging biologically relevant is equally unavailing. It argues that peak summertime electricity demand is generally between the hours of 2:00 p.m. and 9:00 p.m., and therefore peak BTU input from Kendall Station will occur during that period. RTC, Response to Comment D3, at p. D5. The Region then concludes that this will cause river temperatures to be the highest during the "first part of the night when alosid juveniles need this habitat." RTC, Response to Comment D3, at p. D5. Besides the fact that this assumption is not consistent with the historic heat load data from Kendall Station, this analysis provides no basis for imposing four-hour average requirements at compliance points near the river's surface during daytime hours. In fact, the argument implicitly -- if not explicitly -- concedes that such a requirement is not necessary. Second, there is no evidence anywhere in the record that peak electricity demand occurs from around 2:00 p.m. to around 9:00 p.m., or that Kendall Station's BTU input coincides with this "high-demand" period. This unsupported assumption aside, the river data from 2005, as set forth above, demonstrates that the temperature at the warmest mandatory surface compliance point was below the thermal limits during the summer months for more than a sufficient period of the nighttime hours to allow for alewife access.

The Region also argues that if alewives are excluded from the surface of the river during the daytime because of higher temperatures, then they will not know that they can go to those portions of the surface at night when the temperatures are cooler. RTC, Response to Comment D3, at p. D5. But this argument makes no sense because -- as the Region has recognized -- alewives are not in the upper water column during the daytime because of their diurnal behavior patterns, and not because of temperature avoidance. The Region's analysis relies on the far-fetched and unsupported scientific assumption that (a) alewives remember portions of the river that they have previously been excluded from due to temperature, and (b) that alewives are somehow biologically programmed to avoid parts of the river that they have had to avoid in the past because of an intolerance to the temperature. Such speculation is especially irrational in light of the fact that river herring in the Charles River regularly occupy surface habitat in the evening that had daytime temperatures that exceeded the maximum temperature limit in this permit.[172] For example, the following grid shows nighttime catches of fish at various monitoring stations in July and August of 2005, where the daytime temperatures at those monitoring stations exceeded the permit's thermal limits. This demonstrates that alewives do not "avoid" surface waters at night when those surface waters were above permitted limits.[173]

Date of Catch	**Station**	**Alewives Caught**	**Prior Exceedances of Permit Limits Under a Four Hour Averaging Regime**
7/25/05	Museum of Science	19	2 exceedances in 24-hours prior to catch, and 37 exceedances during the prior week.
8/4/05	Boston	3	2 exceedances in prior 24 hours and 15 exceedances in prior week
8/23/05	Mid-Channel	2	6 exceedances in prior 24-

			hours, and 15 exceedances in prior week.

iii. Four Hour Averaging is Not Necessary to Maintain Sufficient Daytime Habitat at Depth

The Region also argues that it is important to maintain temperature limits at depth throughout the daytime hours because unless fish are able to occupy these cooler depths during the daytime hours, they will not be able to occupy the surface areas of these same portions of the river at night. RTC, Response to Comment D3, at p. D5. The Region goes on to state that in 2005 "[w]ater temperatures exceeded the target temperature of 81° F from the surface down to depths of 9 and sometimes 12 ft. for several concurrent weeks (or longer) at certain stations in the lower basin," RTC, Response to Comment D2, at p. D5, presumably as a basis for suggesting that there has not been adequate daytime habitat at depth for alewives in the past. But the Region's argument provides no basis for imposing four-hour averaging at surface compliance points during the daytime because its argument, at most, only addresses a perceived need for sufficient habitat at depth during the daytime.

Furthermore, the Region cannot use this selective data set to argue that four-hour averaging is needed at compliance points at depth to protect daytime refuge because the full data set (which the Region failed to present) demonstrates that there was sufficient daytime habitat at depth. It appears that the Region is referring to the data collected by the thermistors located at the Museum of Science and the New Charles River Dam. A chart of the temperature readings from the 9 and 12 foot depths at these two stations does show that there were some exceedances of the permitted limits.[174] But the extent of these exceedances have been exaggerated by the Region. As can be seen on the graphs,

temperatures --for the most part -- were generally right at the permitted limits. There were no spikes or prolonged periods of time when temperatures were far above permit limits.

Even more significant is the fact that the temperatures at the 15 foot depth for these thermistors show that there was sufficient habitat at depth for these stations.[175] In fact, it demonstrates that the entire bottom half of the water column (which is the daytime deep-water refuge that the Region is attempting to protect) was below the permitted limits. For these reasons, the Region's suggestion that there was insufficient deep-water refuge during the daytime for alewives is plainly incorrect.

Further, the Region's argument provides no rational basis for why it is a four-hour averaging period -- rather than a 24-hour period -- that is necessary to ensure compliance with temperature limits at depth during the daytime. In other words, the Region's observation that 2005 temperatures in the river exceeded 81° F under the current permit, which does not have any in-stream thermal limits or averaging periods, cannot be the basis for predicting that such habitat would be unavailable if a 24-hour averaging period were used to measure compliance with the new in-stream temperature limits established in the NPDES renewal permit.

d. The Region Erred by Separating Duration Period from Acute Effects Thresholds.

Mirant Kendall also commented that the literature that the Region relied on in setting its temperature limits supports much longer averaging periods than the four-hour period the Region arbitrarily selected. MK Comments, Comment D3, at p. 56. This is because the Region chose temperatures from the end point of scientific studies that evaluated exposures lasting from a minimum of 24 hours to a maximum of fourteen days.

MK Comments, Comment D3, at p. 56. In other words, all of the studies documented effects over longer periods of time than four hours.[176] Moreover, none of the studies found avoidance effects at 83° F (or 81° F) for any duration period.[177] In this sense, four-hour averaging is entirely over-protective because the Region has paired a duration period shorter than any period observed in the studies to have adverse effects with a temperature limit lower than any found to have adverse effects in any of the studies.

Mirant Kendall commented that it is a well-accepted principle that adverse effects experienced from shorter, acute exposure durations (such as four hours) occur at higher temperatures than adverse effects from longer, chronic exposures. MK Comments, Comment D3, at p. 56. When determining a protective averaging period, therefore, it is scientifically necessary to properly align that averaging period -- or duration period -- with an appropriate temperature limit. MK Comments, Comment D3, at p. 56.

For example, high maximum temperatures can be protective so long as they are linked with shorter periods of durations exposure (such as the four-hour average). MK Comments, Comment D3, at p. 56. This is true even if those higher temperatures would have adverse effects over a longer exposure period. MK Comments, Comment D3, at p. 56. In order to avoid being unnecessarily stringent, therefore, use of a four hour averaging period is arbitrary and capricious unless it is paired with a higher maximum temperatures than the ones the Region selected based on exposure durations much longer than four hours. MK Comments, Comment D3, at p. 56. It is unnecessary and over protective to couple short time periods with low temperatures. MK Comments, Comment D3, at p. 56. If the Region wishes to regulate on the basis of four-hour averaging, then it must select temperature limits closely aligned with those that have been scientifically

shown to cause the undesired adverse effects after four hours of exposure. MK Comments, Comment D3, at p. 56. On the other hand, if the Region wishes to regulate on the basis of the lower temperatures it selected, it must pair those temperatures with the appropriately longer duration period associated with a documented real potential for onset of a corresponding adverse effect. MK Comments, Comment D3, at p. 56. In other words, by choosing a relatively low temperature and pairing it with a short duration period, the Renewal Permit is overly protective.

The Region's explanation in the Response to Comments as to why it picked a short duration period for the Renewal Permit's relatively low thermal limits was "that laboratory studies cited in the DD generally isolate the effects on biota of prolonged chronic exposure, which is far longer than the 4-hour exposure that permit compliance is based upon." RTC, Response to Comment L2, at p. L3. In order to justify four hour averaging, the Region claimed that it "also considered additional information about acute, short term effects. For example, information addressing avoidance of a species to certain water temperatures under much shorter time periods was also incorporated into" the Permit's establishment of protective temperatures. RTC, Response to Comment L2, at p. L6. As set forth more fully below, the Region's reliance on the literature and the field data to select its temperature limits and averaging period is fundamentally flawed.

3. Erroneous In-Stream Thermal Limits

Part I.A.1 of the Permit, which includes and incorporates footnotes 7 and 8 and Attachments A and B, establishes an in-stream temperature compliance regime. This regime prohibits Kendall Station from discharging any amount if any of the required compliance points in the ZPH exceed the applicable in-stream temperature limits. These

applicable temperature limits differ with the time of year. See NPDES renewal permit, Attachment A.

The Region focused on what it determined to be the most temperature sensitive species -- yellow perch and alewives -- at different life stages, and developed specific temperature limits for specific times of the year based on this analysis. The Region based the temperature limits for the summer months (i.e., months where in-migration and spawning were not concerns) on what it believed would be an avoidance temperature for yellow perch and alewives. The Region developed these temperature limits in the draft NPDES renewal permit based largely on its review of various scientific studies. But then, after the close of the public comment period, the Region conducted an extensive analysis on the 2004 and 2005 data. This analysis led the Region to two distinct (yet related) conclusions: (1) alewives (and to a lesser extent bluebacks) suffered appreciable harm in 2004 and 2005, and (2) the data supported the conclusion that alewives avoided temperatures above 81° F. This latter finding was the critical basis for the NPDES renewal permit's temperature limits.

As discussed above, Mirant Kendall believes that this new, critical analysis should have been submitted for public comment, but this section specifically addresses the issue of why the NPDES renewal permit's in-stream temperature limits are arbitrary and capricious.

a. Neither The River Data Nor the Scientific Literature Support the Region's Conclusion that 81° F is an Avoidance Temperature.

The Region bases its summer-time in-stream thermal limits on its analysis of the 2004 and 2005 Charles River data. But there are several problems with the Region's

analysis. First, as described above, the Region's analysis in Response to Comment C3 (which also served as the basis for its determination of appreciable harm) has several flaws that the Region failed to address, and which contradict its ultimate conclusion. Second, in the period leading up to the public comment period, Mirant Kendall submitted substantial data showing that river herring larvae and juvenile alewives were actually more abundant in years with relatively warmer in-stream temperatures, including a few summers with frequent exceedances of the NPDES renewal permit's applicable temperature limits.[178] The Region's analysis failed to adequately respond to this data.

With respect to yellow perch, Mirant Kendall also argued that 24-hour averaging was sufficient to protect yellow perch, which are largely absent from the ZPH for reasons other than temperature anyway. Mirant Kendall also commented that yellow perch were caught in waters with temperatures warmer than the protective limit developed by the Region. And finally, Mirant Kendall commented on how the chill period for yellow perch was inconsistent with other permit objectives, notably the timely initiation of the alewife spawning run, and was, at best, a tangential issue until the conditions of salinity stratification that exclude yellow perch from the ZPH were remedied. The Region failed to offer an adequate response to any of these arguments on yellow perch.

i. The Region's Selection of 81° F as an Avoidance Temperature Suffers from Several Flaws that the Region Failed to Address or Consider.

The Region's analysis with respect to its selection of 81° F as an avoidance temperature (which in turn provides the basis for the permit's thermal limits) is the same analysis the Region relied upon in finding appreciable harm. As discussed supra, that analysis suffers from numerous flaws, and is contradicted -- rather than supported -- by

the 2004 and 2005 data it purports to rely upon. Mirant Kendall hereby incorporates its prior arguments with respect to this issue, and relies on those prior arguments on this distinct point of that 81° F is an incorrect avoidance temperature.

In summary, some of, but not all of, Mirant Kendall's prior arguments on this point include:

- **The 2004 and 2005 Data do not show that alewives avoided water temperatures warmer than 81° F.** On days when at least one sampling station was warmer than 81° F, equivalent numbers of alewives were caught above 81° F as there were alewives caught below 81° F. The CPUE's between these two catches were also sufficiently equivalent to contradict any argument that 81° F operated as an avoidance temperature. Furthermore, in the warmer summer months, more alewives (and a higher CPUE of alewives) were caught in the warmer sampling stations near the discharge. Each of these sampling stations experienced mean temperatures above 81° F during this time;

- **Factors other than temperature explain why Hyatt was the most successful sampling station for alewives.** The record contains substantial material demonstrating that Hyatt station presented preferable habitat for juvenile alewives for reasons other than temperature For example, Hyatt has a more plentiful preferred food source (which the Region acknowledged); it is where the Charles River first broadens so juvenile alewives do not have to expend as much energy searching for food; it has sufficient dissolved oxygen at depth to allow juvenile alewives to occupy areas at depth during the daytime; it has bottom vegetation that supplies food and cover; the push-net samples at the Hyatt station covered much more area than sampling events at other stations; and juvenile alewives could not evade capture by the push-nets as easily as at other stations because Hyatt is shallower and the juveniles cannot dive below the nets as effectively;

- **The 2004 data demonstrate that the distribution of alewives in the lower basin is for reasons other than a preference to avoid 81° F temperatures.** Because there were only two days in 2004 when alewives were caught when one or more sampling station was above 81° F, the distribution of alewives in the lower basin (with the exception of those two days) was necessarily explained by factors other than a preference to avoid 81° F temperatures. Given that the distribution in 2004 is consistent with the distribution in 2005, it is possible to conclude that distribution of alewives in 2005 was also caused by factors other than a preference for water below 81° F;

- The Region's analysis seemed to suggest that any temperature higher than the temperatures it determined as being optimal for alewives was an avoidance temperature;

- The Region discarded push-net data that did not support its conclusions;

- The Region downplayed the importance of the 2005 data by describing it as inferior for testing avoidance effects, but the 2005 was actually superior to the 2004 data, because 2005 had more days with temperatures above 81° F, and because more fish were caught, thereby eliminating the bias of a reduced sample size;

- [The Region's explanation for why alewives were caught in the beach seines at temperatures well-above 81° F proves Mirant Kendall's point.] The Region suggested that the alewives were in those warmer waters because of food and cover. This is precisely Mirant Kendall's point. Alewives are distributed in the lower basin because of factors such as food and cover, and not because of avoidance of 81° F;

- The Region's results are skewed by sampling inefficiencies at downstream stations, and also by catches in cooler waters during the fall when alewives are migrating out of the system; and

- The Region failed to account for the fact that ambient conditions in the Charles River exceed 81° F during most summer months.

For these reasons, which are set forth more fully above, Mirant Kendall asserts that the Region's selection of 81° F as an avoidance temperature, and its decision to impose permit limits based on that analysis, represents clear error. This is not a matter of scientific disagreement regarding interpretations of data, but rather represents clear failure by the Region to do the necessary analyses to produce rational, relevant results.

ii. River Herring Larvae and Juvenile River Herring Were More Abundant in Warmest Years When River Temperatures More Frequently Exceeded The Limits in the Permit Than Other Cooler Years of Lower Relative Abundance.

Mirant Kendall made several, detailed comments on how the relative abundance of river herring larvae and juvenile alewives was greater during the years where there

generally were more days with exceedances of the in-stream temperatures set as the thermal limits in the NPDES renewal permit. MK Comments C-13, C-23, and C-46.[179] Mirant Kendall used this fact as the basis for commenting that slightly higher in-stream thermal limits would fully protect the BIP.

Mirant Kendall commented that the thermal conditions (including Kendall Station heat loads over 50% in 2003) between June 12 and August 31 in 2002 and 2003 exceeded the thermal limits in the permit on a number of days, yet abundance of alosid larvae and juvenile alewives compared favorably to that of the much cooler similar flow year, 2000, which had no exceedances of 83° F at the Kendall Station intake all summer. MK Comments, Comment C48, at p. 50. On the other hand, between June 12, 2002 and August 31, 2002, there were exceedances of 83° F on 37% of the days in the ZPH (up to 88° F) and 11% (river-wide) of the days. Similarly, 2003 had exceedances of 83° F on 20% of the days in the ZPH (up to 86° F) between June 12 and August 31. MK Comments, Comment C48, at p. 50.

Mirant Kendall also commented on the permit's requirement of a 72° F thermal limit in the ZPH for the first week in June in order to protect alewife reproduction. MK Comments, Comment C13, at p. 26. Mirant Kendall commented that despite the fact that there was an exceedance of this temperature every day in the first week of June in the ZPH, alosa larval densities in the ZPH were observed to be more than 1,500 per 100 cubic meters on June 8. MK Comments, Comment C24, at p. 35. Mirant Kendall also pointed out that this period was followed by a greater abundance of juvenile alewives than any other sampling year. MK Comments, Comment C24, at p. 35.[180]

The Region's first attempt to address this presentation of data was to argue that just because there were high larval densities does not necessarily mean that there were high larval densities of alewives as opposed to bluebacks. RTC, Comment C3, at p. C13. But this speculation is undermined by the fact that the relative abundance of juvenile alewives in 1999 was greater than any other year. MK Comments, Comment C24, at p. 35. This fact, which the Region does not dispute, necessarily means that there was a relatively and correspondingly high abundance of alewife larvae that year as well.

The Region also points out that Mirant Kendall used temperature readings at its intake as a basis for some of its conclusions that there were exceedances of the permit's temperature limits in the ZPH. RTC, Response to Comment C13(e), at p. C49. The Region states that exceedances at the intake temperatures do not necessarily mean that there were exceedances in the ZPH sufficient to cause a permit violation. RTC, Response to Comment C13(f), at p. C49. The Region's assumption that an exceedance at the intake does not necessarily constitute an exceedance in the ZPH is contrary to the data that were available to the Region. Under the permit, there is an exceedance in the ZPH whenever the two-foot depth at Monitoring Station 3 exceeds the applicable seasonal thermal limit. Using this historic river temperature data, it is possible to predict, with over 99% certainty, the temperature at this Monitoring Station based on Kendall Station's intake temperature.[181] This predictive analysis proves that Mirant Kendall's conclusions, described above, with respect to a violation in the ZPH are correct. In fact, more exceedances of the thermal limits would be expected at Monitoring Station 3 than at Kendall Station's intake because the thermistor results from where Monitoring Station 3

will be located are consistently warmer than the intake temperatures when Kendall Station is running at high capacity under average or below average river flows.

Mirant Kendall also specifically commented to the Region that data from the Charles River from 1999 through 2004 demonstrated that the two years with the greatest relative abundance of juvenile river herring were 1999 and 2004. (That, of course, was before 2005 results were in, which showed greater relative abundance in 2005 when compared with 2004). Mirant Kendall then pointed out that there were nine days with an exceedance of the Permit's thermal limits for May 11 through June 11 in 1999, and that there were eight days with an exceedance for this same time period in 2004. On the other hand, there were only three days of exceedances in 2000 for this same time period; four days of exceedances in 2002, and zero days of exceedances in 2003. In fact, the only year with more days of exceedances than 1999 and 2004 during this period was 2001, which had 13.[182] Mirant Kendall stated that this positive correlation of abundance with exceedances of permitted limits demonstrated that the types of temperatures in the Charles River during 1999 and 2004 could not be meaningful limiting factors on juvenile alewife abundance.

In its response to those comments, the Region did not dispute Mirant Kendall's finding of greater relative abundance during 1999 and 2004. What the Region did contest is that there were exceedances of the permit limits in the ZPH during this time period. The Region notes that Mirant Kendall based its "exceedance" analysis on the temperature measured at Kendall Station's intake. RTC, Response to Comment C13(d), (e), (f), at p. C48-C49. First, this argument is a misdirection because the Region has previously agreed that the intake temperatures represent ambient conditions in the lower basin of the

Charles River in the spring.[183] Second, as discussed above, this argument is incorrect given that the temperature for the two foot depth at Monitoring Station 3 in the ZPH can be predicted with over 99% certainty using the temperature at Kendall Station's intake. And, once again, this predictive analysis supports Mirant Kendall's conclusions and discredits the Region's speculation.

In another other effort to rebut Mirant Kendall's comments on this point, the Region cited to and partially summarized its flawed analysis in Response to Comment C3, which consisted of its appreciable harm/avoidance temperature analysis. As stated above, reliance on that analysis is clear error because of the many fatal flaws Mirant Kendall identified, and which the Region failed to address.

Finally, the Region argues that "it is quite plausible that " the higher abundance in 1999 and 2004 "would have been even more robust if the species had better access to more habitat." RTC, Response to Comment C23, at p. C79. The first problem with this argument is that, as discussed above, the river data do not demonstrate that juvenile alewives are excluded from large areas of otherwise suitable habitat because of temperature. The second problem with this speculation is that it is contrary to what the data suggest, which is that temperatures in 2005 did not limit the population of alewives. This is demonstrated by the fact that the warmer 2005 (with 11 upstream ambient exceedences of the permit limits and more than 60 exceedances of the permit limits in the ZPH) had much greater relative abundance compared to the cooler 2004, which had no upstream exceedences and less than a third as many exceedances in the ZPH[184]. Both years had similar overall numbers of days believed to be capable of advection, but in 2004 there were none after May 15, so that the great majority of alewife eggs and larvae

were likely retained to grow into juveniles in the Basin. By contrast, even though more spawning adults may have reached further upstream in 2005, the middle of the critical period (the end of May and first days of June 2005) saw high flows approaching 900 cfs, which are capable of advecting the early cohorts of the larvae below the Watertown Dam and the mid-run cohorts of eggs. In this sense, if things "could have been better" in 2005 if there had been lower temperatures (as the Region speculates), then they would have been, in fact, better in 2004 than they were because 2004 and 2005 exhibited very similar flow conditions, but 2004 had lower temperatures.

Furthermore, this type of "could have been better" argument cannot form a sufficient basis for the Region's decision because such an unsupported assumption is incapable of being rebutted. The Region attempts to justify its use of such a speculative position by stating that Mirant Kendall "carries the burden of proof to show heat levels it advocates for its discharge will protect the BIP." RTC, Response to Comment C23, at p. C79. The first problem with this statement is that it is simply not true. There is no authority for placing the burden on Mirant Kendall at the permitting stage to demonstrate that the Region's proposed temperatures are incorrect. At most, the only burden the applicable regulations place on Mirant Kendall is the burden of showing no prior appreciable harm. It is the Region, however, that bears the burden of drafting a permit with a rational justification for its thermal limits. If the Region were allowed to justify any of their actions with conclusory statements that the applicant failed to meet its burden to convince them otherwise, then there could never be any meaningful review of the Region's decision-making. The Region would be able to do whatever it wanted knowing

that a conclusory statement that the applicant had failed to meet its burden would insulate its decision.

iii. The Field Results Confirm Mirant Kendall's Analyses of Larval and Juvenile Abundance in Years of Different Water Temperatures.

Mirant Kendall provided comments to the Region showing that an age analysis of 2004's returning adult alewives shows much greater percentage abundance of three-year-old fish from the 2001-year class than of 4-year-old fish from the 2000 year class. MK Comment Ex. No. C23-2. Mirant Kendall also explained that the Determinations Document failed to explain how the 2001-year class could so predominate over the 2000-year class, given the number of thermal exceedances that would have occurred in 2001 compared to the much cooler 2000. Thermal conditions during the usual peak timeframe of the alewife run in 2001 included 11 days in early May with temperatures between 68° F and 72° F at the Broad Canal intake; only 3 days were that warm in 2000. Between June 12 and August 31 in 2001, there were about 10% exceedances of 83° F at the Kendall intake (up to 86° F). There were no such exceedances in 2000.

The Region's response to this presentation of the data consisted of (1) arguments that exceedances of the intake were not necessarily exceedances in the ZPH representing a permit violation, (2) statements that general alewife population has declined in recent years, and (3) refers back to its flawed appreciable harm analysis.

The problems with the first and third argument have been discussed above. The statement by the Region that the "general alewife population" is declining is a significant misrepresentation of the situation regarding juvenile abundance in the river. This is true for two reasons. First, Mirant Kendall acknowledges that the "general population" over

the entire northeast is indeed declining, but that decline is disconnected from conditions in the river by the reproductive "strategy" of alewives and their Alosid relatives, such as shad. This consists of producing such an excess of young (on the order of hundreds of thousands per mating pair) that the population is well buffered against the large losses inherent in coastal rivers where episodes such as catastrophic advection flows will recur regularly. Thus, very few adults can produce a robust crop of young of the year/juveniles.[185] Second, and very important here, the field data collections have demonstrated threefold increases in alewife juveniles in the Charles push nets and gill nets over the 2003 to 2005 timeframe despite the overall regional decline, and the correspondingly "flat" numbers of returning adults in gillnet collections.[186]

iv. The Region has departed from applicable guidance and failed to provide rational justification for the purportedly protective 81° F in-stream limit.

The Region has continued to fail to provide rational justification for how it derived a purportedly necessary "protective" temperature at 81° F for alewives. In the Determinations Document (for example, Section 5.7.3i) and again in Section C of the RTC for the NPDES renewal permit, the Region discussed the results of literature reviews of toxicity testing of juvenile alewives that it cited for its selection of the temperature of 81° F. In the RTC, the Region also newly attempted to justify the 81° F value based on a purported finding of exclusion of juvenile alewives from the area below the Harvard Bridge at temperatures above 81° F. The incorrect and irrational nature of the Region's analysis regarding the exclusion issue are discussed in detail above. Here, the lack of rational basis for the Region's use of the literature, and the inconsistency with applicable EPA Guidance, are discussed.

Although the Region relies on the Thermal Guidance Manual in its evaluation of 316 (a) compliance issues, see supra, it acted contrary to the guidance in that Manual in establishing the 81° F temperature. On page 43 of the Manual, users are told that 48 hr hour TL_{50} results can be used to estimate the upper non-lethal limit for adult and juvenile fish. Mirant Kendall agrees that is a rational, relevant objective in this proceeding The Manual goes on to the describe the method by subtracting 2° C from the 48 hr hour TL_{50} to specify the corresponding Upper Non-Lethal Limit. This in effect provides a "margin of safety." The Region had available the data to do this, but did not do so.

Specifically, the Region cited, and Mirant Kendall commented on,[187] the data on 48 hour TL_{50} for young-of-the-year ("YOY") alewives from EA 1978. The value at the acclimation temperature of 77° F was 32.6° C , which upon subtraction of 2° C becomes an upper non-lethal limit of 30.6° C = 87.08° F. [188]

The Region also had and cited a No Adverse Effects Level (NOAEL) for juvenile alewife of 84.2°F from Otto.[189] Yet, with these two reference points available, including their inherent margins of safety, the Region somehow, without specific explanation, ends up more than 3° F lower at 81° F. Then the Region adds an additional requirement for 4-hour averaging with the general explanation that (an additional) margin of safety is needed below these numbers. Yet, these numbers were derived over longer exposure test periods with already built-in safety margins - i.e., "no effects" were reported by Otto at this 84.2° F number - with 90% survival at 86 to 87.8° F. This action by the Region was arbitrary and irrational and contradictory to the relevant Thermal Guidance Manual procedure.

Further, the Region attempts to add justification to the 81° F number by linking it to unspecified literature studies of avoidance. Indeed, there are relevant literature studies of juvenile alewife avoidance temperatures. Mirant Kendall would have quickly brought them to the Region's attention had they been afforded the due process of comment when the Region newly established 81° F as an in-stream limit in the final permit based on its new avoidance analysis. For example, five such tests conducted at the here-relevant acclimation temperatures of 77-82.4 °F found "Least Significant Avoidance" in the range between 86 and 93.2°F. "Mean avoidance" was found in the 88-90° F range.[190]

None of these data, nor any of the literature test data cited by the Region, point to 81° F as necessary for protection. Indeed, these numbers are consistent among them, and only show the onset of effects above 86° F. This is further consistent with Mirant Kendall's collections of juvenile alewives in the river up to that 86° F temperature. Notwithstanding the Region's literature citation of other various "protective recommendations" (which are very different from actual test results), the Region has not provide the evidence from the literature to support 81° F as "necessary" to protect juvenile alewives. The consistent literature results instead point to a temperature at or above the NOAEL level of 84.2° F as fully protective.

For these reasons, and the clear invalidity of the Region's "exclusion analysis" the 81° F in-stream limit should be remanded to the Region for reconsideration and revision to match the available empirical data.

iv. Temperature Limits based on Spawning Period for Yellow Perch

Mirant Kendall commented that a 24-hour average was sufficient to assure a protective temperature for yellow perch spawning.[191] The Region rejected this approach

based on speculative concerns that Kendall Station's discharge could cause "potential spikes in temperature," and "could markedly raise the temperature of the Basin, conceivably above the protected temperature limit for some time." RTC, Response to Comment C16, at p. C58. The Region also explained that a 24-hour average would allow Kendall Station's discharge to "raise temperatures several degrees above the protective levels" during portions of the day and then still achieve thermal limit under a 24-hour averaging regime. RTC, Response to Comment C16, at p. C59.

The problem with these conclusions is that the actual data from the Charles River demonstrate that if Mirant Kendall were operating under a 24-hour averaging regime, there would be no hidden temperature spikes, or prolonged or marked departures over the Permit's thermal limits. As set forth more completely supra, Mirant Kendall has examined the historical temperature data at the warmest compliance point in the ZPH (Monitoring Station 3, two foot depth) from every day where there would have been an exceedance of 83° F as a four-hour average, but not an exceedance 83° F as a 24-hour average for the summer of 2005. A review of the continuous temperature readings from these days demonstrates that under a 24-hour averaging regime, as opposed to a four-hour averaging regime, there are:

- **No "hidden" temperature spikes, or elevation of temperature "several degrees above the protective limit."** On most days, the temperature did not even get more than one degree above the permitted limits; and

- **No "hidden" prolonged temperature elevations above the protective limit.** On most days, the temperature was below the permitted limits for at least 18 hours a day.

Based on these data, the Region's speculative arguments about "hidden" dangers of a 24-hour averaging regime have no basis.

v. Thermal Limits Based on Yellow Perch Juveniles Are Below Temperatures That Juvenile and Adult Yellow Perch Are Regularly Caught in the Charles River

Mirant Kendall commented that the Region's target protective temperature for juvenile yellow perch of 80.6° F, based on anecdoteal information, was undermined by actual data from the Charles River that showed juvenile and adult yellow perch voluntarily occupying water with temperatures as high as 84.8° F. Specifically, Mirant Kendall's beach seine collections found numerous juvenile and adult yellow perch in temperatures ranging from 80.2° F up to 84.8° F. Based on these data, Mirant Kendall commented that the Region's conclusion that 80.6° F represented an "avoidance" temperature, a conclusion which was based on anecdotal representations by Massachusetts Fisheries and Wildlife that they had not collected yellow perch above that temperature,[192] was not supported by site-specific River Data. Based on this conclusion, Mirant Kendall commented that a temperature limit of 83° F under a 24-hour averaging regime would be sufficiently protective of adult and juvenile yellow perch.

The Region attempted to rebut Mirant Kendall's river data by claiming that a review of the data led it to select a temperature limit that the scientific literature identified as providing a relatively low amount of suitable habitat. But this argument does little to explain why a 24-hour average, in light of the numerous catches near or above the Region's avoidance limit, would not be protective.

The Region also claimed that it was plausible that the lack of yellow perch in the area of Kendall Station's discharge meant that the yellow perch were avoiding unsuitable temperatures there. But this speculation does not explain why the Region decided to select actual temperature limits below those where yellow perch have been caught, and

why it decided to reject Mirant Kendall's proposal of a 24-hour averaging regime.

Furthermore, the Region admitted that the absence of yellow perch in the area near the discharge could be attributable to other factors, but that Mirant Kendall did not provide any information on this subject. This is false. As discussed infra, Mirant Kendall provided substantial biological and water quality data showing a 60-80% decline of yellow perch abundance since 2002, at the same time the lower basin was experiencing buildup and sustained bottom salinities of 16 ppt to 20 ppt, which is too high for yellow perch to tolerate. These intolerably high levels of salinity are not caused by Kendall Station's discharge. It is this high level of salinity in much of the lower basin that excludes the yellow perch from habitat, and which has led to a decline in the yellow perch population. As discussed infra, Mirant Kendall proposed to modify its discharge by use of a diffuser in a manner that would reduce the areas of high salinity in a third or more of the affected portion of the lower basin, but the Region refused to grant that request, thereby making it likely that the species the Region purportedly wishes to protect will continue to suffer declines in population that are greater than any hypothesized effects from Kendall Station's discharge.

Finally, the Region claimed that yellow perch caught in the beach seines may not have actually been in water at the recorded temperatures. The Region claims that because beach seine temperature readings are taken at the water's surface, the fish could actually be in cooler temperatures a couple of feet below the surface. First, the Region has pointed to no data to suggest that temperatures a foot or two below the surface in these shallow sampling areas are substantially cooler than the surface. Second, the Region does have temperature data at depth for areas immediately adjacent to these

sampling areas. Mirant Kendall has been collecting and providing continuously recorded thermistor data from a couple of feet below the surface at locations close to the several seine sites below the Harvard Bridge since 2002. Further, every time a seine collection is made, in addition to the temperature reading the Region seems to be referring to on the data sheet, the sampling crew performs vertical profiles of temperature from the sampling boat at the seine locations, all of which have been provided to the Region. These temperature readings that the Region fails to acknowledge confirm that temperatures at the two or three foot depth at the beach seine locations are not markedly, if at all, cooler than the surface temperature readings.

vi. The Region Has Placed Undue Emphasis on Maintenance of the Required "Chill Period" in April, to the Foreseeable Detriment of the Alewife .

The Permit requires Mirant Kendall to maintain temperatures below 50° F for a 150 day chill period beginning November 1 and continuing as needed to mid-April. Mirant Kendall commented that the extension into mid-April overlapped the onset of the alewife spawning run, which it documented repeatedly to begin in earnest when temperatures reach and exceed 50° F.[193] The Region dismissed Mirant's comment by stating "[i]n capturing this potential tradeoff in permit conditions, EPA and MassDEP believes (sic) there is sufficient time in spring, after the yellow perch chill period, to allow for alewife migration." RTC, Response to C18, at p.C66.

This position by the Region on the tradeoff is wholly inconsistent with its more understandably opposite position, where the Region states "[b]ecause the Charles river alewife run appears to be small, EPA and MassDEP are concerned that if only the bulge

in the run is protected, an important portion of the run could be excluded by selecting inappropriate temperature limits. ..." RTC, Response to C43, at p. 123.

But that is exactly what the Region has done by retarding the onset of 50° F in the part of the ZPH downstream of the Longfellow Bridge. As documented in the record,[194] the alewife run is well underway in most years by mid-April. Further, this location is in any case unsuitable habitat for yellow perch in the absence of the diffuser regardless of temperature because of excessive bottom salinity and low dissolved oxygen.[195]

Thus, the chill period requirement should be remanded to the Region for reconsideration and revision of the requirement for extension into April, and for coordinated consideration along with the opportunities for perch habitat improvement in the ZPH below the Longfellow Bridge by approval and use of the diffuser.

b. Improper Imposition of 81° F as a Thermal Limit

As discussed above, the Region determined (primarily on the basis of its analysis of the 2004 and 2005 data) that 81° F was an appropriate avoidance temperature for alewives. The draft NPDES renewal permit, however, imposed in-stream thermal limits of 83° F in the summer months under the reasoning that there would be sufficient habitat in the ZPH at or below 81° F if 50% of the compliance points in the ZPH were required to meet the 83° F limit. Based solely on its analysis of the 2005 data, however, the Region concluded that its prior assumption was incorrect, and that in-stream thermal limits of 81° F were needed at certain compliance points during certain times during the day to ensure that sufficient habitat was available.

The Region reached its conclusion that 81° F thermal limits were needed based on its analysis of temperatures from the 2005 thermistor data. The Region concluded, based

on this review, that there was not sufficient habitat below 81° F (with sufficient dissolved oxygen) for the alewives in the ZPH during the summer months of 2005.[196] Based on this analysis, the Region decided to impose 81° F as a thermal limit at certain compliance points in the ZPH for certain portions of the day.

The Region's decision to impose stricter requirements is irrational because it concludes that the 83° F thermal limits in the draft NPDES renewal permit would have been insufficient to ensure habitat in the ZPH under 81° F based on an evaluation of temperatures from 2005. The problem with this approach is that it uses river temperatures experienced under the current permit (which does not include thermal limits with four-hour averaging) as a basis for concluding that the thermal limits and four-hour averaging imposed by the draft NPDES renewal permit would not be stringent enough. In reality, the Region only demonstrated that 81° F is not met at certain points in the river under the current NPDES permit. Its analysis provides absolutely no insight into what temperatures would look like under the much more restrictive draft NPDES renewal permit, which includes in-stream thermal limits based on four-hour averaging. Because the Region has failed to analyze whether sufficient habitat would be available under the draft NPDES renewal permit, it cannot rationally conclude that those limits are not stringent enough by reference to 2005 river temperatures.

4. Erroneous Delta T Requirement

Part I.A.1, Attachment A of the NPDES renewal permit imposes a Delta T requirement of 5° F. The Delta T requirement provides that 5° F is the maximum temperature difference between (a) the 24-hour average of the 2 and 6 foot compliance points at upstream Monitoring Station 1 and (b) each of the average 24-hour temperatures

at two continuous monitoring points at five monitoring stations (stations 2, 3, 4, 7 and 8) located in the ZPH. Id. The Delta T requirement, accordingly, adds five daily compliance events to the over 100 absolute temperature ZPH compliance events described in the Background section.

The record indicates, however, that there is no biological basis to impose a Delta T requirement of 5° F such as the Region established in the permit. Mirant Kendall provided site-specific data -- that the Region has not adequately responded to -- that demonstrates a Delta T of 5° F between Station 1 and the ZPH is unnecessary to protect the BIP. The Delta T requirement also has several other flaws, described below.

a. River Data Demonstrate that Fish Traveling in a School are Distributed Across a Higher Delta T than 5° F.

Mirant Kendall commented that a 5° F Delta T was unnecessary to protect the BIP because fish in the lower basin have been documented traveling in schools that span a vertical Delta T of 8-12° F.[197] MK Comments, Comment D19, at p. 65. This means that individual fish traveling in the same school are distributed vertically throughout the water column in temperatures that differ vertically across a range of 8-12° F. The distribution of fish across that temperature range is site-specific data that undermines the Region's literature-based approach that a Delta T of 5° F is necessary to protect the BIP in the lower basin.

Mirant Kendall also commented that the Region's counter-argument that individual fish in a school were traveling linearly and did not experience Delta Ts of 8-12° F had no support. MK Comments, Comment, D19, at p. 65. The Region's argument is contrary to fundamental principles of natural selection that would have extinguished such fish who only traveled in a single horizontal line within a school. Id. Second, years

of observation of alosid schooling behavior demonstrates that individual fish in a school move vertically throughout the water column within that school. Id. This is not surprising as it is a fundamental aspect of schooling behavior for all fish. It is arbitrary for the Region to base its Delta T requirement on such an unsupported and novel theory of schooling behavior -- especially when that theory is directly contrary to well-established science and data to the contrary.

The Region's only response to Mirant Kendall's comment on this point was that Mirant Kendall provided no proof that fish in the schools moved across temperature gradients.[198] Simply put, there is not much more Mirant Kendall could do to prove the Region incorrect, and so the Region's conclusory statements that Mirant Kendall has not done enough are irrational. Mirant Kendall provided river-specific data on schools of fish that occupied temperature gradients from 8-12° F, and coupled this data with the scientific fact that individuals in a school circulate throughout that school. The Region should not be able to defend its actions with conclusory statements that Mirant Kendall has not submitted sufficient proof, especially in light of the site-specific data (supported by unassailable science on alosid schooling behavior) Mirant Kendall did submit. The Region must contest either the data itself, or provide some scientific basis for its novel theory that fish in a school do not move throughout that school but rather only occupy the same vertical isotherm. In this case, the Region has done neither.

Furthermore, the Charles River temperature data show that even if the Region's theory that fish in a school traveled solely in a horizontal vector those fish would experience a grater Delta T of 5° F as the school made its way upstream. For example, alwives, bluebacks and white perch captured at depths of 14 to 20 feet or more in late

June and July of 2003 and late May of 2005 were at temperatures more than 5 degrees cooler than the bottom temperatures in upstream shallower water, e.g., at Hyatt or the BU bridge.

b. Delta T Requirement - Speculation on Interference with Migration

Mirant Kendall commented that the river sampling data demonstrate that actual Delta Ts greater than 5° F do not support the Region's fears of avoidance behavior by fish. MK Comments, Comment D24, at p. 67. The Region dodged Mirant Kendall's evidence of actual non-avoidance behavior , however, by asserting concern about possible avoidance by fish entering the Charles River system from below the New Charles River Dam. RTC, Response to Comment D24, at pp. D34.

There are several reasons why the Region cannot justify its Delta T requirement with this reasoning. First, the Region has developed extensive in-stream limits that apply during the in-migration season based on its determination of what in-stream temperatures are sufficient to ensure migration into the Charles River from the harbor at the New Charles River Dam.[199] The Region has failed to explain why the Delta T requirement is necessary, too, to ensure in-migration when the Region has already set in-stream thermal limits it believes protects in-stream migration.

Second, the Region's fear of interference with in-migration is nothing more than pure speculation. The Region claims that it "lacks information" regarding what percentage, if any, of anadromous fish are held back from migrating into the Charles River because of temperature differences. RTC, Response to Comment D24, at p. D34. Given that the Region admittedly has no basis for concluding that fish, in fact, have been held back from entering the system because of temperature differential, it is arbitrary and

capricious to impose a stringent Delta T requirement to protect against adverse effects the Region claims have no documented basis.

Finally, even assuming that the Region's in-migration avoidance is a valid concern, the Delta T requirement in the permit bears no rational relationship to that concern. As discussed above, the Delta T comparison is between Monitoring Station No. 1 and the specified Monitoring Stations in the ZPH. But every monitoring station in the ZPH is above the New Charles Dam, meaning that the Delta T requirement only "protects" fish that have already passed by the New Charles River Dam and are in the system. In other words, the Region has failed to explain how the temperature difference between points within the ZPH (and above the dam) with a compliance point over one mile upstream from the New Charles River Dam has any rational relationship to protecting in-migration from below the dam into the Charles River.

c. Tagging Studies Indicated No Blockage

Mirant Kendall submitted data on its sonic tracking studies to the Region before the public comment period, and during the public comment period noted that the results of its studies showed no "significant effects" of a Delta T on the ability of those fish to move upstream. MK Comments, Comment D27, at pp. 67-68.

The Region admitted that "most fish that were tracked in 2001 swam past the thermal plume from Kendall Station without displaying obvious behavior that would indicate their movement was disrupted." RTC, Response to Comment D27, at pp. D37-38. The Region then went on to note that a small number of fish "meandered" between the Museum of Science and the Harvard Bridge for two weeks to a month. Id. The

Region then went on to speculate that it is "plausible" that the discharge plays a "leading role" in this behavior. Id.

But this speculation does not provide a rational or sufficient basis for the Region's decisions. First, the meandering fish had already been shown by the studies to have moved upstream past the plant in a few days. Second, the very fact that fish were moving between Museum of Science and Harvard Bridge undermines -- rather than supports -- the Region's speculation that Delta T has a negative effect on fish movement because the area between those two stations represents the area of the lower basin most effected by Kendall Station's discharge. The very fact that some fish meandered in this area, therefore, demonstrates that this fish had no problem moving across an area with the most pronounced thermal effects due to Kendall Station's discharge.

Second, the Region did not provide any analysis to support the theory that this fish movement represented some type of thermal blockage due to Delta T effects. The Region has failed to provide any temperature or other data suggesting a link between the discharge and the movement of these fish. Unless the Region has some basis -- in the science or in the data -- for its speculation, its attempts to justify its Delta T determination on such speculation are arbitrary and capricious.

d. The Region Recognizes that Delta T on Any Given Day Not Necessary to Protect Out-migration

Mirant Kendall commented that out-migration of juvenile river herring occurs over a large temperature range of up to 25° F, and that there was no basis for a Delta T of 5° F to ensure that proper out-migration occurs. MK Comments, Comment D28, at p. 68.

The Region agreed with Mirant Kendall that "a 5° F difference on a given day is not likely significant," and stated that its only concern was preventing "Delta Ts above 5°

F for extended periods of time." RTC, Response to Comment D28, at p. D38. For this reason it is irrational for the Region to require a Delta T calculated using a 24-hour average for the time of year after in-migration is completed because by its own recognition, Delta Ts in any 24-hour period is irrelevant to ensuring successful out-migration. This issue should be remanded to the Region so that it can consider an appropriate averaging period (other than the admittedly irrelevant 24-hour period) for the Delta T calculation in the periods after in-migration has completed.

e. Delta T Requirements Are Only Necessary to Prevent Abrupt Changes in Temperature.

Mirant Kendall commented that a more appropriate Delta T regime would be designed to ensure that fish do not experience any abrupt changes in temperature as they swim across the ZPH. The basis for Mirant Kendall's comment was that all of the scientific literature and studies that recommend a Delta T requirement, do so on the basis that such a requirement is necessary to protect fish against sudden, abrupt temperature changes. MK Comments, Comment D30, at p. 69. All of the literature in the record that the Region relies upon makes this clear.

Mirant Kendall then commented that using Monitoring Station 1 as the comparison point for Delta T bears no rational relationship to this goal. Id. It is well documented that the temperature gradient between Monitoring Station 1 and the other monitoring stations in the ZPH represents a gradual change in temperature. Therefore, even if fish were to experience more than a 5° F Delta T as they moved to that station, temperature change would be the type of gradual -- rather than abrupt -- change that the Delta T requirement was not intended to prevent. Indeed, Mirant Kendall proposed a Delta T regime that would require Delta T comparisons between adjacent monitoring

stations to ensure that there would be no abrupt changes in river temperature in the ZPH.[200]

The Region's response never addressed this aspect of Mirant Kendall's comments. The Region never explained why a Delta T requirement intended to protect against abrupt changes in temperature was being applied in a manner that prohibits gradual changes in temperature over the course of up to one linear mile.

5. The Region Did Not Rationally Account For Ambient Conditions, Which Have Historically Exceeded The In-stream Temperature Limits in the Permit.

The Region failed to provide an adequate justification for the effluent limitations in the NPDES renewal permit that impose in-stream temperature limits below the level of historic, ambient temperatures in the Charles River. The Region also failed to adequately address Mirant Kendall's proposal to accept permit limits that would ensure that Mirant Kendall's discharge would not deviate from the historic ambient temperatures regime, which would necessarily assure the protection of the BIP.

a. Permit Provision at Issue

Part I.A.1 of the Permit, which includes and incorporates footnotes 7 and 8 and Attachments A and B, establishes a comprehensive set of effluent limitations based on in-stream thermal limits. Many of these limits are lower than ambient temperatures that the lower basin of the Charles River has historically experienced during the pertinent seasons.

b. Mirant Kendall's Comments

Mirant Kendall commented (and it is not disputed)[201] that ambient temperatures -- meaning those temperatures not influenced by Kendall Station's discharge -- in the lower

basin of the Charles River have regularly exceeded the in-stream limits set by the Region in the permit. Mirant Kendall also submitted several proposals to the effect that it would accept permit limits that would ensure that its discharge did not cause temperatures in the Charles River to exceed the range of historic ambient conditions to which the BIP in the lower basin of the Charles River has adapted without harm. See, MK Comment C-16, at p.27.

The primary basis for this approach is that, by definition under the process of natural selection, the naturally occurring variations in ambient temperatures determine the composition of the BIP and are inherently protective of the BIP. In other words, the BIP cannot be separated from the ambient temperatures within which it has developed. The BIP in any given system is there because that BIP is able to tolerate the naturally occurring variation in ambient conditions found in that system. For example, Mirant Kendall provided comparison of temperatures in the Charles River and in the Nemasket River, a Massachusetts stream which the state uses as a source of alewives for stocking of other streams, and is, accordingly, viewed as a productive habitat for alewives. The data showed the temperatures in the Charles River and the Nemasket River were similar during the comparison period, with some higher temperatures in the Nemasket on some days and at levels exceeding the Region's maximum temperature of 81° F in the ZPH. See the report provided as EPA Doc. #489 on the 10/12/06 A.R. Index.

The Region's undocumented claim that ambient temperatures in the Charles River are unsuitable because they are "among the warmest in the state, accordingly, misses the issue. The issue is whether the ambient temperatures are harmful to the BIP. The naturally occurring range of ambient temperatures in a system necessarily as adequate to

assure the protection and propagation of the BIP that exists in that system. The Region was therefore irrational and unscientific in departing from this basic principle.

Based on this fundamental scientific fact, Mirant Kendall proposed a statistically and scientifically sound method for imposing thermal limits that would ensure that its discharge would not cause any departures from the protective ambient temperatures that the Charles River has historically experienced. Mirant Kendall proposed that it would be sufficiently protective to set thermal limits for each calendar period based on a temperature that is no more than two standard deviations above the historic mean. This would ensure protection of the BIP because a temperature below two standard deviations from the mean is within the naturally occurring range of temperatures that the BIP has regularly experienced, and can tolerate without any appreciable harm. The record indicates that EPA recognizes that limits below two standard deviations are protective of the BIP.[202]

Mirant Kendall's comments illustrated that approach to demonstrate what a protective temperature would be, and to demonstrate how some of the draft NPDES renewal permit's limit are unnecessarily and inappropriately restrictive because they are so far below the range of naturally occurring ambient conditions.[203]

c. Nothing in the Record Nor the Response to Comments Justifies a Permit that is not Squarely Founded on Ambient Temperatures

The Region's response to Mirant Kendall's proposal demonstrated an admitted misunderstanding of Mirant Kendall's analysis. Therefore there is not a rational basis for the Region to reject Mirant Kendall's proposal given that (a) it admitted that it failed to understand Mirant Kendall's proposal (and failed to engage Mirant Kendall on this

issue), and (b) the Region seemed unable to grasp the fundamental principle that historic ambient conditions, by definition, are protective of the BIP because that is what the BIP has historically experienced and adapted to tolerate.

The Region's Response to Comments makes clear that it failed to understand Mirant Kendall's proposal. For example, the Region admitted that "it is unclear what Mirant is asking with regard to the '90% confidence upper bound of the ambient 24-hour temperatures.' If the permittee is suggesting that the historical record be used for that day in question, this approach is problematic."[204] But it is not that difficult. The proposal to set permit limits at the "90% confidence upper bound," in conjunction with a BTU load reduction requirement, meant that temperatures in the lower basin would never have the potential to exceed two standard deviations (95% upper bound) without curtailment of plant operations. This would ensure that Mirant Kendall would not cause temperatures to exceed the two standard deviation range of naturally occurring temperatures that are protective of the BIP.

The Region's response also suggests that it believes the naturally occurring variation of historic ambient temperatures is somehow not protective of the BIP. The Region explained that it "can not justify a protective temperature limit based solely on the fact that the temperature is expected to occur in a water body under ambient conditions."[205] This is irrational because the Region appears to be claiming that naturally occurring temperature conditions can harm the BIP. The Region has not provided -- because it cannot provide -- any credible scientific basis for why temperatures below two standard deviations from the mean, recurring with essentially their historic

frequency, would not be protective. If the BIP could not tolerate such deviations from past-historic conditions, then a different BIP would presently exist in the lower basin.

Also, that conclusion is also supported by the data from the Charles River itself. For example, as discussed supra, juvenile alewives were almost three times more abundant in 2005 than they were in 2004, yet the water temperatures in the critical alewife larval development period in the second week of June, 2005 were about 77° F, exceeding both the Region's permit limit of 75° F (applicable for just a four-day period!) and the 76° F 90th percentile, which is one-and one-half standard deviations above the mean temperatures for that period. Thus, these temperatures were even higher than the permit limits based on the 90% upper bound that Mirant Kendall would accept.

By contrast, the three times lower juvenile alewife densities in 2004 occurred along with intake temperatures of about 71° F, meeting the Region's proposed limits, and several degrees below the 90th percentile values for early June. The summers of 2004 and 2005, over which these juvenile abundance densities were measured, followed a similar temperature pattern, with 2005 intake temperatures about 80° F, about two degrees above the applicable mean, and 2004 intake temperatures averaging about 76° F, four degrees cooler.

Finally, the Region disclaims the material in the record indicating that EPA recognizes that limits should be set no higher than two standard deviations from the mean in order to ensure protective conditions.[206] The Region argues that Mirant Kendall took this statement out of context.[207] This is not true. The memo where this statement appears provides no other context, and none is needed. The statement stands on its own, and is capable of being understood without any context added. Furthermore, nothing in the

record provides support for the Region's revisionist attempts to construct a context for this statement. The Region's decision-making is confined to the administrative record, and it cannot seek to change the plain meaning of materials in the record by providing "context" that has absolutely no record support. Notwithstanding, even the "context" provided by the Region fails to call into question the basic premise of the protective nature of the 95th percentile values—it merely focuses the discussion of its application to a particular time period.

Finally, the Region claims that the application of the 95% upper bound confidence limit is only proper when that limit is correlated with a healthy or abundant BIP. But this has been Mirant Kendall's suggestion all along, which has been to tie the permit limits to temperatures that occurred during the years that have been documented as successful in terms of relative abundance of target species, including river herring. Mirant Kendall is more than willing, as the Region suggests, to consider temperature limits statistically correlated to the river temperatures seen in these years.

Further, Mirant Kendall has proposed measures, notably the diffuser, that would lower river temperatures and mitigate the other more significant limitations on the BIP (e.g., excessive salinity and insufficient dissolved oxygen). This issue should be remanded for the parties to work cooperatively towards implementing the Region's objective and enhancing the BIP.

C. ZPH and Compliance Regime

1. Arbitrary And Capricious Overbreadth of The Compliance Regime

a. Overbroad Compliance Scheme

In the RFI Response and in the MK Comments,[208] Mirant Kendall established that the compliance scheme in the draft NPDES permit was overbroad because it was much more burdensome on the Station than necessary to achieve the Region's stated purpose of protecting a ZPH. Specifically, there will be many days when the Station could not operate at all because of just one or two projected temperature exceedances among the more than one hundred daily compliance events in the ZPH, even though a majority of the ZPH and the majority of the rest of the lower basin much larger than the ZPH would have remained in full compliance during the full day. Mirant Kendall urged the Region to modify that overbroad approach to tailor the compliance scheme more accurately to the purpose and to reduce unnecessary burdens on the Station.

Mirant Kendall also pointed out that the larger volume in the lower basin means that the river retains heat longer there than it does upstream at the background location. When in-stream temperatures drop at the background location, the differential with temperatures in the lower basin naturally grows, even with no discharge from the Station.[209] As a result, there will be days when the Station cannot discharge, even though no impermissible absolute temperatures would occur in the ZPH, because any discharge would be treated as contributing to a violation of the requirement that ZPH temperatures not exceed of the 5° F 24-hour temperature differential from background. The Station would be shut, accordingly, just because the large volume lower basin naturally is slower to cool than the small volume background location, even if the Station's impact were just to add less than a degree of heat to the lower basin and the temperatures there were fully within the absolute limits. The Region's RTC does not argue otherwise.

In its RTC, the Region grudgingly conceded Mirant Kendall's points. The Region acknowledged that the "regulatory structure of the permit may not always perfectly reflect" the conditions seen in the river. But, the Region said, bright lines must be drawn to be enforceable and it would be too difficult to write a permit where a "violation" at one or more compliance points could be "ignored as a legal matter." As a result, the final NPDES permit retains the same overbroad enforcement scheme. In a transparent effort to excuse the overbreadth, the Region also noted that Mirant Kendall always can come back for permit modifications later if the permit is unnecessarily restrictive. [210]

The Region's response, however, seriously misrepresents Mirant Kendall's comments. Mirant Kendall never suggested that a compliance scheme should allow it to "violate" legally enforceable compliance points. Rather, it established that this compliance scheme is unnecessarily overbroad and unnecessarily puts Mirant Kendall's existence at risk. And Mirant Kendall proposed that the Region should develop an approach, such as the BTU Loading Approach, that uses in-stream temperatures to determine the Station's operational levels but does not force the Station entirely to shut down in order to avoid the risk of violating in-stream temperatures even on days when the goals of the ZPH would be fully satisfied.

The RTC also suggests that the difficulty in devising a more accurate compliance scheme resulted from Mirant Kendall's failure to submit an acceptable hydrodynamic model. But the Region goes on to confess that the Region would use such a model and "reasonable worst-case assumptions" to impose even more restrictions on the Station.[211] So the question of modeling is immaterial to the question of how to devise an in-stream temperature monitoring and compliance scheme that achieves the Region's goal of

protecting the BIP without unnecessarily curtailing the Station's ability to operate and survive.

The central, explicit point of Mirant Kendall's comment on overbreadth was that the Region should seek to reduce that overbreadth. Instead, the Region misrepresented Mirant's comment and has acknowledged but entirely declined to grapple with the impacts on Kendall's operations. It was arbitrary and capricious for the Region to refuse to tailor its compliance scheme more accurately to the needs of both the river and the discharger. The Board should review the Region's determination to impose an overbroad compliance scheme and remand to the Region.

b. ZPH is Not Viable Spawning Habitat

The compliance regime is also overbroad because it bears no rational relationship to the biological activity (in this case spawning) that it purports to protect. The NPDES renewal permit imposes temperature limits for the compliance points in the ZPH in the springtime in order to ensure that the ZPH is available for alewife and yellow perch spawning during that period.[212] But even assuming such limits were needed, setting permit limits to protect spawning in the ZPH will actually do little or no good without the diffuser because any spawning that takes place in the ZPH will not likely result in the production of significant numbers of juvenile alewives or yellow perch. This is because eggs and floating larvae will either be advected out of the system if they are in the upper water column, because the ZPH is too far downstream, or will settle to the bottom where they will experience lethal conditions caused by a lack of dissolved oxygen and high salinity.

i. The ZPH is Not a Viable Spawning Area Because Eggs and Floating Larvae Will be Advected out of the System

or will Settle to the Lower Depths and Experience Lethal Conditions.

Mirant Kendall commented that the ZPH is too far downstream for floating eggs and larvae to remain in the system long enough to reach an age where they can swim. MK Comments, Comment D7, at p. 60. Mirant Kendall commented that residence time in the ZPH, even under low flow conditions in May, is approximately eight days. Eggs and floating larvae near the surface will have even shorter residence times. MK Comments, Comment D9, at p. 61. A residence time of three to four weeks after spawning is necessary for eggs to develop into larvae that can swim strongly enough to avoid advection. Given these facts, any spawning that takes place in the ZPH -- or even just upstream from the ZPH -- will certainly result in eggs that never develop into swimmable larvae prior to advection.

Mirant Kendall also commented that the eggs and larvae that sink into the lower water column in the ZPH experience lethal conditions due to low dissolved oxygen and high salinity. MK Comments, Comment D9, at p. 61. This fact is an independent reason why the ZPH does not represent a viable spawning habitat.

The Region has not contested that a residence time of three to four weeks after spawning is necessary for eggs to develop into larvae that can swim well enough to avoid advection or settling. The ZPH cannot be considered a viable spawning area, therefore, unless the Region provides a rational basis for concluding that eggs spawned in the ZPH will (a) not be advected in a three to four week period, and (b) will not experience lethal conditions if they avoid advection and settle to the bottom of the ZPH. The Region has failed to make either showing.

With respect to advection, the Region does not dispute that 100 cfs results in a residence time of in the ZPH of approximately eight days. Therefore, the Region has conceded that under low flow conditions during the month of May, spawning that takes place in or even near the ZPH will result in eggs or larvae being advected from the system. For this reason alone, the Region's attempts to regulate the ZPH as spawning area must fail.

What the Region does argue is that residence times in the ZPH are longer than eight days in June, which has lower flows than May. RTC, Response to Comment D9, at p. D15. The Region then explained that the second lowest June flow for the nine year period from 1994 through 2002 was 83.5 cfs, and that this was lower than the 100 cfs, which resulted in advection in eight days. RTC, Response to Comment D9, at p. D15. But the Region fails to argue that 83.5 cfs will result in a residence time (i.e., three to four weeks) that is sufficient to allow larvae to develop to the stage where they can avoid advection. In fact, a flow of 83.5 cfs only results in a residence time of approximately ten days. For this reason, the Region's observation of low flows in June of 83.5 cfs does not support the argument that eggs and floating larvae in the ZPH experience enough residence time -- even under the lowest recorded flows during the tail end of the spawning season -- to survive advection.

The Region also speculates that flows along the shoreline are lower than towards the center of the river. RTC, Response to Comment D9, at p. D15. But this argument does little to support the necessary finding that residence time in the ZPH for eggs and floating larvae approaches the three to four weeks needed. First, the Region points to no flow data (and the record contains no such data) from the Charles River showing that this

is the case in the ZPH. Second, the Region has failed to offer any suggestion of what the cfs is along the shoreline, or what the residence time for eggs and floating larvae along the shoreline would be. Third, all of the water column is subject to advection in shallow areas along the shoreline. Because the Region's conclusory statement -- with no record support -- provides no basis for concluding that residence time along the shoreline would be sufficient to protect eggs and floating larvae from advection (even assuming lower flows there), the Region has failed to justify its position that the ZPH is a viable spawning area.

Finally, the Region's response to Mirant Kendall's comment that lethal conditions exist in the deeper water relies on a misleading presentation of the data. The Region argues that there is sufficient oxygen at depth in the ZPH to support eggs and larvae. Not only does this comment contradict what the Region has said elsewhere in its Response to Comments, but it is belied by the very data that the Region relies upon.

The Region claims that the data show sufficient oxygen at depth. The Region states:

> Water quality data does not identify [the spring and early summer] as a period when a large layer of water is absent of dissolved oxygen in the lower basin. For example, in mid-May of 2004, when river herring egg and larval density was at a peak at the Charles River Station, DO levels at this station were greater than 5.0 mg/l from the surface to the bottom (approximately 15 feet).

RTC, Response to Comment D9, at p. D16. But rather than being an "example" of typical dissolved oxygen levels at depth during the spawning seasons, as this comment suggests, the DO levels in May 2004at the shallow Charles River sampling station are completely unrepresentative of the prevalent local condition. DO levels at that shallow station were unrepresentative of the DO below 5.0 mg/p that same date in the deeper

water comprising the majority of the area. Lower water column DO levels that May, including on that date, in the deep part of the ZPH were never above 5.0 mg/l. They were also never above 5.0 mg/l for the entire measurement period in 2003, which went from April 11 through September 24, 2003. On a single date, May 28, 2005, the DO was above 5 near the deep bottom in the ZPH, but it had been below 5.0 mg/p on all of the six preceding dates and was again below 5.0 mg/p on the 27 dates thereafter until November. In fact, the May 2004 reading cited by the Region is thoroughly misleading of the conditions in the deep water of the ZPH, where eggs and larvae would perish. This concern is acknowledged by Mass Division of Fisheries and Wildlife's letter expressing support for Mirant's proposed diffuser.[213]

The Region's attempts to cherry-pick an outlier data point that appears to support its argument and then characterize that data point as a typical "example" -- when the contrary is true -- casts serious doubt on the integrity of the Region's approach to this issue. Furthermore, as discussed infra, the data could not be more contrary to the Region's denials of an increasing problem with stratification in the ZPH. For these reasons, the Region has failed to provide any basis for concluding that eggs and larvae that sink into the deeper water in the ZPH experience lethal conditions.

c. The Upper Water Column of the ZPH is not Habitat For Any of the Target Species

The compliance regime is also overbroad because it requires compliance with daytime, surface in-stream thermal limits in order to protect fish that the Region acknowledges are not there during the daytime.

As discussed above, the NPDES renewal permit creates a compliance zone called the ZPH that consists of seven different fixed monitoring stations located throughout the

lower basin of the Charles River.[214] Each monitoring station has four different compliance points located at various depths from the surface. The first compliance point is two feet from the surface, the second is at six feet, the third is at twelve feet, and the lowest one is at 24 feet or three feet from the bottom.

As discussed above, the temperature at each compliance point is assessed as a four hour average at six discrete times each day. And if the temperatures at a minimum number of these compliance points during each four hour period is not below the applicable thermal limits, Kendall Station cannot discharge.

The primary problem with this compliance scheme is that Mirant Kendall commented -- and the Region acknowledged -- that both yellow perch and alewives are absent from the upper six feet of the water column during the daytime hours. For this reason, it is irrational to require compliance with temperature limits during the daytime four hour blocks in order to "protect" alewives and yellow perch that are not even there.

i. Alewives, By Nature, Avoid the Upper Water Column During the Daytime Hours

Mirant Kendall commented that alewives exhibit diurnal behavior patterns, meaning that their activity patterns vary between night and day. Mirant Kendall's push-net and beach seine data from 2003 through 2005 demonstrates that alewives are absent from the upper water column during the daytime hours. MK Comments, Comment D11, at p. 62; Comment D3, at p. 55. It is only during the evening hours -- from around sunset and into the early morning -- that juvenile alewives appear in the upper water column in order to feed. MK Comments, Comment D3, at p. D55. For this reason, it makes no sense to require compliance with daytime temperature limits for the upper water column when the alewives do not use that portion of the ZPH during the day anyway.

The Region agreed with Mirant Kendall's conclusions that alewives exhibit diurnal behavior patterns and do not inhabit the upper water column during the daytime hours.[215] Despite this acknowledgement, the Region still maintains that daytime limits in the upper water column are still necessary. One of its reasons is that juvenile alewives will avoid surface waters at night when those waters were too warm during the days. RTC, Response to Comment D3, at p. D5.

As discussed supra, that argument makes no sense for several reasons. First, it ignores the fact (acknowledged by the Region) that alewives do not inhabit the upper water column during the day. Therefore, juvenile alewives do not even experience and have no idea what surface water temperatures are during the daytime. Second, this theory assumes that alewives somehow "remember" areas that are too warm, and avoid those areas in the future. There is no scientific basis for such speculative fish "psychology," and, even more significantly, the sampling data shows that this is simply not the case. Many alewives were caught in the evening at sampling stations where prior daytime temperatures at those stations regularly exceeded the Region's protective limits. See supra.

The Region also argued that drifting larvae may be in the upper water column during the daytime, and so daytime temperature limits in the upper water column are necessary to protect them. The major problem with this argument is that it can only -- at the most -- justify upper water column temperature limits during the spring time when floating alewife larvae are present and too small to swim, which is no later than about June 15.[216] Moreover, Mirant Kendall provided the Region with a fractional loss analysis

that addressed this issue, but in its Response to Comments, the Region has failed to even address that analysis.

For these reasons, the Region has not provided a rational basis for why temperature compliance points in the upper water column for the daytime hours throughout the summer are needed to protect alewives who are not there.

ii. Yellow Perch Are Absent from the Upper Water Column in the ZPH During the Daytime Hours.

Mirant Kendall commented that the data from its gill-net, push-net, and beach seine data demonstrated that there were no yellow perch caught during the daytime in the upper water column in the lower basin -- both inside and outside of the ZPH -- during any of the sampling events. MK Comments, Comment D3, at p. 55. Because the yellow perch, like the alewife, are absent from the upper water column during the daytime hours, it is irrational for the NPDES renewal permit to impose daytime thermal limits in the upper water column in the ZPH in order to protect yellow perch.[217]

The Region failed to provide any specific response as to why it was necessary to have daytime compliance events in the upper water column to protect yellow perch. All of its responses that purportedly justified daytime compliance events in the upper water column were with respect to alewives. Because the Region failed entirely to respond to Mirant Kendall's comments with respect to yellow perch, the protection of yellow perch cannot be the basis for daytime compliance events in the upper water column.

d. Yellow Perch Largely Absent from the ZPH

The compliance regime is overbroad because it imposes limits in the ZPH in order to protect yellow perch, even though it is well-documented -- and the Region does not contest -- that yellow perch utilize only a small portion of the entire ZPH as habitat.

As discussed above, the NPDES renewal permit imposes in-stream thermal limits in the ZPH based, in part, on temperatures that the Region found would be protective of yellow perch. The primary problem with having temperature limits in the ZPH based on yellow perch is that all life stages of yellow perch have been documented as being largely absent from a substantial majority of the ZPH. The reasons for this documented absence include the fact that the ZPH provides little or no habitat for yellow perch due to its deep bathymetry, relatively high salinity, and lack of preferred shallow, vegetated areas. Such habitat shortcomings are especially pronounced when compared with areas just upstream from the ZPH where all life stages of the yellow perch have been found due to the comparably superior water quality (with respect to salinity) and abundant shallow, vegetated areas.

i. Permit Provision at Issue

Part I.A.1 of the Permit, which includes and incorporates footnotes 7 and 8 and Attachment A and B, establishes an in-stream temperature compliance regime. This regime prohibits Kendall Station from discharging any amount if any of the required compliance points in the ZPH exceed the applicable in-stream temperature limits. These applicable temperature limits are differ with the time of year. See NPDES renewal permit, Attachment A. The Region has explained that both the thermal limits, and designation of the ZPH were based on its efforts to protect the most sensitive species for temperature: alewives and yellow perch.

ii. Yellow Perch Largely Absent from ZPH

Mirant Kendall commented that it was irrational to set protective temperatures in the ZPH for yellow perch because yellow perch are largely absent from the upper water

column of the ZPH based on Mirant Kendall's gillnet and pushnet sampling efforts. MK Comments, Comment D3, at p. 55. Mirant Kendall also commented that salinity levels at depth in a majority of the ZPH preclude yellow perch from occupying the deeper waters. MK Comments, Comment D10, at p. 62. Mirant Kendall commented that absence of yellow perch from the ZPH can be explained by the fact that the ZPH is primarily a deep channel (with intolerable levels of salinity at depth) without insufficient shallow vegetated habitat for yellow perch. MK Comments, Comment D14, at p. 64.

The Region's primary response to these comments was that yellow perch were caught in a beach seine at the "Lagoon" station, and at the "Boston" station, and that the permit limits are designed to protect those areas of habitat. RTC, Response to Comment D10, at pp. D16-D18. The problem with this response is that the Lagoon station is located upstream and outside of the ZPH. Requiring Mirant Kendall to meet compliance points in the ZPH to protect habitat outside of the ZPH is not rational. It is true, as Mirant Kendall readily recognizes, that the Boston station is close to within the ZPH. That station consists of a thin strip (less than 10 meters wide) of potentially viable habitat for yellow perch along the Boston shoreline. But a finding that that thin strip of water is viable yellow perch habitat still does not justify setting protective temperatures for yellow perch throughout the entire ZPH. In other words, it is irrational to set protective limits throughout the entire ZPH on the basis that a small area of that ZPH may provide habitat for yellow perch. This is especially true because all of the compliance points are located in areas of deeper waters that the yellow perch avoid. In other words, an exceedance at a compliance point will have no impact on yellow perch because none of the compliance points are located in the shallow, strip along the shoreline, which is the only area where

the yellow perch occupy. In this sense, placement of the compliance points is arbitrary because it is not matched to where the fish are located.

The Region also argues that there have been some yellow perch caught at depth in the ZPH. RTC, Response to Comment D14, at pp. D22-D23. Again, as Mirant Kendall recognizes, some yellow perch have been caught at depth in the ZPH. But this only occurs when salinities at those depths are below the levels required by yellow perch. What the Region has failed to explain is why protective temperature limits are necessary throughout the ZPH when many of the compliance points at depth throughout the ZPH are too high in salinity to be viable habitat for yellow perch.

2. Erroneous DO Requirement

As described in the Background section, a principal cause of shutting down of the Station's operations due to inability to meet the in-stream limitations comes from a condition - low DO in the lower basin - that is entirely unrelated to the Station's discharge but would be improved were the Region to approve the diffuser outfall. The Board should review and remand the permit for reconsideration of the requirements leading to that outcome.

Specifically, the permit requires that a contiguous 50% of the 16 monitoring points at monitoring stations 3, 4, 5 and 6 meet the temperature limits, but a monitoring point will count towards the 50% requirement only if it also exhibits a DO level of at least 5.0 mg/l. NPDES renewal permit, Part I.A.1 n.7 and Attachment A, n. 6 (the "DO requirement"). The Region's apparent rationale is that unless at least 50% of the cross-river transect represented by those four monitoring stations is meeting both the DO and temperature requirements, then the ZPH will not have sufficient "suitable habitat."

Therefore any contribution of a thermal discharge would add unacceptable stress, even if the in-stream temperatures during each of the 4-hour blocks would remain below the temperature limits.

That combination of requirements will cause major curtailments. The salt wedge and the stratified conditions it causes means that DO levels generally fall below 5.0 mg/l at those four monitoring stations at all depths greater than 15 feet during the late spring and summer. During low flow episodes the low DO condition commonly occurs at depths greater than 12 feet. Year round since 2002, the depths greater than 20 feet, which includes all of the deepest monitoring points at monitoring stations 3 to 6, almost always exhibit DO levels below 5.0 mg/l. [218]

As a practical matter, therefore, the persistent stratification means that the four deepest monitoring points will almost never count towards meeting the 50% cross-river DO requirement, and therefore that the plant cannot discharge unless the river is certain to meet both the DO and temperature requirements at 8 of at most 12 of the cross-river monitoring points. In fact, the 50% cross-river DO requirement really functions as a 75% requirement (or even higher if DO levels fall below 5.0 mg/l at shallower depths, as in low flow conditions).

As a consequence of the DO requirement, accordingly, on many occasions the plant will be curtailed in circumstances where there would not be any temperature exceedances at any of the monitoring stations except at the top two monitoring points at the monitoring stations 5 and 6 in the ZD. The curtailments would be required not due to temperature, but because the DO requirement extended the ZPH into the ZD that supposedly is available under the variance.

The imposition of the DO requirement places the Region's failure to allow use of the diffuser outfall in stark relief. Mirant Kendall proposed to address the salt wedge and thereby to restore DO, but not only has been denied, but now faces major shutdowns due to a condition that the plant has not caused and has sought to remedy. For the reasons stated elsewhere in this Supplemental Petition, the Board should review the denial of the diffuser outfall. For the following reasons, the Board also should review the DO requirement itself.

It was irrational for the Region to determine that waters with DO levels below 5.0 mg/l automatically become "unsuitable habitat" and therefore could not form part of the ZPH. The gill net sampling data in the record indicate that river herring and yellow perch are present in comparable abundance in the river at all DO levels above 3.0 mg/l, and only became noticeably less prevalent at DO levels below 2.0 mg/l.[219] The Region has made no showing that the protection of the BIP or the functioning of the ZPH requires DO at a constant 5.0 mg/l.

Rather, the DO requirement appears to stem from an adoption of the requirement in the state's Water Quality Standards for these Class B waters to maintain DO at 5.0 mg/l. But the state's WQS are clear that maintenance of DO levels of 5.0 mg/l need not be required when the lower levels are caused by background conditions. 314 C.M.R. 4.05(3)(b)1. The Region should have considered a design of the ZPH requirements that took account of the background conditions, the flexibility in the state's WQS, and the evidence from the river to establish a less rigid and burdensome set of in-stream DO requirements. The Board should review the Region's failure to do so, and remand for

further consideration, particularly in conjunction with a remand concerning the diffuser outfall.

3. Failure To Adopt BTU Loading Approach

MK Comments D5 and D6 called upon the Region to revisit the BTU Loading Approach that Mirant Kendall had proposed in December, 2002 in its RFI Response of September, 2003, and in the MK Comments.[220] In the RTC, the Region once again rejected consideration of the BTU Loading Approach, citing several new reasons.

First, the Region argued that the BTU Loading Approach would provide Mirant Kendall with unique protections not shared by other generating facilities using once through cooling systems. Specifically, the Region claimed:

> Other facilities that use once through cooling water and must comply with a permitted instantaneous maximum discharge temperature limit accept the very real prospect of modifying their operation in anticipation of rising temperatures, irrespective of whether a given facility's discharge would have caused an in-stream exceedance of a temperature criterion. These facilities do not have some advance reliable understanding of how they will be able to operate the facility over the immediate planning horizon of 24-48 hours. They must plan their generating capacity based in part on their best prediction of how hot the background temperature of the cooling water will be as it comes to the plant. This challenge of predicting the impact of ambient conditions on generating capacity is faced by all generating facilities that use once through cooling water, especially during dry, hot summertime conditions, and in this manner, Kendall Station's situation is not unique.

RTC, Response to Comment D5, at p. D10. That reasoning is clearly irrational and erroneous.

First, the BTU Loading Approach concerns how Mirant Kendall can operate in compliance with in-stream temperature limits, not "permitted instantaneous discharge temperature limits." But the purpose of the BTU Loading Approach is not to avoid such instantaneous discharge limits. Indeed, Mirant Kendall has operated under such limits for

years because the 1988 NPDES permit and its predecessors all included an instantaneous discharge temperature limit of 105° F. Like other generating stations, Mirant Kendall always has had to attend to the temperature of its intake water to ensure that the background temperatures and its operations would not combine to cause exceedances of that 105° discharge limit or the related requirement not to exceed a temperature differential of 20° F above the intake temperature.

Mirant Kendall has never objected to that mechanism for the simple reason that, like those other power plants, it has the ability to control its discharge temperature. What Mirant Kendall cannot control are the manifold other causes of temperature levels in the Charles River basin: air temperatures, precipitation, human management of riverflows, daily cloud conditions, and other factors which strongly influence four-hour averages across the monitoring points established under the NPDES renewal permit's compliance zone. Under the Region's compliance regime, Mirant Kendall would be in violation of the NPDES permit were it to cause or contribute to an exceedance at any one of those monitoring points, where in-stream temperatures are inherently less predictable and controllable than the intake temperatures at the Broad Canal.

Therefore, it is erroneous and irrational for the Region to dismiss the BTU Loading Approach by comparison to end-of-the-pipe discharge limitations. The Region's analogy is particularly irrational in noting that other plants can operate "irrespective" of whether there actually would be an exceedance of an in-stream temperature criterion, as long as they meet their end-of-pipe limits. That observation is correct, but it is precisely that operational security that the NPDES renewal permit denies Mirant Kendall and that the BTU Loading Approval would provide. It was irrational for the Region to dismiss the

BTU Loading Approach by reference to the need for generating stations to comply with end-of-the-pipe discharge limits.

The Region did address Mirant Kendall's underlying concern about operational security. The Region claimed that it was "sensitive" to that predicament, and it agreed that Mirant Kendall "should not be liable under the permit for in-stream temperature exceedances which the Kendall Station did not cause or contribute to." RTC, Response to Comment D5, at p. D10. The NPDES Renewal Permit accordingly states at p.4, n.7 that the "permittee may not cause, or contribute to conditions that cause, in-stream water column temperatures to exceed the temperatures set forth" in the seasonal profile of protective temperatures established under Attachment A to the NPDES Renewal Permit. But actually that new language makes the predicament worse because the permit is now explicit that the contribution of any thermal load to the River at the time of any exceedance of the temperature limits set forth in Attachment A to the NPDES Renewal Permit will be considered a violation of the permit.

The Region also errs in another rationale for rejecting the BTU Loading Approach. The Region complains that approach is not acceptable:

> because it improperly insulates the company from responsibility for maintaining the protective in-stream temperatures necessary to protect the BIP, granting the company the opportunity to take advantage of the lower basin's actual assimilative capacity.

RTC, Response to Comment D5, at p. D10. But it is not Mirant Kendall's responsibility to maintain the temperatures selected by the Region -- it does not control the flows, precipitation, air temperatures, or clouds. The Station is not the Region's own temperature control mechanism, and the Region ignores that it is entirely appropriate for

an authorized discharger to manage its discharge consistent with the assimilative capacity of a stream.

Finally, the Region has irrationally minimized the extent to which background conditions will lead to curtailments of the station's operations under the Region's compliance regime. The Region claims:

> It is conceivable, but not likely, that despite appropriate curtailments or cessation of the Station's operations, temperatures in the lower basin might exceed the in-stream limits.

Id. Yet the record documents regular and numerous instances where background temperatures have exceeded the in-stream temperatures that the NPDES Renewal Permit establishes for the lower basin, which normally runs warmer than the upstream temperatures.[221] It was erroneous and irrational for the Region to reject the BTU Loading Approach on the grounds that it is unlikely that Mirant Kendall would need to curtail or stop its operations due to background conditions. In fact, as Mirant Kendall has repeatedly demonstrated to the Region, the opposite is true.[222]

Whether because the Region had become wedded to a different approach, because it found the BTU Loading Approach too complicated, or because it resisted further developing that approach with Mirant Kendall, Mirant Kendall does not know. What Mirant Kendall does know is that the Region's stated reasons for rejecting that approach were erroneous and irrational. The Board should remand the permit to the Region with directions to work with Mirant Kendall to develop the BTU Loading Approach or a similar approach that provides a better fit between the operational needs of a generating station and the Region's efforts to protect water quality in the Charles River.

D. Diffuser Outfall

In Section E of the MK Comments, Mirant Kendall identified the reasons why the Region's refusal to propose use of the diffuser outfall when it issued the draft NPDES permit should be changed into an authorization when it issued the NPDES renewal permit. The MK Comments and Mirant Kendall's prior submissions in the record demonstrated that use of the proposed diffuser outfall would improve a significant portion of the habitat in the lower Charles Basin, as well as reduce the maximum temperatures in the lower basin caused by the Station's thermal discharge. In the final NPDES permit, however, the Region again declined to authorize use of the proposed diffuser outfall.

In the Section E of the RTC, the Region assigned four basic explanations for its decision:

1. That there was a "reasonable potential" for the diffuser to cause or contribute to excursions above the eutrophication standard in the Massachusetts Water Quality Standards;

2. That Mirant Kendall had "failed to dispel" that finding of reasonable potential because Mirant Kendall has not submitted what the Region considers as acceptable results of an appropriate model of the potential effects of the diffuser outfall on eutrophication;

3. That Mirant Kendall failed to convince the Region that use of the diffuser outfall would cause the habitat benefits that Mirant Kendall forecasts; and

4. That for those habitat benefits and thermal reductions that the Region recognizes would occur, the benefits are outweighed by the potential for use of the diffuser outfall to cause or contribute to excursions above the state's water quality standards for eutrophication.

For the following reasons, each of the Region's stated explanations is so insufficient that the Board should review and remand this issue to the Region for further consideration.

1. Region's Finding of Reasonable Potential does not Warrant a Determination to Deny Use of the Diffuser Outfall.

As the RTC reflects, Mirant Kendall and the Region had voluminous exchanges starting in 1999 over the potential benefits, effects, and risks of the proposed diffuser outfall. The Region raised myriad concerns involving the potential for release of phosphorus and toxins bound up in the sediments on the river floor, the potential effects on algae, and the potential effects of temperature change and salinity change in the lower basin. Mirant Kendall and the Region agreed on the need to evaluate some of those issues and disagreed on others, but Mirant Kendall does not dispute that the Region had reasonable concerns for the potential effects of the diffuser outfall on algae levels.

The Region's determination that use of the proposed diffuser outfall would have the reasonable potential to cause excursions, however, should not end the proposal. The existence of a reasonable potential for a discharge to cause excursions of water quality standards does not mean that the discharge must be prohibited - it just means that the permit writer is empowered to impose appropriate conditions to assure that the discharge will not have that effect.

From the start, Mirant Kendall recognized that the grant of authority to use the diffuser outfall would be conditional, and Mirant Kendall made several proposals for such conditions. For example, by its letter dated December 17, 2003,[223] Mirant Kendall proposed a set of monitoring and curtailment requirements in the permit under which operations of the diffuser outfall would be altered if use of the diffuser outfall was shown to cause or contribute to eutrophic conditions. The Region rejected that particular proposal for the reasons stated in Attachment A to the draft NPDES permit Fact Sheet, page 31, and in the RTC at p. E19. But then the Region made no attempt to follow up to establish alternative conditions. Instead, the Region's explicit position has become that it

simply will not consider authorization of the diffuser outfall until Mirant Kendall produces modeling acceptable to the Region.[224]

Mirant Kendall responds to that modeling explanation below. Here, Mirant Kendall's point is that the Region's finding of "reasonable potential" provides no basis for the Region to deny use of the proposed diffuser outfall. Rather, that finding only provided the Region with the authority to establish appropriate conditions. In view of the acknowledged benefits of the diffuser outfall, both to the habitat and to Mirant Kendall's ability to operate, it was error for the Region to abandon the task of setting appropriate conditions.

2. The Region Inappropriately Rejected the Results from Mirant Kendall's Application of the Region's TMDL Model.

The Region's explanations in the RTC for declining to authorize use of the proposed diffuser outfall boil down to one - that EPA will not approve that proposal until Mirant Kendall has performed (to EPA's satisfaction) whatever diffuser modeling and design analysis the Region requires.[225] The Board should review and reject that excuse, however, because the record is clear that the Region misled Mirant Kendall into awaiting the Region's own completion of the required modeling, blocked Mirant Kendall's ability to satisfy the Region, has established open-ended and unreasonable modeling requirements, and has mischaracterized and failed to acknowledge the favorable results of the modeling that Mirant Kendall then submitted using the Region's own TMDL model.

Several claims in the RTC serve to illustrate the ways in which the Region has misrepresented or blocked rather than fairly considered Mirant Kendall's efforts. First, the Region describes its various requests during 2001 for Mirant Kendall to make changes to Mirant Kendall's initial eutrophication model, and claims that Mirant Kendall

ultimately abandoned that model in favor of developing a permit based on monitoring real-time compliance.[226] But the RTC fails to explain that the Region at the time was considering the establishment of effluent limitations to curtail the Station's operations in the event there were excessive levels of algal activity in the lower basin.[227] Mirant Kendall determined to forego efforts to conduct further modeling of thermal effects on eutrophication, and to accept the Region's suggestion instead to develop and rely on in-stream monitoring of algal levels, because the complex set of factors influencing eutrophication of the lower Charles Basin made modeling to link the plant's thermal discharge to eutrophication too difficult to serve as a reliable basis for developing enforceable and reliable effluent limitations.[228]

Indeed, later the Region reached the same conclusion both in the NPDES renewal proceedings and in the TMDL process, that is, that there is not good evidence or basis for directly linking algal conditions in the lower Charles Basin to the Station's thermal discharge.[229] Accordingly, the Region did not propose algal-related effluent limitations either in the draft or in the final NPDES renewal permit. The initial discussions about modeling the effects of the thermal discharge on eutrophication are irrelevant to the Region's later determinations about modeling the phosphorus impacts of the proposed diffuser outfall.

Second, as outlined in the Background section, supra, the Region clearly intended to utilize the TMDL model that it was developing as part of the Nutrient TMDL to evaluate the potential impacts of the proposed diffuser outfall. As described in the Background section, the Region so informed Mirant Kendall and the members of its TMDL Technical Advisory Committee beginning in 2002 and had its contractor insert

that capacity into the model. Mirant Kendall actively sought to participate in the Technical Advisory Committee for the Nutrient TMDL, partly in order to cooperate in that effort. Even if that modeling effort was not required of the Region, it was incumbent upon the Region either to follow through or to provide timely indication to Mirant Kendall of a change in plan that placed further modeling by Mirant Kendall on the critical path for approval. Instead, the Region deferred sharing and release of any results of the TMDL modeling activities until November, 2005, and only then informed Mirant Kendall that the diffuser component of the TMDL model had not actually been operated.

The Region now asserts that the Nutrient TMDL's purpose is just to assess current conditions and sources of nutrients, that the Nutrient TMDL is entirely separate from the NPDES renewal process, and that it did not rely on the Nutrient TMDL proceedings in reaching its decisions on the proposed diffuser outfall.[230] I.e., don't look at that man behind the curtain! But the record speaks for itself: the Region clearly backtracked from its original intention to combine the issues of the impact of the diffuser under the two processes. In those circumstances, the Region's reliance on Mirant Kendall's supposed failure to model the diffuser outfall should be seen for what it is: an excuse for the Region's unwillingness or inability to follow through on its own stated intentions.

Third, having established the TMDL model with the diffuser component, but not having run it, the Region belatedly informed Mirant Kendall and then set out its expectations for use of the TMDL model if used by Mirant Kendall.[231] Having lingered over the TMDL model from September 2002 until November, 2005, and at a point when the Region plainly was moving towards issuance of the final NPDES renewal permit, the

Region's description of what it needed in January 2006 was not a serious effort to cooperate with or even to timely engage Mirant Kendall. Not only was that description too late to enable Mirant Kendall to complete the requested modeling in a timely way, but the the requested modeling focused on details of no practical significance and the scope was open-ended at the Region's sole discretion.

For example, the Region's letter of January 2006[232] requested five years of detailed calibrations for individual locations - well beyond what EPA performed in its own use of its TMDL model - for a long list of parameters at dozens of closely spaced stations extending up to about two miles upstream, well beyond the points at which the diffuser could make more than a negligible change. Mirant Kendall acknowledges the value of calibration at the close stations where the diffuser effects might actually exceed the ranges of model and measurement error, but it is pointless at far stations where the modeling indicates the effects of the diffuser are negligible and buried within those error ranges. The Region's modeling requirements amounted to a statement that the Region would never accept any actual result from Mirant Kendall as sufficient to satisfy the Region.

Fourth, that characterization was borne out when Mirant Kendall submitted results from its initial runs of the TMDL model to the Region in July, 2006 [233]and the results of a full run of the five years requested by the Region in September, 2006.[234] Mirant Kendall, as it informed the Region in its September submittal, ran the model exactly as it had been set up by the Region's contractors. The Region's analysis of those results from the Region's own model mischaracterizes Mirant Kendall's work, however,

by claiming that it did not know if Mirant Kendall had set up the model differently than it had been set up by the Region's contractor.[235]

Importantly, the results showed that the diffuser outfall is not projected to exacerbate eutrophication conditions in the lower basin, and may even improve them. Key findings included:

- DO would increase regularly to levels that would support use by fish at the bottom of the river.
- DO would increase regularly to levels above the threshold of 2.5 mg/l specified by Tetra Tech/EPA in the November, 2005 Draft TMDL Model Report as the threshold when enough dissolved oxygen is present for the model to reduce phosphate flux from sediments to the upper portions of the water column where algae can proliferate.
- Reductions in surface temperatures regularly lower by 1 to 5° F in the ZPH.
- Similar levels of total algal growth, measured as chlorophyll-*a,* with and without the diffuser. In no year did the model predict extended periods of higher growth with the diffuser, and in several years, i.e., 1999, 2000, and 2002, it predicted recurring periods throughout the summer and fall with growth 10-30% lower with the diffuser than without.
- For the nuisance blue-green species (*Cyanophytes),* the results were similar to those described immediately above for total algae. However, the predicted reductions in nuisance blue-greens were more consistently evident than the predicted reductions in total algae throughout the modeled timeframes.
- The results for the phosphate form of phosphorus, the primary focus of the EPA's nutrient TMDL study and a focus of EPA's inquiries concerning the proposed diffuser, were very similar in showing little difference between the "with and without" diffuser cases.

The key point was that the Region's own model gave favorable results on all the major issues the Region identified as concerns with this modeling - i.e., no increases in overall or nuisance algae and no increases in water column phosphate. And the modeling results supported the expectations of beneficial effects - reduced temperatures and significantly increased DO.

The Region, however, brushed off those results on the ground that they did not meet the requirements set out in its letter of January 11, 2006. That is not surprising, given the excessively detailed accounting for multiple variables at multiple far-removed locations of tangential if any relevance requested in the January 11, 2006 letter. In addition to mischaracterizing and unfairly rejecting the results of its model, the Region's memorandum concerning those results also suggests that it may back away from its verbal indications in February and April, 2006 that it would apply the same calibration standards to Mirant Kendall's use of the model as the Region had applied to its own use of the model.

Together, these positions effectively close the door to any reasonable effort to convince the Region through modeling that the diffuser outfall is an acceptable risk. Reality is that modeling the complexities of eutrophication in this setting can only provide a prediction based on the assumptions programmed into the model - albeit, all of which to date have been the Region's assumptions. True certainty will not come until the diffuser outfall is deployed and monitored, as Mirant Kendall proposed.

The record therefore shows that the Region's claims that Mirant Kendall has failed to satisfy it with adequate modeling is mostly of the Region's own doing. The Region began the modeling effort, did not inform Mirant when it stopped its own modeling effort, belatedly established an unreasonable bar on the critical path for approval of the diffuser, and then obstructed and dismissed Mirant Kendall's efforts to get up to and over that bar. The Board should remand the NPDES renewal permit to the Region for further consideration of Mirant Kendall's results from the TMDL modeling as

already submitted and as Mirant Kendall is prepared to continue submitting, preferably in conjunction with controlled, conditional testing of the diffuser...

3. Erroneous Rejection of Acknowledged and Unacknowledged Benefits of the Proposed Diffuser.

In the RTC, the Region acknowledges that operation of the proposed diffuser in fact would bring some benefits to the lower basin. Specifically, the Region acknowledges that the diffuser would reduce the temperature impacts of the Station's proposed thermal discharge, and acknowledges that the physical effects of the discharge at the river bottom would improve the stratification caused by the salt wedge and raise DO levels.[236] The Region goes on, however, to minimize the significance of those benefits and also fails to give appropriate weight to additional benefits that Mirant Kendall has identified. For the following reasons, the Board should review these determinations by the Region and remand them for further consideration.

a. Thermal Benefits

First, the Region discounts the thermal benefits of the proposed diffuser by dismissing them as largely motivated by Mirant Kendall's desire to reduce curtailments. Mirant Kendall acknowledges that motive, but that motive is irrelevant to whether the temperature improvements occur or not. As noted above, Mirant's unmodified execution of the Region's model showed consistent surface temperature reductions ranging from 1 to 5° F with the diffuser in operation compared to without.

b. Area and Duration of Improvement

Second, the Region acknowledges that approximately 15% of the volume of the lower basin would experience improved habitat, but dismisses its significance on the grounds that 15% is only a small portion of the lower basin and is not particularly a good

habitat anyway. The Region also asserted that the salt wedge is only a temporary, seasonal phenomenon, so breaking up the salt wedge does not have much beneficial effect.[237]

Those reasons, however, are entirely false and specious. Contrast the Region's notion that restoring 15% of volume of the lower basin is insignificant with the Region's finding that the Station has caused appreciable harm because juvenile alewives allegedly are excluded from a 1.3 mile stretch of the lower basin on days when the water temperatures exceed 81° F. The volume of the entire width of the lower 1400 meters of the river down to a water depth of 3 meters (which is larger than the volume over which temperatures would be elevated by even 2° F), comprises about 12% of the volume of the entire lower basin.[238] The Region has not explained why restoration of DO to a region comprising 15% of the lower basin where portions of the BIC currently are completely excluded by low DO and/or high salinity is insignificant, purported (but not actual) decreases in the presence of juvenile alewives in less than 12% of the lower basin is all-important.

Further, contrary to the Region's statement, the salt wedge is not significantly "diminished or even absent" during times when summer boat traffic is light. Rather, monitoring information,[239] along with contemporaneous 60 to 80 % declines in yellow perch abundance, shows that salinity stratification has worsened and persisted since 2002 and has persisted ever since a spring surge, combined with extraordinary pumping at the New Charles River Dam, washed out the basin in 1998.[240] The Region cites a study dated 2000, but that study concerned data from the 1998 flushing event.[241] The Region also cited its own data from 2001, but without any specificity so it provides no evident

support. The Region provided no response to the past 2002 data that Mirant Kendall cited as critically important. The Region's dismissal of the benefits of the diffuser outfall as limited to a short portion of the year was arbitrary and capricious, and irrational in view of contradictory data[242] that the Region failed to acknowledge or address.

The Region also dismissed those benefits on the basis that destratification of the salt wedge would not be a "great" improvement because other factors mean this area of the river would does not provide a healthy benthic habitat due to the contaminated sediments.[243] The Region here fails to address Mirant Kendall's documentation that oxygen restoration would speed the degradation of complex organic toxicants, like PAHs, which is now retarded by only undergoing anaerobic degradation.[244]

Further, the restoration of oxygen to any lower depths in the basin would enable further repopulation of the benthic invertebrate community that serves as food for yellow perch, sunfish and other species, and was the preferred food of juvenile alewives in Mirant Kendall's analyses of their stomachs in the Charles River.[245] Also, in the February, 2001 NPDES Supplemental Application, Mirant Kendall documented that benthic invertebrates were present in all samples in the ZD/ZPH shallower than 15 feet, and absent in all the deeper samples.

The Region's unsupported claim of little benefits from the diffuser failed to address these benefits, and led to its arbitrary and capricious rejection of the diffuser outfall.

c. Effectiveness of Diffuser Outfall

Another example of the Region's biased, irrational approach is its dismissal of the analysis provided by MIT's Dr. Eric Adams. Dr. Adams concluded that the proposed

diffuser outfall would be as effective and beneficial in breaking up the salt wedge as had the MDC's aerators, and would have minimal potential to suspend sediment.[246] The Region ignored that conclusion and instead cited the Adams memo only as support for the Region's conclusion that the diffuser would act to destratify the basin in a different way than the aerators.[247] But that conclusion is trivial - Mirant Kendall has never claimed that the diffuser outfall's mechanism was the same as the aerators' mechanism. It was irrational for the Region to dismiss Dr. Adams' report by that trivialization and otherwise to ignore his counsel and experience as one of the persons with direct personal experience with diffusers at the very location for which Mirant Kendall's is proposed.

The Region also expressed doubt whether the diffuser would be effective at raising DO levels by citing to a study of other artificial circulation projects.[248] This is an example of the Region "cherry picking" a misrepresentative finding from a study which actually is broadly favorable towards destratification, characterizes the risks as minimal, and explicitly supports Mirant Kendall's reasons to expect improvements in phosphate removal from the water column and the creation of competitive disadvantages for nuisance blue-green "algae" (*Cyanophyte* bacteria).

In summary, the Region's concerns about the effectiveness of the diffuser are irrational in view of the weight of favorable evidence from knowledgeable experts in the record, combined with the opportunity to test the diffuser in a manner which guarantees protection of the environment by design, monitoring and response commitments.

4. Actual Benefits and Minimal Risk

Ultimately, the Region declined to approve the proposed diffuser outfall because the Region weighed its dismissive account of the actual benefits of the diffuser against

the Region's unresolved concern that the diffuser would exacerbate eutrophic conditions, and determined it would not accept the benefits until those concerns were resolved by modeling.

In reaching that outcome, however, the Region failed to give adequate, rational consideration to the favorable modeling demonstration provided by Mirant using the version of the Region's TMDL model supplied to Mirant by the Region. Further the Region failed to address the option to authorize use of the diffuser outfall at no risk to the environment or to the Region in the manner suggested by Mirant. This proposal included gradual startup in the colder months before any eutrophication effects could occur, subjecting the diffuser operation to intense monitoring, and following a protocol for responsive curtailment upon specific evidence of the development of differences from monitored background ambient conditions.[249] Mirant also once again proposed to work with the Region on modeling, particularly to use the testing as the necessary means to calibrate and validate the appropriate models.[250]

Similarly, the Region's concerns about the diffuser's potential to cause harm are wholly unfounded because the design includes a valve system to "throttle" the amount of water going to the diffuser down to zero, thereby keeping the rest of the discharge at Outfalls 001 and 002. This design, combined with Mirant's commitment to start up and operate the diffuser gradually in the "non algae" season, i.e., during the winter time or very early spring, and to closely monitor and curtail flow to the diffuser in accordance with an explicit protocol acceptable to the Region, makes it certain that there is negligible potential for adverse effects.

In light of the acknowledged benefits of the diffuser and the impossibility of using modeling alone to attain certainty in this context, it was irrational and capricious for the Region to fail to engage with Mirant Kendall to develop a set of conditions under which the diffuser outfall could be deployed. The Board should review and remand the Region's determinations about the diffuser.

E. The Impingement-Related CWIS Requirements Are Arbitrary And Unlawful

1. Overview Of The Final Permit's Impingement-Related CWIS Requirements

In addition to the extensive control requirements imposed on the thermal discharge, the Region has opted to move forward with a welter of new requirements for the Station's CWIS. The Region says that it has used its "best professional judgment" to select these requirements, which it claims are necessary to satisfy § 316(b) of the federal Clean Water Act.[251]

The impingement-related CWIS requirements in the NPDES renewal permit include:

- a requirement that Mirant Kendall submit by January 7, 2008 a Comprehensive Demonstration Study (CDS) that characterizes both impingement mortality and entrainment by the Station's CWISs, describes CWIS operation, and demonstrates that the technologies, operational measures, and/or restoration measures already installed or proposed for installation will achieve compliance with the Phase II Rule (Part I.A.16.a, at p. 33 of 35)[252]; plus

- a requirement that the Station restrict its monthly average non-contact cooling water flow rate to 70 MGD during the primary spawning months of April, May, and June (Part I.A.11.a.5, at p. 12 of 35); plus
- a requirement that Mirant Kendall implement a fine mesh barrier net system or "BNS" at a yet-to-be-determined location in front of the CWIS to minimize impingement mortality "to the extent practicable," with an ultimate performance goal of reducing annual impingement mortality for adult and juvenile fish by 80% from a "calculated baseline" (Part I.A.11.a.1-2.b, at p. 11 of 35); plus
- a requirement to restrict the effective through-screen flow velocity to 0.5 fps or less when the barrier nets are in place, and to demonstrate the actual through-screen velocity for both the BNS and the traveling screens (Part I.A.11.4, at p. 12 of 35); plus
- a requirement that Mirant Kendall design, install, and operate the BNS to preclude bypasses due to circumstances within the permittee's control, to the extent practicable (Part I.A.11.a.1, 6, at pp. 11-12 of 35); plus
- a requirement to design the BNS using some technology not identified in the permit, to allow eggs and larvae that are impinged against the fine mesh to be freed in a manner that would increase the probability of their survival, which the permit implies might be accomplished by locating the BNS outside the Broad Canal, in the open waters of the Charles (Part I.A.11.a, at p. 12 of 35); plus
- a requirement that Mirant Kendall retrofit the CWIS in some unspecified manner so as to allow the Station to return to the receiving water, in a manner that prevents re-impingement on the intake screen, any live adult or juvenile

organisms trapped against the Station's three traveling screens (Part I.A.2.d-e, at p. 8 of 35); plus,

- an aggressive schedule requiring the implementation of the BNS within 120 days of the effective date of the permit, unless icing prevents deployment, and commencement of impingement sampling within ninety days of the effective date of the permit (Part I.A.11 at pp. 11-14 and 14.d.9, at pp. 29-30 of 35); and, finally,
- requirements for extensive monitoring of the barrier net system and traveling screens throughout the permit term (Parts I.A.12 at pp. 14-17, and 14.a.3.a-d.7, 9 at pp. 29-30 of 35).

2. Comparison With Impingement-Related CWIS Requirements In The Draft Permit

Although the proposed impingement-related requirements vary somewhat from those the Region initially proposed, they are substantially similar to, and in some cases more burdensome than, those in the draft permit. Both the draft and final permits require Mirant Kendall to limit flows to a monthly average of 70 MGD -- a level consistent with pre-upgrade flow limitations -- during the primary spawning season. Both require the Station to achieve a 0.5 fps design through-screen intake velocity, which under § 125.94(a)(i)(ii) of the Phase II Rule constitute per se evidence of compliance with the applicable performance standard and, thus, with § 316(b).

In addition to these requirements, the final permit, like the draft, requires implementation of a fine mesh barrier net to reduce impingement mortality, even though the Region now has correctly concluded that entrainment reductions (the reason that Mirant Kendall initially proposed fine mesh instead of coarse mesh) are not applicable under federal law. The draft and final permits also assess BNS performance using a

performance standard of 80% reduction in impingement mortality as compared to a "calculated baseline." Neither permit addresses critical issues regarding the metrics (other than life stage) to be used in setting the baseline and providing credit for other control measures, such as operational restrictions imposed by the permit. The Phase II Rule entitles the Station to take credit for such measures, and Mirant Kendall's comments pointed out the importance of defining such metrics. (MK Comment H27 at pp. 113-114.)

Also, both the draft and final permits require that the BNS be designed to allow impinged eggs and larvae (which, under the Phase II Rule, are considered "entrainable organisms")[253] to be freed so as to increase their chances of survival. The Region makes no determination regarding how this is technically feasible at this site and, if so, what it would cost and whether that cost would be justified. And both versions of the permit suggest that, if the BNS fails to satisfy the performance goals, adjustments may be required. Neither the draft nor final version explain or limit what may be required, or provide for notice and comment on any new requirements.

Further, both the draft and final permits require Mirant Kendall to remove all live adult and juvenile fish from the intake's traveling screens and return them to the water body in a manner that prevents re-impingement. In the RTC, the Region suggests that this may entail retrofitting fish collection devices and a fish return on the existing CWIS. RTC Comment H35 at pp. H77-79. The Region offers no analysis of the cost or feasibility of this requirement, or the number of fish likely to be saved as a result.

Although the final permit, unlike the draft, now specifies that the 80% performance standard is a non-enforceable goal (Part I.A.11.a.2, at p. 11 of 35; RTC

Comment H1 at p. H16), it adds several new requirements that are no less objectionable. For example, where the draft permit specified that the BNS should be installed in front of the Station's intakes, the final permit leaves this critical design element unresolved. See Part I.A.11.a at pp. 11-12 of 35. Instead, the permit now suggests that the BNS may be installed outside the Broad Canal, if that will help to improve survival of entrainable-sized organisms that become impinged on the fine mesh. Id. The final permit also now requires that the Station "minimize impingement mortality to the extent practicable"-- a standard so vague that it provides Mirant Kendall no meaningful notice as to what is required. Part I.A.11.a.2, at p. 11 of 35. Also, the final permit now specifies that the 80% impingement reduction goal is an annual value (id.) -- a choice that the Region fails to explain and that conflicts with the guidance given in the Phase II Rule.[254]

As another example, the final permit replaces the draft permit requirement for BNS deployment from April 1-November annually with a new requirement that the BNS be deployed year-round, except when icing conditions in the Broad Canal reasonably preclude their deployment. Part I.A.11.a, at p. 11 of 35. The Region appears to have given no thought to the additional costs and other burdens this broad requirement will impose. Neither has it even attempted to explain why imposing those burdens is necessary to achieve the performance goal, in light of the *de minimis* reductions that deployment beyond the peak impingement season likely would achieve.

Nor are the implementation schedules and monitoring requirements imposed in the final permit appreciably better than the draft version. The draft permit gave the Station 60 days from the effective date of the permit to install the BNS, while the final provides 120 days. In neither case does the record provide any evidence that the Region

based these schedules (which in fact are wholly unrealistic) on any systematic consideration of the steps required to complete design, permitting, contracting, and installation of the BNS, and the length of time each step will take. As for the monitoring requirements, although the final permit eliminates some of the unwarranted detail to which Mirant Kendall objected, the basic requirements for a BNS study, as well as impingement monitoring throughout the five year permit term and population analyses that will be used to assess the population-level effects of the CWIS, remain essentially unchanged. These requirements, for which the Region has not bothered to develop any cost estimate, are particularly objectionable, given that facilities which propose to achieve compliance by attaining the intake velocity standards are not required by the Phase II Rule to do any verification monitoring.

The following sections lay out in greater detail the grounds on which Mirant Kendall bases its claim that the impingement-related CWIS requirements in the final permit are arbitrary, capricious, and otherwise inconsistent with applicable law.

3. Arbitrary And Unlawful BPJ CWIS Requirements

a. Points Of Agreement Between the Region And Mirant Kendall

The Region and Mirant Kendall agree on many things. For example, neither side disputes:

- that the Region, exercising BPJ, has consistently over the past 31 years determined that the existing CWIS reflects BTA at this site;
- that the Phase II Rule now applies to the Station (DD § 7.2.2 at pp. 185-186; RTC Comment H1 at pp. H1-5);

- that the Phase II Rule only requires Mirant Kendall to comply with performance standards for reduction of impingement mortality (RTC Comment H1 at pp. H10-13, and Comment H8 at p. H29);
- that the Phase II Rule requires Mirant Kendall to complete its evaluation and selection of compliance alternatives and to submit by January 7, 2008 any data, analyses, and compliance plans required to support the compliance option it selects (see, e.g., Part I.A.16 at p. 33 of 35; RTC Comment H9 at p. H30; MK Comment H6 at pp. 98-99);
- that, until Mirant Kendall submits the Phase II application materials (which are due in a little under thirteen months from now), any determination regarding what is "BTA" for the intake structures during that interim period would be made on the basis of the Region's best professional judgment (MK Comments H4-6 at pp. 98-99; RTC Comment H1 at pp. H1-10);
- that in setting BPJ requirements the Region must apply to the case at hand the factors required by the statute for the standard in question (RTC Comment H1 at p. H5);
- that applicable law allows the Region to determine that the existing CWIS is BTA where the record fails to support the conclusion that another set of requirements is BTA (RTC Comments H4 at p. 22 and H6 at p. 25, n.10);
- that applicable law allows the Region to reopen permit proceedings if it concludes that the requirements of the Phase II Rule are of sufficient magnitude to make further proceedings desirable (RTC Comment H1 pp. H3-4; MK Comment H3 at pp. 96-97).

b. Areas Of Dispute Between the Region And Mirant Kendall

The real points of dispute are:

- Whether the Region has articulated an adequate basis for determining that new information made available since the last permit was issued requires establishment of new BTA requirements for the interim period until the Phase II application materials are available and the Rule can be fully implemented?
- Whether the Region may set BPJ limits which are more stringent than an applicable national rule that authoritatively interprets the statute and that went into effect for two years before the final permit is issued?
- Whether the Region may selectively consider and apply applicable national rules that authoritatively interpret the statute and that took effect long before the permit is issued?
- Whether the Region otherwise has an adequate basis for the impingement-related CWIS requirements it has chosen?

c. The Region's BPJ Determination That "New Information" Required Immediate Establishment Of New CWIS Requirements Is Unsupported By Its Own Analysis

The Region itself acknowledges that § 316(b) does not require elimination of all impacts where effects are *de minimis*, further reduction is not feasible with available technology, or costs would be wholly disproportionate to benefits. DD § 7.2.5.d, at p. 200. As justification for the many new CWIS requirements the Region has chosen to impose just thirteen months before it will receive the information necessary to make a definitive BTA determination under the Phase II Rule, the Region offers several arguments.

In essence, it says that:

- The level of impingement mortality that has occurred or is likely to occur at the Station creates significant issues that warrant new controls (see, e.g., RTC Comments H4 at p. H22, H9 at p. H31, H10 at p. H35, and H15 at p. H43).
- The Region has identified "available technological improvements that would reduce adverse environmental impacts from MKS's CWIS" (see, e.g., RTC Comment H4 at p. H22).
- The cost of complying with the permit's CWIS technology-based limits will be "relatively modest" (RTC Comments H10 at p. H35 and H35 at p. H79)[255].
- Identifying the existing intake as BTA for the interim period, establishing a schedule for submission of required information, and establishing definitive requirements based on that information would "likely lead to substantial delays in achieving any real progress in addressing the plant's intake" (RTC Comment H6 at p. H25-26).

1. The Region Offers No Explanation For Why Information On Impingement Levels Necessitates Immediate New Controls

The Region's claim that new information on impingement levels warrants immediate action is simply baseless, for several reasons. First, the record is devoid of any evidence that the Region made any attempt to compare the current data with past information on which it based its 1975, 1982 and 1988 determinations that the existing CWIS is BTA. Thus, its claim that new information raises new concerns is without foundation.

Even if this comparison were irrelevant (which it is not), the Region has failed to offer any explanation of why it believes that current or reasonably anticipated impingement levels warrant immediate action. According to the Region's calculations, the annual impingement totals for all twenty-nine species evaluated (as well as all organisms not identifiable to species) ranged from a high of 2145 organisms in the year 2000 to a low of 129 organisms in 2004, with a seven-year average of 641. RTC, Response to Comment H14, at p. H41.

Since 2002, when re-powering was completed, these values have, if anything, decreased. For example, Table E.1 below, which uses record information, shows that the number of alewives impinged annually from 2003-2005 ranged from a high of 20 in 2003 to a low of 2 in 2004, even though the number of similarly sized alewives caught in gillnets during the same period remained relatively stable from year to year. In every year, the number of alewives caught in the gillnets was anywhere from 3.5 to 9 times greater than the number of organisms actually impinged.

The results are similar for blueback herring. The table shows that the number of bluebacks impinged annually from 2003 to 2005 ranged from a high of 295 (in 2003) to a low of 1 (in 2005), despite the fact that heat loads and therefore water withdrawals had increased and the number of bluebacks caught in gillnets decreased much less than the impingement decreased. In every year, the number of bluebacks caught in the gillnets was anywhere from 1.3 to 400 times greater than the total number of bluebacks impinged.

In other words, the required gillnet sampling (which the Region proposes to continue) has resulted in far greater impacts to both alewives and bluebacks than the operation of the existing CWIS.

Numbers of Adult River Herring[256] in Gill Nets and Impinged on Mirant Kendall CWIS Screens, 2003-2005[257]

Alewives

Year	April-May % of Max. Heat Load	# Alewives in Gillnets	Gillnet Catch/hr	Total # Impinged on CWIS Screens Annually
2003	30.1	65	0.73	20
2004	51.7	27	0.19	2
2005	83.7	61	0.21	5

Blueback Herring

Year	April-May % of Max. Heat Load	# Bluebacks in Gillnets	Gillnet Catch/hr	Total # Impinged on CWIS Screens Annually
2003	30.1	381	6.74	295
2004	51.7	310	3.70	10
2005	83.7	414	2.13	1

The Region concedes that Mirant Kendall's impingement of river herring, which in most years accounts for anywhere from 50-80% of the total number of fish impinged, RTC, Response to Comment H14, at pp. H40-41, has decreased, even though the Station's average water withdrawal has increased. RTC, Response to Comment H14, at pp. H41-42. Thus, the Region's original concern[258] that the proposed increase in withdrawal rate (which the permit disallows for the key spawning months of April-June)[259] will cause a corresponding increase in impingement is wholly unfounded. Citing uncertainty as to why this should be so, and the fact that some impingement will continue at the Station, the Region concludes that further controls are necessary. At no point does the Region respond to Mirant Kendall's comment (MK Comment H15, p. 106) requesting an explanation for why the Region suddenly views this level of impingement as sufficient to necessitate a change in its previous BTA determination and the immediate imposition of extensive new controls.

The Region also offers no assessment of the potential impacts of these extremely low impingement levels on the affected populations, community or ecosystem. As the Region admitted in the Determinations Document, it has not assessed the population or other implications of impingement, either separately or in combination with other stressors in detail or quantitatively in the § 316(b) analysis. See, e.g., Determinations Document at p. 208. It says this is so because it lacks detailed information necessary to allow such an analysis. But, even if this were an adequate excuse, which it is not, the Region's "qualitative analysis" is nothing more than a series of speculations strung together, with no consideration of the available facts.

For example, in the RTC, the Region states that "this case does not present a *de minimis* scenario" RTC, Response to Comment H10, at p. 35. It then notes that the populations already are stressed, and that a small impact on such populations may be more important to address than a larger absolute impact on an otherwise robust population. RTC, Response to Comment H10, at p. H35. But the Region never explains (1) how the stresses experienced by the system today differ from those occurring in the past, when it determined that the existing CWIS was BTA, or (2) why it believes the level of impingement occurring or likely to occur at the Station will so adversely impact the population that immediate controls – and these particular controls – are warranted.

In this regard, the Region's assessment differs markedly from the assessments made in both In re: Dominion Energy Brayton Point, LLC, NPDES Appeal No. 03-12 (Remand Order) (EAB February 1, 2006) 12 E.A.D. 153-155 (examining population impacts and comparing impacts associated with different CWIS alternatives); Seacoast Anti-Pollution League v. Costle, 597 F.2d 306 (1st Cir. 1979) (examining effects of

impingement and entrainment relative to total population). In both of those cases, the permit writer offered at least some analysis of potential population level effects as the basis for finding that impingement levels were, or were not, likely to create adverse environmental impact.

The Region also says that the impingement mortality reduction provisions of the permit could not be relaxed without running afoul of state. See, e.g., RTC, Response to Comment H10, at p. H3. This is not what MassDEP WQC itself says. The WQC simply agrees that EPA's selected impingement-related requirements will protect state water quality standards. MassDEP WQC at pp. 9-11, EPA Doc #673 as listed in the 10/12/06 A.R. Index. MassDEP confirmed this interpretation in its recent Response to Order to Show Cause, pp. 9, 19-20.[260] The Region offers no independent analysis as to why the impingement-related requirements are necessary to protect State WQS. Thus, it cannot rely on state water quality standards or the MassDEP WQC to justify its impingement requirements.

2. The Region Fails To Justify Its CWIS Requirements Based On New Technology Or Cost Information

The Region's second and third claims, i.e., that information on potentially available technological improvements shows that the CWIS is not BTA, and that the cost of the final CWIS requirements is relatively modest, are equally unsupported. Nowhere in the record does the Region even attempt to explain how it could determine that a fine mesh net located in an unspecified place, and using an unspecified technology to remove small organisms that become impinged as a result of using that fine mesh, is the best technology available for impingement control. Nor could the Region have done so, given crucial errors and omissions in its analyses.

First, standard CWIS technology design principles, of which the Region was well aware[261] identify coarse mesh net, not fine mesh net, as appropriate for reducing impacts to impingeable-sized organisms. EPA itself, in assessing what technologies effective for impingement control alone, identified coarse mesh net, not fine mesh net. See, e.g., 68 Fed. Reg. 17142, col. 1.

Second, smaller organisms that otherwise would be entrained are more likely to be impinged on fine mesh. Although the extent to which this is likely to occur at the Station is unclear at best, and a pilot test suggested that very few entrainable sized organisms were likely to be impinged if the net is located in the Broad Canal as Mirant Kendall has proposed,[262] this may not be the case if the Region requires placement of the net outside the Canal.

Third, the Region has nowhere identified, and indeed has left for post-permit planning, many crucial elements of BNS design, operation, and assessment. The most important of these include: the exact design and location of any net, what the calculation baseline is, what metrics will be used in assessing compliance, and what actions the Station must undertake if the technology falls short of the performance standard.[263]

Under the Phase II Rule, if Mirant Kendall had chosen to comply with the BTA performance standards using a design and construction technology such as a barrier net, it would have been required to address all of these issues, and the permit would not have left them open to future interpretation. See 40 C.F.R. § 125.95(b)(3)(iii) (requiring estimation of calculation baseline); § 125.95(b)(4)(i) (requiring design and construction technology plan); § 125.95(b)(4)(ii) (requiring technology installation and operation plan that, inter alia, identifies adaptive management techniques for addressing shortfalls in

performance); and § 125.95(b)(7) (requiring verification monitoring plan). These are the minimum requirements that EPA itself has established as prerequisites for selecting BTA.

As Mirant Kendall pointed out in its comments, MK Comments H2 at pp. 95-96 and H27-H28 at pp. 113-115, it would be inappropriate for the Region to make a determination that a specific technology is BTA without defining these elements in some fashion.[264] Yet the final permit omits all of them.

Fourth, as discussed in greater detail infra., the Region offers no adequate assessment of the feasibility or costs of addressing the additional, and often open-ended, requirements it has imposed beyond the design proposal offered by Mirant Kendall.

3. The Region's Claim That Delaying Imposition Of New CWIS Requirements Will Result In Unacceptable Delay Is Wholly Implausible

The Region also says that it rejected Mirant Kendall's request to preserve the *status quo* until the necessary application materials could be submitted because such an approach would result in "substantial delays in achieving any real progress in addressing the impacts of the plant's intake." RTC, Response to Comment H6, at pp. H25-26. It claims this is so because: (1) time would be needed to negotiate a schedule for submission of those materials, (2) litigation may ensue over the permit terms, and (3) collection and assessment of data necessary to make the required decisions regarding implementation of the Phase II Rule could be time-consuming. Id.

Given that the NPDES renewal permit sets a deadline of January 7, 2008[265] for completion of the necessary application materials, the first argument clearly is specious. That deadline is less than thirteen months from the date of this filing. Moreover, had the Region taken Mirant Kendall up on the offer, expressed in its comments, MK Comment

H6 at pp. 98-99, to jointly develop a schedule with earlier deadlines, those data might well have been submitted by now. Instead, the Region refused even to discuss the issue with Mirant Kendall. Thus, the Region has no one but itself to blame if the application materials are not submitted until January 2008.

Nor is it clear how the potential for permit litigation militates in favor of moving forward, when it deprives Mirant Kendall of the benefit of full and fair implementation of the Phase II Rule. The Region's preferred approach has not deflected that litigation, while a more reasonable course of action could have.

The Region's third claim amounts to a complaint that, based on the difficulty it has had in setting a BPJ limit in the absence of any rules, it might be quite time-consuming to review the application materials and apply the Phase II Rule. This ignores the fact that EPA's Phase II Rules are designed to provide a systematic means of applying § 316(b) so as to streamline the overall decision-making process. Indeed, EPA repeatedly emphasized during the rulemaking that its regulatory choices were driven in part by the need to provide greater consistency and to relieve administrative burdens. 69 Fed. Reg. 41607-08, 41612 (July 9, 2004). Thus, if the Region follows the Rule, it should have no reason to fear that past will be predicate.

In short, not one of the reasons that the Region cites as the basis for its decision is supported by the record. Thus, the Region's conclusion that changes to the CWIS are necessary and supported by this record is arbitrary and capricious.

d. Applicable Law Does Not Allow the Region To Set BPJ Limits More Stringent Than Required By The Phase II Rule

The Region does not like the Phase II Rule, as its comments on the proposed Phase II Rule (which is similar in most respects to the final Phase II Rule) make quite

clear. EPA Doc. #220, as listed in the 10/12/06 A.R. Index. That bias may explain why the Region has gone to such lengths in this proceeding to avoid applying it fully and fairly.

Even if the Region could justify moving forward with new CWIS requirements before Mirant Kendall has had a chance to evaluate and select its preferred options and to submit the necessary application materials under the Phase II Rule, nothing in the applicable law authorizes it to establish requirements in excess of those established by a nationally applicable regulation in effect two years before a permit is issued.

Yet that is exactly the authority the Region claims. It says:

> BPJ permits represent a case-specific application of the CWA's technology standards which is not generally limited or controlled by future rulemakings; BPJ determinations may lawfully end up imposing more stringent limits based on a site-specific application of the CWA's general technology standards than the Agency might later develop in an industry-wide guideline.

RTC, Response to Comment H8, at p. H28. This analysis ignores a basic legal principle governing BPJ analysis which has been reiterated by EPA and by many reviewing courts, whose conclusions Mirant Kendall summarized in its comments. MK Comment H3, at pp. 96-98. That is, the BPJ determination must reflect the permit writer's highest quality technical opinion of the permit conditions required by the CWA, based on consideration of the same statutory factors that would apply if EPA had set national guidelines for facilities like the one in question. Thus, the outcome of the BPJ analysis should come as close as possible to the outcome that would be imposed if technology-based limits were imposed on the facility in question via a national guideline. The BPJ authority conferred by CWA § 401(a)(1), 33 U.S.C. § 1342(a)(1), does not give Region 1 *carte blanche* to set any limit it chooses, if at the time it is making the determination it knows exactly how

EPA has determined that the statutory factors should be applied to the facility in question. In this unique case, the Region actually knew, almost two years before it issued this permit, exactly what the national guideline requires. Nevertheless, hiding behind its "BPJ" authority, the Region selected CWIS requirements that go far beyond those justified by the Phase II Rule.

Although Mirant Kendall has never had a chance to evaluate its options for compliance with the Phase II Rule,[266] both the record to date and the evaluations Mirant Kendall has performed that the Station might easily have done so either by (1) finding a means of maintaining a coarse (rather than fine) mesh capable of achieving a design through-screen velocity of 0.5 year round,[267] or, if that proves infeasible, (2) seeking alternative site-specific performance standards for that part of the year during which the net can not be used due to ambient conditions. See, e.g., MK Comment H2, at pp. 94-95; MK Comment H26, at pp. 112-113.

Had Mirant Kendall complied by achieving a design 0.5 fps design velocity year-round, no follow-up monitoring would be required. Had it used other means of complying, the Phase II Rule suggests that two years of monitoring would have been adequate. See 40 C.F.R. § 125.95(b)(7).

Mirant Kendall also proposed use of the diffuser as a way of ameliorating any impingement and entrainment impacts. As Mirant Kendall's Comments MK Comment H22, at p. 109 reminded the Region, the diffuser would enhance the survival prospects for those eggs and larvae that sink below the upper water column (where advection out of the Basin and into the Harbor takes place) but today die near the bottom in the absence of dissolved oxygen. The Region refused even to consider this factor in evaluating the risks

and benefits of the diffuser. Instead, it suggests that the diffuser would not likely enhance egg and larvae survival because, the Region says, DO levels already are adequate during the periods when ichthyoplankton are most likely to be present. RTC Comment H22 at p. H49. For this proposition, the Region cites data from May and October of 2004.

Mirant Kendall can only assume that the Region intended to be misleading, since the DO graph presented supra shows that in most months for the three-year period of record, DO levels were seldom above 2.5 mg/l and were often around zero at the location of the proposed diffuser outfall.[268]

Instead of considering all available options under the Rule, the Region selected a host of requirements that go well beyond the four corners of the Phase II Rule. As noted above, the NPDES renewal permit requires installation of a fine mesh net, even though only coarse mesh could be justified to reduce impingement. Having required fine mesh, which may result in greater impingement of entrainable organisms, the Region then added a requirement that Mirant Kendall deploy that net so as to allow small eggs and larvae to be freed with the greatest chance of survival. The permit language suggests that this might best be accomplished by locating the net outside the Broad Canal.[269] As discussed infra, below, such a location is unlikely to be technically feasible and is likely to have environmental impacts that more than offset any possible gains.

The final permit also requires extensive monitoring to assess the BNS's performance, even if the net can be shown to achieve a design through-screen velocity of 0.5 fps or less. The Phase II Rule specifically provides that such monitoring is not required. 40 C.F.R. § 125.94(a)(i)(ii). The only rationale that the Region offers for

ignoring the Phase ll Rule's instructions is its desire to revisit, on a site-specific basis, the wisdom of the judgment EPA Headquarters made when it developed the national guideline. RTC, Response to Comment H1, at p. H17. Nothing in the statute or the Phase II Rule authorizes this kind of wholesale re-visitation of the Phase II Rule, under the guise of making a BPJ decision. It is simply unlawful.

e. The Region Committed Reversible Error By Considering Only Selected Portions Of The Phase II Rule

The Region says that it considered the Phase II Rule and the permit record in a "reasonable and appropriate way" in developing BPJ limits for the CWIS. RTC Response to Comment H1, at p. H5. As the following discussion shows, the Region's consideration of the Phase ll Rule was, at best, highly selective. Not only did the Region go beyond the confines of the Phase II Rule in establishing its permit requirements, it also failed to consider options that Mirant Kendall would have been entitled to consider had it been given an opportunity to complete its evaluation under the Phase II Rule.

Mirant Kendall described the ways in which the Region's final BPJ requirements failed to address important elements required by the Phase II Rule for final BTA selection. Each of these omissions constitutes selective and unreasonable application of the Phase II Rule. Mirant Kendall also described the myriad ways in which the permit imposes CWIS provisions that go well beyond what the Phase II Rule requires. Again, each of these duplicative or unnecessary provisions evidences the Region's selective consideration of the Phase II Rule.

In addition to these errors or omissions, the Region also failed to consider other options expressly allowed by the Rule, which its "BPJ" determination will now effectively foreclose. Options that Mirant Kendall's comments identified as possible for

the facility included restoration, alternative net designs, and site-specific alternative limits based on consideration of costs and benefits. MK Comment H2, at pp. 94-96, and H26, at pp. 112-113.

The record is devoid of any evidence that the Region considered restoration (an authorized compliance option under § 125.94(a)((3), (c)) as even a partial compliance option, even though Mirant Kendall's February 2001 Supplemental Application supplied the agencies with information on the benefits of the diffuser as a restoration technology for species potentially subject to impingement. See, e.g., TRC, NPDES Permit #MA0004898 Kendall Square Station Equipment Upgrade Project, Cambridge, MA, Vol. II, App. 5-11 (EPA Doc. #454 as listed on the 10/12/06 A.R. Index).

As for consideration of alternate standards based on a comparison of costs and benefits, the Region purported to find that the costs of achieving the new CWIS requirements would not be either "wholly disproportionate" to or "substantially greater" than the benefits. See, e.g., RTC, Response to Comment H23, at pp. H53-58. The Region does not explain how it could have done so, given that final decisions affecting many crucial elements of the design, location and operation of the technology have not been defined. Even if this uncertainty did not make cost estimation impossible. Section 125.94(a)(5)(ii) of the Phase II Rule requires, that cost-benefit analysis compare the capital, operation and maintenance ("O&M"), and pilot testing costs of the technology in question to the economic benefits of achieving the standard with that technology. The process required to estimate both costs and economic benefits is laid out in some detail in § 125.94(a)(5)(i),(ii) of the Phase II Rule.

The Region completely ignored these regulatory requirements. It did not even acknowledge their value as guidance, or bother to explain why they could or should not be complied with. Instead, the Region (despite its emphasis on the "site-specificity" of its choices) failed to make any site-specific cost analysis of many components of the CWIS requirements.

The Region also failed to analyze the economic or ecological benefits of the requirements it chose. The Region suggests that it was not obliged to make such an assessment, because Mirant Kendall did not provide any quantitative benefits data. RTC, Response to Comment H23, at pp. H57-H58. It also suggests that, under the circumstances, its "qualitative analysis" is sufficient. Id. These responses ignore the fact that the Region bears the burden of showing that it considered the factors required by applicable law.

Even if that were not the case, the Region's "qualitative analysis" is deficient. That analysis consists of nothing more than a recitation of impingement values; a statement that the Region considers impingement rates to be of concern; an acknowledgment that the Phase II Rule treats impingement mortality as adverse for purposes of setting standards; and a wholly unsupported statement that reducing impingement will "improve the quality of the Lower Charles River basin as a habitat for fish...." RTC, Response to Comment H15, at pp. H42-43.

In sum, the Region should have performed all of the above analyses, but it did not. If it is going to deprive Mirant Kendall of the opportunity to consider available options under the Phase II Rule, the Region must shoulder that burden itself in order to make a legitimate BPJ decision that applies "to the case at hand the factors required by

the statute for the standard in question" (RTC Comment H1 at p. H5), as EPA has now definitively determined them. Its failure to do so renders its BPJ determination unlawful.

f. These CWIS Requirements Lack Record Support

In numerous regards, the Region has failed to provide adequate support for the CWIS requirements it selected. For example, the Region:

- Failed to provide any estimate (site-specific or otherwise) of the cost of locating the BNS at the entrance to or outside the Broad Canal, as the permit suggests may be required;
- Failed to adequately consider the technical feasibility of locating the BNS at the entrance to or outside the Broad Canal.
- Failed to provide any site-specific analysis of the feasibility or cost of technology required to allow for impinged eggs and larvae to be freed in a manner that would increase the probability of their survival,
- Failed to identify the "calculated [sic] baseline" and metrics for verification monitoring that will be used to assess the performance of the BNS and other operating measures required by the permit
- Failed to consider the environmental impacts associated with loss of habitat if the net is placed at the entrance to our outside the Broad Canal,
- Failed to provide any site-specific analysis of the cost of installing fish collection and return systems on the existing traveling screens, and
- Failed even to attempt any economic analysis of the benefits to likely to be derived from these technologies.

- Failed to set a compliance schedule that takes into account the many steps Mirant Kendall will need to take before it can implement the BNS and to estimate the time needed to complete those steps.
- Failed to supply any adequate rationale for requiring verification monitoring for the entire permit term, when the Phase II Rule requires only two years.

The Region omitted these important analyses and explanations even though Mirant Kendall's comments pointed out the need for them.

Although the record suggests that the Region believes Mirant Kendall may be able to use a "Gunderboom©" type net with an "airburst" system to remove organisms (see, e.g., RTC, Response to Comments H23, at p. H57, H24 at p. H59, H26 at p. H63, and H31 at pp. H69-71), it neither determines that such a technology is feasible here nor discusses the costs or habitat effects of using such a system. As Mirant Kendall explained in its comments, MK Comment H31, at pp. 116-117, the use of such a system is neither feasible nor necessary at this site, and the Region has provided no evidence that it is, other than experience at a wholly different site.

The record also suggests that the Region looked at general information regarding the cost of retrofitting the traveling screens with fish collection buckets and a fish return. As Mirant Kendall pointed out in its comments, MK Comment H35, at p. 119, such retrofits may be technically difficult and in any case are wholly unwarranted, given the very small number of fish likely to be impinged during the times of year when a net is not in place. The Region's only response is to point to EPA's Technical Development Document for the Final Phase II Existing Facilities Rule, and to suggest that the cost of such retrofits is "relatively low." RTC, Response to Comment H35, at p. H79. It does

not attempt to estimate costs of such retrofits for this facility, nor as discussed supra, does it compare those costs in any systematic way to the likely environmental benefits.

The Region also dismissed, with little or no explanation or evidence, concerns expressed by Mirant Kendall and other commentors regarding the environmental and social impacts likely arise if the BNS were placed at the entrance to or outside the Broad Canal. See, e.g., MK Comment H23, at pp. 110-111; Transcript of Public Hearing on MKS Draft Permit at p. 38 (EPA Doc. #638 as listed in the 10/12/06 A.R. Index); Comment of the City of Cambridge at p. 2 (EPA Doc. #645 as listed in the 10/12/06 A.R. Index). With respect to public access to the canal, the Region says that Mirant Kendall could attach "flexible materials" (which it does not bother to identify) across the top of the net to allow passage for non-motorized small boats. RTC, Response to Comment H23, at p. H57. As for access by motorized vessels, the Region agrees that there would be an increased risk, but "feels strongly" that those risks would be "more than offset" by the environmental benefits of such a system. Id. Again, the Region offers no substantive analysis for why this is so. And the Region did not bother to address at all the potential exclusion from the canal of organisms that are not susceptible to impingement or entrainment and the effects of any loss of habitat, even though juvenile alewives commonly populate the canal.

It also is obvious that the Region, while continuing to assess performance goals against a "calculated [sic] baseline," has made little attempt to address important questions that must be answered in order to fairly assess compliance and provide credit for any operational or other measures that reduce impingement mortality and entrainment. See MK Comment H27, at pp. 113-114. If the Region intends that the

calculated baseline will be derived based on existing data, it does not say so, nor is it clear which data it would view as acceptable and how those should be used. Although the final permit now specifies that performance will be assessed on an "annual" basis, the Region does not explain why it chose that value or how that value will minimize the confounding effects of natural variability.

Of equally great concern, the Region, despite urging by Mirant Kendall, either fails to acknowledge the many steps that must precede "implementation" of the BNS or to evaluate the time reasonably needed to complete each step. As Mirant Kendall's comments point out MK Comment H31, at p. 117, the draft permit left open important design issues and permitting issues that will take some time to resolve. The final permit only adds to these issues, creating new requirements for evaluation of alternative locations. Yet nowhere does the Region consider how much time these steps will take, so that it can set a schedule for which it has some rational foundation. Instead, in response to Mirant Kendall's comment, the Region simply tacks 60 days onto its original proposal, without any explanation as to how it arrived at this schedule. RTC, Response to Comment H31, at p. H71. As a result, the schedule it has imposed is arbitrary and capricious.

Similarly, in response to Mirant Kendall's objections to the extensive impingement monitoring required throughout the permit term MK Comment H38, at p. 120, the Region says that this monitoring will document impingement levels under a range of flow conditions, fish densities, and facility operations. RTC, Response to Comment H38, at pp. H81-82. But nowhere does the Region explain why such long-term monitoring is necessary to document that the technology is achieving the relevant

percentage reduction, which is the point of verification monitoring. The Region has failed to identify any basis for concluding that the performance rate is likely to vary appreciably under different environmental or operational conditions, nor could it. Thus, the monitoring conditions it has imposed are arbitrary and capricious.

4. The Entrainment-Related CWIS Requirements, Although Unlawful, Are Not Subject to Review In This Proceeding

As discussed supra, the permit also includes a number of requirements focused on reducing entrainment and the mortality of entrainable sized organisms (i.e., those capable of passing through a standard 3/8 inch screen) that may be impinged once the required fine mesh barrier net is installed. Part I.A.11.b at pp. 13-4 of 35, and 14.d.11 at pp. 30-31 of 35. The Region states repeatedly throughout the permit and the Response to Comments that these requirements are imposed solely pursuant to the MassDEP's Water Quality Certification, from which they have been taken verbatim. Id. See also, RTC, Response to Comments H1, at pp. H12-13 and H17 at p. H55; Water Quality Certification for NPDES Permit MA 0004898 (Mirant Kendall Station, Cambridge, MA), EPA Doc. # 673 as identified in the 10/12/06 A.R. Index. Because these requirements are imposed solely pursuant to the MassDEP WQC and EPA has offered no independent rationale for them,[270] these provisions are not subject to challenge in this proceeding. See In re Dominion Energy Brayton Point, L.L.C., slip op. at 189-90 (explaining that "permit conditions that arise from [the State Water Quality Certification] are 'attributable to State certification' and . . . cannot be challenged in the permit appeal before the Board"). As noted supra, Mirant Kendall has filed with the MassDEP Office of Administrative

Appeals and Dispute Resolution ("MassDEP OAADR") a Notice of Appeal of the Water Quality Certification for Mirant Kendall.

5. Two Important Procedural Question Related To The Entrainment Provisions Merit Review Here

a. Failure to Provide For Notice and Comment on Entrainment-Related Provisions

Although the substance of the entrainment-related provisions is not subject to review by this tribunal, two important issues related to the procedures followed by the Region in connection with those provisions are reviewable here. The first issue concerns the Region's failure to give Mirant Kendall any notice of or opportunity to comment on the entrainment-related provisions it ultimately imposed and the basis for those provisions. Although the Region may be obliged by CWA § 401 to impose any requirements contained in the state water quality certification, this does not relieve the Region of its obligation to provide notice and allow comment. These procedures are even more important where, as is the case here, the state agency offered no opportunity for comment before it issued the certification.

The importance of ensuring that the Region seeks public comment before proceeding with State WQC-based provisions is well-illustrated by the position MassDEP has taken in its December 13, 2006 "Response to Order to Show Cause," pp. 23-25.[271] There, MassDEP contends that Mirant Kendall's appeal of the State WQC for entrainment and impingement should be stayed, because entrainment and impingement issues are so inextricably intertwined that the Board inevitably will have to consider the entrainment issues when it considers the impingement issues. This argument ignores the EAB precedent precluding the Board from considering permit conditions based solely on

a State WQC. It also highlights the fact that, if the MassDEP OAADR were to accept the this argument, and the EAB were to agree that review here is appropriate, the only "record" on which the EAB could base its review of the entrainment provisions would be the bare assertions in the State WQC itself, uninformed by any public comment.

b. Unlawful Delegation of Permitting Authority to MassDEP

Second, the permit delegates to MassDEP sole authority for making final decisions regarding the design, operation, and monitoring of the BNS or "alternative entrainment prevention system" ("EPS"). This is unlawful. Specifically, the permit includes a number of open-ended requirements for the design, location, installation and operation of a system for reducing mortality of river herring and white perch eggs and larvae that become impinged on the fine mesh net. Part. I.A.11.b at pp. 13-14 of 35. Those requirements anticipate that Mirant Kendall will develop plans for satisfying these requirements, which will be submitted to, and reviewed and approved solely by, MassDEP. According to the permit, the Region is not the final decision-maker, nor does the federal agency appear to have any formal role in evaluating and determining the adequacy of the proposals submitted, even though these provisions are part of a federal permit and enforceable under federal law. As Mirant Kendall pointed out in its comments MK Comment H39, at p. 121, the Region has in essence delegated its permitting authority to MassDEP in this regard. That is prohibited by applicable law.

The Clean Water Act clearly and specifically confers on EPA exclusive authority to issue NPDES permits unless and until the Agency determines, based on properly submitted information required by the statute, that a state program satisfies all of the minimum statutory requirements, including requirements for public participation. CWA

§ 402, 33 U.S.C. § 1342 (a)-(e). Nothing in the statute or in EPA's NPDES regulations suggests that EPA may delegate to a state or any other "co-regulator" the final authority for taking action relevant to specific permit terms.

In response to Mirant Kendall's objection to this provision, the Region indicates that there is nothing improper in merely "mentioning that the state may also need to approve permit modifications" and that the Region will retain its authority over any permit modifications. RTC, Response to Comment 39, at pp. H82-83. But that is not what the permit says. The language of the permit itself does not require Mirant Kendall to submit the required plans to both the Region and the State and secure the approval of both. Neither does it require that Mirant Kendall submit the plans to the Region and charge the Region with obtaining the State's concurrence. Instead, it requires Mirant Kendall to submit the plans directly to MassDEP for "approval." Moreover, there is no suggestion that the plans, once approved, require any permit modification prior to their implementation. Thus, the Region's clarification on permit modifications is irrelevant to this issue, and the provision remains unlawful.

F Monitoring Requirements

1. Real-Time In-Stream Monitoring is Not Necessary to Ensure Compliance

The NPDES renewal permit creates an unprecedented compliance regime based on over one hundred in-stream compliance events every single day. For reasons discussed elsewhere, that compliance regime is overbroad and irrational. For the following reasons, the permit's in-stream compliance monitoring methods also are excessive and unnecessary, especially in light of the associated costs and logistical difficulties.

a. The In-stream Monitoring System

In order to monitor for compliance with the NPDES renewal permit's in-stream temperature limits, the permit would require Mirant Kendall to install nine in-stream monitoring stations, including at least six fixed buoys, in the various locations inside and out of the lower basin of the Charles River described at Part I.A.14.b of the NPDES renewal permit. Each station must be capable of transmitting real-time water quality information via radio signal to Mirant Kendall. Id. Mirant Kendall must then make this real-time data available on a website that can be accessed by the Region and MassDEP. Id. Each buoy will cost Mirant Kendall approximately $50,000. MK Comments, Comment 112, at p. 127.

b. The Region Did Not Adequately Consider Less Burdensome Methods.

Mirant Kendall commented that in-stream, real time continuous monitoring was unnecessary for several reasons. First, Mirant Kendall commented that the Region and Mirant Kendall first hatched the real-time in-stream approach in 2001 at a time when they had no detailed, continuous temperature records the lower basin other than the Station's intake and discharge temperatures. Partly for that reason, MassDEP had made clear that it would insist on in-stream monitoring.[272] But by the time of the comments on the draft NPDES permit, and even more so by now, Mirant Kendall has gathered a multi-year record of representative and continuous temperature data from thermistors placed in key areas in the lower basin, including in the ZD and the ZPH, that correspond closely to the locations of the in-stream monitoring points established in the permit.

These six years of thermistor data, as well as eight years of weekly vertical profiling, were collected under a full range of river floes and plant heat loads, make real-

time monitoring in the future unnecessary and excessive. With these actual river temperature data, algorithms have been developed that predict (with 99% and greater certainty) the upstream ambient background temperatures and the temperatures throughout the ZD and ZPH based on the temperature readings at Kendall Station's intake.[273] These data eliminate beyond reasonable doubt any uncertainty about the effect of Kendall Station's present discharge on temperatures in the lower basin.

Accordingly, Mirant Kendall commented that the Region did not need to impose the expense and burdens of in-stream monitoring and buoys, but rather, should utilize the intake temperatures as the base for placing effluent limitations on the discharge. MK Comments, Comment I2, at p. 127. When this predictive ability is coupled with the Region's need to consider the costs of the monitoring it imposes, see MK Comments, Comment I12, at p. 127, and the unprecedented nature of the real-time data transmittal regime, see MK Comments, Comment I13, at p. 128, it is clear that the real-time monitoring buoys are unnecessary and should be avoided.

In fact, the Region recognized that real-time continuous monitoring program would be unnecessary "if the permittee can supply predicted temperatures for key areas of the lower basin (ZPH)." RTC, Response to Comment I2, at p. I3. What the Region failed to address, however, is that the temperature data Mirant Kendall has already provided to the Region does allow for these critical predictions. Indeed, the Region requested and Mirant provided the Station intake data for this very purpose.[274] As discussed above, the relationships here are so consistent that by comparing the continuous intake data and the continuous data from the thermistors around the basin, the algorithms are available to predict -- with better than 99% confidence -- the temperatures

at the key compliance locations in the basin based on the temperature reading at Kendall Station's intake.[275] Also, both the Region's own TMDL model and Mirant' hydrodynamic model have the capacity to accomplish the task of closely predicting temperatures in the lower basin: and their accuracy can now be improved with the thermistor data.

Real-time in-stream monitoring is unnecessary, therefore, because the real-time temperature measurements at the Broad Canal intake provide a fully adequate means to predict the contemporaneous temperatures at the relevant locations throughout the lower basin. Because the Region has failed to provide results of its effort to accomplish this goal, and failed to allow Mirant to demonstrate the attainment of the goal by use of the historical temperature data and without requiring unprecedented and expensive real-time in-stream monitoring, this issue should be remanded for such consideration.[276]

2. Overbroad and Unnecessary Biological Sampling and Water Quality Monitoring

The NPDES renewal permit imposes an unprecedented biological sampling and water quality monitoring program. Part I.A.14, as summarized in the Background section, supra. In a real sense, the Region has used the NPDES renewal permit to commission Mirant Kendall to fund and implement a comprehensive, on-going study of the lower basin of the Charles River. The scope of the program, however, is unmoored from any reasonable expectations about the potential effects of Mirant Kendall's discharge as conditioned by the renewal permit, and is largely unnecessary in view of the comprehensive monitoring program Mirant Kendall has voluntarily performed over the past five and more years. The Board should review Part I.A.14 of the renewal permit and remand it to the Region for reconsideration

a. The Scope of the Program is Overbroad

First, elsewhere in this Supplemental Petition Mirant Kendall has demonstrated that the Board should review and remand the requirements in Part I.A.14.b regarding real time continuous temperature monitoring at nine in-stream monitoring stations. Another portion of the Supplemental Petition demonstrates that the impingement related monitoring requirements are unlawful under the Phase II CWIS regulations. Also, Mirant Kendall has appealed the entrainment related monitoring requirements in the parallel state proceedings.

Accordingly, this portion of the Supplemental Petition focuses on the remainder of Part I.A.14. specifically, the non-continuous water quality monitoring under Part I.A.14.c; the comprehensive biological monitoring program under Part I.A.14.d and its eleven subsections; and the annual monitoring program evaluation under Part I.A.14.e.

Those components of Part 1.A.I4 bear only tangential relation to the discharge from the Kendall Station, particularly as that discharge is conditioned by the remaining provisions of the renewal permit. As the Region has readily acknowledged, the impairments to herring migration in the Charles River and the problems of nutrients and eutrophication and the salt wedge are largely attributable to causes unrelated to the Station. Even in considering the Station's discharge under the 1988 NPDES permit, the Region has not attributed those problems to the Station (excepting the Region's belated and irrational finding of prior appreciable harm to juvenile herring, as discussed supra). Yet the NPDES permit would impose on Mirant Kendall the obligations to conduct river herring counts all the way up to the Watertown Dam, to conduct water quality contour maps for the entire lower basin, to conduct nutrient and phytoplankton sampling for the

entire lower basin weekly during the summer, and to continue Mirant Kendall's voluntary program of beach seine, push-net and gill or Fyke net sampling.

Mirant Kendall's comments on the draft NPDES permit criticized that program as excessive.[277] In response, the Region made two basic points. First, that a broad biological monitoring program is necessary to confirm that the renewal permit remains protective. Second, that the program is commensurate with the monitoring requirements the Region has imposed on two nuclear power stations and the largest fossil fuel power station.[278]

Neither of those responses adequately address Mirant Kendall's comments. The Region's first point is non-responsive because the Region made no effort to show why the particular monitoring at issue - e.g., river herring counts - could be used to confirm the protectiveness of the permit. The manifold factors influencing river herring numbers in the Charles River largely overwhelm any potential impact of the Station's discharge, particularly as that discharge would be conditioned by the renewal permit. It is excessive for the Region to impose such comprehensive monitoring duties just on one discharger where its discharge has such small potential impacts.

Similarly, the monitoring programs imposed on the nuclear stations and Brayton Station if anything prove Mirant Kendall's point. Each of those Stations dwarfs Mirant Kendall both in generation size and in discharge impacts; none of them is situated in an impounded water body where the major impacts on water quality come from other causes. The Region's reliance on those precedents indicates exactly how the Region has irrationally lumped Mirant Kendall in with very different discharges.

b. Past Sampling and Monitoring Sufficient

Mirant Kendall also commented that the biological sampling and monitoring requirements were irrational because Mirant Kendall has voluntarily gathered and submitted precisely this type of data for the past several years.[279] It is difficult to determine if the Region actually responded to this comment. At most the Region seemed to say that the monitoring program is designed to "effectively characterize the effects of the discharge...."[280]

But that explanation is not responsive because it fails to address why the past submissions have been insufficient. The Region apparently believes it had sufficient information to issued the renewal permit; it has not adequately explained why continued biological monitoring of this scale is still necessary.

The Region cannot rely on its claim that continued monitoring and sampling is necessary because Kendall Station has upgraded its operations and has a much greater impact on the lower basin.[281] The NPDES renewal permit will lessen the impact that Kendall Station's discharge has on temperatures in the lower basin because of its stringent new thermal limits and compliance regime. The Region failed to explain why the monitoring program of this scale remains necessary given the NPDES renewal permit, which will ensure that Kendall Station's discharge has less of an impact on temperatures in the lower basin than it has had in the past.

c. Not Legally Authorized

Mirant Kendall also commented that the Clean Water Act and its implementing regulations set an outside limit on the amount of monitoring and sampling.[282] Specifically, the permit is limited to monitoring to assure compliance with the permit limits. See 40 C.F.R. §§ 122.44(i), 122.48. For example, 40 C.F.R. § 122.44(i) only

allows for monitoring "to assure compliance with permit limitations...." And 40 C.F.R. § 122.48 merely describes the level of specificity that a NPDES permit must contain with respect to monitoring obligations. Simply put, while the Clean Water Act and the implementing regulations contemplate some level of monitoring, it is clear that that monitoring is confined to that which is necessary to ensure compliance with permit limits. Mirant Kendall commented that even if the CWA could be read more expansively to allow for some non-compliance based monitoring, the level of monitoring and sampling required by the NPDES renewal permit exceeds any expansive reading of the Act.[283]

In response, the Region argues that this expansive monitoring is necessary because Mirant Kendall did not develop what the Region could find as an acceptable hydrodynamic model to predict in-stream temperatures.[284] But that this argument only speaks to why compliance-focused monitoring is necessary. It does not justify the expansive biological monitoring and sampling required by Part I.A.14.c, d, and e. The Region has failed to explain why it is authorized to impose that substantial and far-ranging biological monitoring not tied compliance with the permit limits.

The Board should review and remand the biological monitoring program with directions to the Region to tailor any biological monitoring program to permit compliance monitoring.

3. Clear error regarding monitoring and effluent limitations on internal Outfall 009

Part I.A.3 of the NPDES renewal permit would authorize Mirant Kendall to discharge the UF/RO reject water through a new internal Outfall 009, and also establishes enforceable discharge limitations and monitoring requirements for that discharge at

Outfall 009. Mirant Kendall requests that the Board review and remand the discharge limitations and monitoring requirements at Outfall 009 for two parameters: (1) total suspended solids, and (2) oil and grease.

The draft NPDES permit had contained the same provisions as appear in the NPDES renewal permit, despite Mirant Kendall's comment that the imposition of monitoring and discharge limits on Outfall 009 was unnecessary and unauthorized under 40 C.F.R. § 122.45(h).[285] The thrust of Mirant Kendall's comment was that it is practicable and feasible to impose standards on total suspended solids and oil and grease at Outfalls 001 and 002. Accordingly, there are not the "extraordinary" circumstances required for imposing those limitations at Outfall 009.

The Region's response to Mirant Kendall's comment was not adequate to justify these requirements. First, the Region claimed that 40 C.F.R. § 122.45(h) applies only to limitations on internal waste streams but is inapplicable to the permit's monitoring regime.[286] That regulation does, however, provide for monitoring of internal waste streams under 40 C.F.R. § 122.48, but only when effluent limitations have been established for the internal waste stream. The Region did not identify any other source of authority for imposing monitoring requirements on an internal waste stream. Accordingly, if the Region does not have a sufficient basis for imposing effluent limitations on the internal waste stream, there is no basis for imposing monitoring limitations.

The Region also seeks to justify this monitoring on the ground that Outfall 009 is the only location where the discharge from 009 itself could be effectively characterized. But that is a tautology. If there is sufficient basis to monitor and impose limitations on

the UF/RO reject water separately from other waste streams, then of course that monitoring should occur at Outfall 009. But first the Region must have a sufficient basis for monitoring and limitations on the separate UF/RO reject water.

The Region also seeks to justify these requirements on the basis that they would provide information. Yes, but what information? The Region stated:

> Since Mirant has not provided specific data on this internal stream, this monitoring will provide an understanding of whether some of these parameters may be discharged at levels which could cause or contribute to an excursion from WQC.[287]

In fact, however, Mirant Kendall's February 2001 Supplemental Application provided extremely specific data, stating that:

> The reject water would be about 0.5 percent of the discharge volume and would include 106 gpm (average) of water with all the inlet concentration of total suspended solids, a 6.6 concentration increase, and 145 gpm (average) of water with 4 times the inlet concentration of total dissolved solids. To examine the impacts of the wastewater reject consider the river analysis results in Table 2-8. If the plant received influent of that quality (4 mg/L TSS and 242 mg/L TDS) then the discharged diffuser wastewater would contain 4.05 mg/L TSS and 244 mg/L TDS. These small incremental increases should not have any detrimental effect on the river.

Supplemental Application, pp. 238-239.[288/] In response, the Region has provided no basis for any concern that discharge of the UF/RO reject water into the Station's much larger cooling water flow would lead that reject water to cause any excursions in the River. Indeed, the amount of dilution from the cooling water means it is almost impossible for the discharge from 009 to cause or contribute to any such excursions. The claim of a need for the information, standing alone, is not sufficient to justify imposition of expensive monitoring requirements. The Region must explain, but has not, why it needs the data in more than conclusory terms.

The Region also asserts that gaining this information "is especially important for those parameters which are not monitored at any outfall."[289] It is true that the NPDES renewal permit does not require monitoring for those parameters at the other outfalls, but that was the Region's own election. The absence of such a requirement elsewhere does not in itself provide any warrant for imposing such requirements on Outfall 009 unless getting that information in itself is important. But the Region has not made that case.

Finally, the Region claims that it should impose such monitoring requirements and limitations at Outfall 009 because "the wastes at the point of discharge are so diluted as to make monitoring impracticable."[290] The Region did not, however, explain why that is so. Yes, the cooling water discharges will dilute the effluent from Outfall 009, but monitoring at the other outfalls certainly is practicable.

Mirant Kendall submits that the Region has reflexively imposed monitoring requirements and limitations on the discharge from Outfall 009 without any basis for belief that that discharge could cause any excursion from water quality standards in the Charles River. The Region lacks adequate authority for imposition of those requirements.

4. Erroneous requirements for whole effluent toxicity testing

The draft NPDES renewal permit contained a requirement for whole effluent toxicity ("WET") testing. Draft NPDES Renewal Permit, Part I.A.1, and fn. 11-14. The selected species for the WET testing were the daphnid and the fathead minnow, both of them freshwater species. Id. Mirant Kendall commented that these were inappropriate because the water from the lower basin that the Kendall Station withdraws (and then discharges) has higher levels of salinity than the freshwaters those species inhabit, which

would make it meaningless to conduct WET testing. MK Comments, Comment I22, at p. 132.

In the final NPDES renewal permit, the Region responded to that comment by adding two marine species to use if the salinity of the intake water exceeds 1 ppt. RTC, Response to Comment I22, at p. I21 and NPDES renewal permit, Part I.A.1, and nn. 11-14.

While Mirant Kendall appreciates the Region's willingness to revise the WET testing procedure, the Region's new WET testing requirements remain irrational. First, one of those marine species - the sea urchin - is taxonomically remote from any species that the Station's discharge could ever encounter. Second, the fertilization test procedures for the sea urchin, as outlined on Attachment C2 to the permit, require radical adjustments to the effluent test water to make it match marine conditions, which will render the test unrepresentative and thereby likely to produce false failures. Specifically, the procedures require adjustment of the effluent salinity from the prevalent salinity range of less than 2 ppt in the oligohaline to mesohaline waters of the lower basin up to a marine salinity level of 29-32 ppt, a salinity level that is never approached anywhere in the portions of the water column that receive the effluent. Such adjustment will alter the chemistry of the naturally low salinity water in ways that will change the availability of potential background toxicants, creating a potential for false failures wholly unrelated to the effluent.

The Region's response to Mirant Kendall's showing that the freshwater species are inappropriate would substitute an equally inappropriate species and procedures. The WET testing requirement should be remanded to the Region for revision to appropriately

reflect the applicable oligohaline to mesohaline range in both the test conditions and species selection.

5. Unsupported requirements for daily monitoring of fish mortality and for operational curtailments

The NPDES renewal permit imposes a requirement that Mirant Kendall perform visual inspections of the ZD, the Broad Canal, and the area of the BNS, daily throughout the year, for dead fish. While Mirant Kendall does not object to a reasonable monitoring regime for dead fish, the regime contemplated by the NPDES renewal permit is overbroad. Moreover, the NPDES renewal permit imposes curtailment requirements in circumstances where fish mortality is entirely unrelated to the station's operations. The Region has failed to address Mirant Kendall's comments on this overbreadth.

a. No Evidence that Discharge Has Been or Could Lead to Fish Kills

Mirant Kendall commented that there is nothing in the record indicating that any fish kills in the lower basin have resulted -- in whole or in part -- from Kendall Station's discharge. MK Comments, Comment I6, at p. D124. Given Mirant Kendall's over 50 years of operations without such a documented incident that could plausibly be connected with its discharge, it is arbitrary to impose such conditions on it now, especially in light of the thermal limits in the NPDES renewal permit that will limit Kendall Station's ability to discharge at past levels. Moreover, there is nothing in the record to indicate that Kendall Station's discharge under the NPDES renewal permit would increase the probability of such kills.

The Region essentially admits that there is no historic evidence of any fish kills attributable to the discharge. RTC, Response to Comment I6, at pp. I7-I8. The Region

attempts to justify the requirement by claiming that there is no evidence that there have not been any fish kills attributable to Kendall Station's discharge because there has been no prior monitoring on this issue. RTC, Response to Comment I6, at pp. I7-I8.

That position is ridiculous. The Region seems to be suggesting that undocumented fish kills may have occurred in the past. The very fact that there have not been any documented fish kills attributed to the Station for the past 50 years in a highly urbanized and utilized portion of the Charles River is necessarily determinative evidence that there have not been any such incidents. Hundreds of individuals line the lower basin's banks on bike paths and in parks and grassy areas each day every summer. In addition, hundreds of individuals are actually out in the lower basin on pleasure craft, sail boats based in the community boating center, and on tour boats. Also, Mirant Kendall has deployed sampling teams in the ZD virtually every week of the spring, summer and early fall for seven years since 1999. These teams are aware of the responsibility to report any fish kills, but have reported none. And finally, fish kills have been documented for other reasons in the past, thereby debunking the Region's theory that such incidents have gone unnoticed in lieu of monitoring by Mirant Kendall. For these reasons, the Region's suggestion that there may have been past, undocumented fish kills in the lower basin attributable to the Station is irrational.

The Region also uses tank studies in the academic literature to argue that there have been lethal temperatures observed in the area of Kendall Station's discharge in the past. RTC, Response to Comment F4-2, at p. F9; Response to Comment I6, at p. I7. But even were this true (a fact that Mirant Kendall contests), there have been no documented or observed dead fish that have been attributed to these supposedly "lethal conditions."

Moreover, the fact that conditions in the past may have approached or exceeded "lethal conditions" has no bearing as to whether such conditions will recur in the future under the new NPDES renewal permit. As discussed above, the thermal limits in the NPDES renewal permit would ensure that no such "lethal conditions" (even as defined by the Region) will occur in the lower basin in the future. The Region cannot use past conditions under a less restrictive permit - when there were no fish kills - as a justification more burdensome fish kill monitoring under a more restrictive permit.

b. Unnecessary Curtailments and Collections When Dead Fish Not Attributable to Plant

Mirant Kendall also commented that the fish mortality monitoring portion of the NPDES renewal permit would require discharge curtailments and extensive fish collection/clean-up by Mirant Kendall even if the dead fish were not attributable to Kendall Station's discharge. MK Comments, Comment 14, at p. 126. For example, this could occur if dead fish floated downstream into the inspection area from a portion of the Charles River not affected by Kendall Station's discharge, forcing Kendall Station to curtail operations and clean up dead fish caused by some unrelated (and possibly man-made) factor is irrational.

The Region responded is to speculate that it might be beneficial to reduce stress to the receiving waters, whatever the cause of the fish kill, by ensuring that the Station's discharge is kept below 95° F. RTC, Response to Comment I6, at p. I7. That is an entirely speculative claim, however. There is no basis in the record for finding that a reduction in the Station's discharge temperature would have any benefits whatsoever with respect to fish kills not caused by the Station. The Board should review and remand this issue for further consideration.

c. No justification for Year Round Monitoring

Mirant Kendall commented that there was no rational basis for year-round monitoring for fish kills. MK Comments, Comment I6, at p. 124. The Region, once again, failed to address this issue. Such a failure is particularly telling where the Region's only stated basis for requiring such monitoring (i.e., lethal or near lethal temperatures near the discharge) does not exist year round. To the contrary, such discharges only occur during the warmest periods of the year.

d. Definition of Dead Fish

Mirant Kendall commented that the Region's definition of a "dead fish" was overly vague. MK Comments, Comment I6, at p. 125. Nothing in the NPDES renewal permit provides any clue as to what "loss of equilibrium" means. Imposing permit conditions on such unnecessarily vague conditions is arbitrary and capricious because it fails to provide the permittee with sufficient guidance as to what is required for compliance.

The Region's response did nothing to provide further clarification of its vague definition, and failed to explain why its definition its "dead fish" was easily understandable. For this reason, this issue must be remanded to the Region to provide more clear guidance with respect to this requirement.

6. pH Limits Below Naturally Occurring Ambient Conditions

The NPDES renewal permit sets an in-stream effluent limitation for pH at each monitoring location, apparently inclusive of the background stations identified on Attachment B. NPDES renewal permit, Part I.A.1, n. 8. While this range is acceptable most of the time, the record does contain information showing that ambient conditions in

the lower basin can sometimes exceed 9.0 standard units.[291] Moreover, there is no basis in the record, nor could there be, for the Station to be subject to permit violations due to in-stream pH exceedances anywhere, much less at background stations not influenced by the Station's discharge, because the Station's operations do not have the reasonable potential to cause such in-stream pH exceedances.

This portion of the NPDES renewal permit should therefore be remanded for reconsideration of whether to impose in-stream effluent limitations for pH, or in the alternative, clarification that there will be no permit violation when ambient conditions exceed this permit limit.

7. Electricity Generation Report Unnecessary and Not Authorized by Law

The NPDES renewal permit requires that Mirant Kendall provide the Region with hourly calculations of its electricity generation. NPDES renewal permit, Part I.A.1. The permit separately requires Mirant Kendall to report its heat load data and gallons per day. Presumably the Region wants all of this information to evaluate the relationship between output and the heat Kendall Station discharges into the lower basin.

Mirant Kendall requests the Board review whether, as a matter of policy, a NPDES permit should require hourly and daily reporting of megawatts generated, which is closely guarded information about plant efficiency. The Region has not provided any sufficient need for the information. Also, not all of the electricity generation at the Kendall Station is associated with the Station's thermal discharge because the Station also generates from "jets," so the information as required under the permit is not even useful.

8. Intake Screen Backwash pH Monitoring Remains Unwarranted

In the draft NPDES renewal permit, the Region proposed to require daily monitoring of the pH and temperature of the intake screen backwash at Outfalls 005, 006 and 007. The backwash has a maximum daily flow of .1 MGD and consists exclusively of the intake water pumped back onto the three intake screens thrice daily to clear them of debris from the river. The Region also proposed to require that the pH of that discharge fall within the range of 6.5 to 9.0 Standard Units.

Mirant Kendall commented that such monitoring and the pH limit was unnecessary because there was no reason to expect that the temperature or the pH of the backwash would differ materially from the temperature or pH of the intake water.[292]

In response, the Region agreed that the backwashing procedure does not contribute any heat to the intake water, and removed the temperature monitoring requirement.[293] The Region maintained the pH limit and monitoring requirement, however, on the stated ground that the backwashing procedure removes solids and returns them to the river so that it to monitoring the backwash is "necessary to verify that the discharge of such solids from the screens does not result in floating solids, oil sheen or visible foam in other than trace amounts, or temperature or pH changes."[294]

That response, however, entirely fails to address the point raised in Mirant Kendall's comment, which is that there is no reasonable potential for the backwash operation to change the pH of the intake water. The concern for discharge of solids does not explain a pH requirement - perhaps wisely the Region does not attempt to argue the backwash operation has reasonable potential to change the pH. Also, putting a pH meter once per day into the backwash will not provide any useful information about Mirant's operations because the backwash operation does not involve the addition of any

substances or any adjustments to the intake water - it's just intake water pumped back into the Canal.

The Region has failed to provide a rational basis for this requirement, which should be removed.

END NOTES

[1] A copy of the NPDES renewal permit was attached to Mirant Kendall's Petition filed with the Board on October 30, 2006.

[2] A copy of the 1988 NPDES permit was provided as Exhibit B3-3 to the Comments of Mirant Kendall, LLC on the draft NPDES renewal permit filed with the Region on October 14, 2004. Mirant Kendall will cite to those comments as the "MK Comments."

The Region prepared an index dated October 12, 2006 entitled the "Mirant Kendall-NPDES EPA Administrative Record Index, which Mirant Kendall will cite as the 10/12/06 A.R. Index." A copy of that index sorted by document # is provided as Exhibit 1 within the Appendix to this Supplemental Petition. A copy of the index sorted by document date is provided as Exhibit 2 within the Appendix to this Supplemental Petition.

Mirant Kendall requests and assumes that the Region will include all documents identified on the 10/12/06 A.R. Index and cited in this Supplemental Petition within the relevant portions of the Administrative Record the Region is required to file with the Board by April 9, 2007. Accordingly, rather than burden the Board with duplicative filings of voluminous documents, Mirant Kendall cites to documents listed on the 10/12/06 A.R. Index rather than include them within the Appendix to the Supplemental Petition. For convenience of all, Mirant Kendall also requests and expects that the Region's final index to the Administrative Record will maintain the same EPA Doc. # as the Region utilized on the 10/12/06 A.R. Index.

The Region's 10/12/06 A.R. Index failed to list the MK Comments. Mirant Kendall requests and assumes the Region will include those, too, when it files the Administrative Record with the Board on or before April 9, 2007. Accordingly, Mirant Kendall will not burden the Board with duplicative copies.

[3] The Regional Administrator has authority under 40 C.F.R. 124.16 and 124.60 to remove the stay of any uncontested and severable provisions in the NPDES renewal permit, but has not done so to date.

[4] A copy of the MassDEP WQC is EPA Doc. #673 on the 10/12/06 A.R. Index.

[5] A copy of MCZM's conditional concurrence is EPA Doc. #674 on the 10/12/06 A.R. Index.

[6] A copy of the order staying the state permit and staying the appeal in MassDEP Docket No. 06-165 is provided as Exhibit ___ within the Appendix to this Supplemental Petition.

[7] See Exhibit 3.

[8] A copy of MassDEP's Response to Order to Show Cause is attached as Exhibit 4 within the Appendix of this Supplemental Petition.

[9] A copy of Mirant Kendall's Notice of Appeal, without redundant exhibits, is provided as Exhibit 5 within the Appendix to this Supplemental Petition.

[10] A copy of a letter from the Assistant General Counsel for Ocean Services so extending the filing date is provided as Exhibit 6 within the Appendix to this Supplemental Petition.

[11] Copies of the referenced MCZM letters are provided as Exhibits 7 and 8 within the Appendix to this Supplemental Petition.

[12] See the copy of a letter dated December 1, 2006 and provided as Exhibit 9 within the Appendix to this Supplemental Petition.

[13] Order Granting Joint Scheduling Motions, NPDES Appeal Nos. 06-12, 06-13, p.2.

[14] See Statement of Charles B. Cooper attached as Exhibit 10 within the Appendix to this Supplemental Petition.

[15] A copy of the 1988 Fact Sheet is provided as Exhibit 10 within the Appendix to this Supplemental Petition.

[16] The Clean Water Act NPDES Permitting Determinations for Thermal Discharge and Cooling Water Intake from Mirant Kendall Station in Cambridge, MA ("Determinations Document" or "DD"), at p. 23, and the Summary Fact Sheet for the Draft Permit (June 8, 2004), EPA Doc. #202 on the 10/12/06 A. R. Index. The Determinations Document was 232 single space pages issued by the Region on June 8, 2004 together with the public comment draft of the NPDES Renewal Permit.

[17] Determinations Document, at pp. 21-22, EPA Doc. #202 on the 10/12/06 A. R. Index.

[18] Copies of the 1974, 1983 and 1988 NPDES permits were provided as Exhibits B3-1, B3-2 and B3-3 to the MK Comments of draft NPDES renewal permit.

[19] 1988 NPDES Permit, Part I.A.1.g at page 3 of 9, provided as B3-3 to the MK Comments.

[20] 1988 NPDES Permit, Part I.A.2. at p. 5 of 9, provided as B3-3 to the MK Comments.

[21] Id.

[22] Determinations Document, at p. 46, EPA Doc. #202 on the 10/12/06 A.R. Index (stating that the lower basin "has been designated as an impaired water body by the Commonwealth because it violates Water Quality Standards"); Massachusetts Year 2004

Integrated List of Waters, at p. 94 (April 2005), EPA Doc. #593 on the 10/12/06 A.R. Index.

[23] A copy of the 1988 Fact Sheet is provided as Exhibit 11 within the Appendix to this Supplemental Petition.

[24] U.S. EPA Region 1 Response to Comments (September 2006), cited hereinafter as "RTC," at p. C9. The RTC is EPA Doc. #672 on the 10/12/06 A.R. Index.

[25] See EPA Region 1's Charles River History, available at http://www.epa.gov/region1/charles/index.html, a copy of which is provided as Exhibit 12 within the Appendix to this Supplemental Petition. The site was last checked on December 2, 2006.

[26] See EPA Region 1's Clean Charles Initiative - 2006 Report Card, available at http://www.epa.gov/region1/charlesriver/2006.html, a copy of which is provided as Exhibit 13 within the Appendix to this Supplemental Petition. The site was last checked on December 2, 2006.

[27] Id.

[28] See letter from Paul Diodati, EPA Doc. #561 on the 10/12/06 A.R. Index; see Boston Globe article dated December 3, 2006, provided as Exhibit 14 within the Appendix to this Supplemental Petition.

[29] February 2001 Supplemental Application (February 14, 2001), EPA Doc. #279 on the 10/12/06 A.R. Index.

[30] Id.

[31] Summary Fact Sheet, at pp. 18-19 (June 8, 2004), EPA Doc. #202 on the 10/12/06 A.R. Index.

[32] RTC, Introduction to Section E, at pp. E1-E4.

[33] February 2001 Supplemental Application (February 14, 2001), EPA Doc. #279 on the 10/12/06 A.R. Index.

[34] See the agenda and a PowerPoint presentation provided by the Region for a meeting on September 13, 2002 of the Technical Advisory Committee for the Charles River Nutrient Modeling Project, a component of the Charles River basin Eutrophication TMDL project, EPA Doc. #451 on the 10/12/06 A.R. Index.

[35] Id.

[36] Id.

[37] Id.

[38] TMDL modeling framework, Task 4. A copy of the TMDL modeling framework is EPA Doc. #530 on the 10/12/06 A.R. Index.

[39] Memorandum from S. Chapra re: Potential Impacts of Kendall Diffuser (January 13, 2003), EPA Doc. #60 on the 10/12/06 A R. Index. The Region dismisses the pertinence of the Chapra memorandum and related discussions to the permit renewal process on the ground that Chapra's memorandum was addressed to Kathleen Baskin of CWRA rather than to the Region. RTC, Response to A12, at p. A5. The Region's posture ignores, however, that the Region had retained CRWA to manage the Nutrient TMDL and that the Region's staff person, Mr. Mark Voorhees, responsible for the Nutrient TMDL concurrently was the Region's principal staff person handling diffuser and eutrophication-related issues under the NPDES permit renewal process.

[40] See the PowerPoint of September 13, 2002. EPA Doc. #451 as listed on the 10/12/06 A.R. Index.

[41] See the e-mails and correspondence provided as Exhibits 15(a)-(i) within the Appendix to this Supplemental Petition, and comprising:

> (a) an email from Elizabeth Mason (an attorney at the Region at the time) dated March 10, 2003 and describing the planned TMDL schedule, including a planned TAC meeting on April 29, 2003;
>
> (b) a letter from John Reynolds (a project manager for Mirant Kendall at the time) dated March 24, 2003 and seeking back-ground confirmation on the TMDL model in anticipation of that TAC meeting;
>
> (c) an email from Mark Voorhees (the Region's project manager for the Nutrient TMDL) dated March 27, 2003 and indicating that the Region would provide much of the information sought by Mr. Reynolds;
>
> (d) an email string between Mr. Reynolds and Mr. Voorhees and others dated April 25, April 28 and May 1, 2003 concerning model calibration and postponing the April 29, 2003 TAC meeting to June 10, 2003. That meeting never occurred.
>
> (e) an email from Mark Voorhees (the Region's project manager for the Nutrient TMDL) dated September 9, 2004 and regarding the status of Charles River eutrophication model and explaining delays from recoding of the model;
>
> (f) an email from Mark Voorhees (the Region's project manager for the Nutrient TMDL) dated October 17, 2005 and announcing the distribution of the first interim TMDL report for the Charles River basin eutrophication TMDL project;

(g) an email from Mark Voorhees (the Region's project manager for the Nutrient TMDL) dated October 21, 2005 and expressing EPA's availability to discuss adaptation of the TMDL model for analysis of the diffuser;

(h) an email from Mark Voorhees (the Region's project manager for the Nutrient TMDL) dated October 28, 2005 and again expressing EPA's willingness to meet with Mirant Kendall to discuss the TMDL model for analysis of the diffuser;

(i) an email from Mark Voorhees (the Region's project manager for the Nutrient TMDL) dated July 22, 2004 and discussing delays in completion of the TMDL model due to the "complexities associated with the lower Basin."

[42] A copy of a report entitled "A Hydrodynamic and Water Quality Model for the Lower Charles River basin, Massachusetts - DRAFT (November 2005), hereinafter the "TMDL model", is provided as Exhibit 16 within the Appendix to this Supplemental Petition. A copy of the Total Maximum Daily Load for Eutrophication in the Lower Charles River basin, Massachusetts - DRAFT (November 2005), hereinafter the "Draft TMDL," is provided as Exhibit 17 within the Appendix to this Supplemental Petition.

[43] See the Voorhees e-mail included as Exhibit 15d).

[44] See the Memorandum re: Charles River Basin Eutrophication Modeling Needs from Mark Voorhees to David Webster (April 8, 2004), EPA Doc. #516 on the 10/12/06 A.R. Index.

[45] See Meeting Handouts re: Fisheries Management Report (October 1, 1985), EPA Doc. #183 on the 10/12/06 A.R. Index.

[46] See Exhibit 15(f); see Letter from S. Konary re: TMDL Modeling Comments (December 28, 2005), EPA Doc. #559 on the 10/12/06 A.R. Index.

[47] EPA Doc. #162 on the 10/12/06 A.R. Index.

[48] Letter from S. Konary re: TMDL Modeling Comments (December 28, 2005), EPA Doc. #559 on the 10/12/06 A.R. Index; see Email from T. Callaghan (January 5, 2006), EPA Doc. #585 on the 10/12/06 A.R. Index; Email from M. Voorhees (April 7, 2006), EPA Doc. #664 on the 10/12/06 A.R. Index; Email from F. Sellars (April 6, 2006), EPA Doc. #666 on the 10/12/06 A.R. Index.

[49] See Letter from S. Konary re: TMDL Modeling (July 12, 2006), EPA Doc. #590 on the 10/12/06 A.R. Index; see Letter from S. Konary re: Diffuser Modeling Comparison, EPA Doc. #676 on the 10/12/06 A.R. Index.

[50]RTC, Response to A12, at p. A5.

[51] Letter re: Summer 2002 Data and Potential Permit Conditions (October 23, 2002), EPA Doc. #246 on the 10/12/06 A.R. Index.

[52] Apart from the explicit linkage indicated by the meeting on April 8, 2004, see the memorandum from Mr. Voorhees dated April 29, 2004 explaining that he had invited one of the Nutrient TMDL contractors to serve as an expert for the Region regarding the NPDES renewal permit. EPA Doc. #517 on the 10/12/06 A.R. Index.

[53] A portion of Draft Environmental Impact Report is EPA Doc. #455 on the 10/12/06 A.R. Index.

[54] MassDEP's comment letter of June 23, 2000 on the FEIR is provided as Exhibit 18 within the Appendix to this Supplemental Petition. The Region's comment letters of June 23, 2000 on the FEIR is provided as Exhibit 19 within the Appendix to this Supplemental Petition.

[55] A copy of the Secretary's Certificate of June 30, 2000 on the Final Environmental Impact Report was provided as MK Comment Ex. E1-3.

[56] For example, see the PowerPoint presentation by the project sponsor at an inter-agency meeting attended by the Region on September 9, 1999. The attendance list for that meeting is EPA Doc. # 175 on the 10/12/06 A.R. Index, and a copy of the PowerPoint is provided as Exhibit 20 within the Appendix to this Supplemental Petition.

[57] CRWA comment letter of September 9, 2004, on draft NPDES renewal permit, at p. 1, EPA Doc. #643 on the 10/12/06 A.R. Index.

[58] A portion of Draft Environmental Impact Report is EPA Doc. #455 on the 10/12/06 A.R. Index.

[59] MassDEP issued both a waterways license and a 401 water quality certification for the installation of the barrier net and the diffuser outfall. See the MK Comment Exhibits cited in text.

[60] See the MassDEP, Region, and CWRA FEIR comment letters provided as Exhibits 18, 19, and 21 within the Appendix to this Supplemental Petition. MassDEP indicated that the proposed diffuser outfall "could greatly benefit aquatic life on the Charles basin." The Region commended the proponent's effort to use the project as a potential method to benefit the environment consistent with the Charles River 2005 initiative. CRWA commented that the project is potentially of high value to the Charles River, particularly due to the "innovative" approach to using the cooling water to disrupt the "century old salt wedge."

[61] Mirant Kendall's predecessor had filed a timely request to renew the 1988 NPDES permit. The February 2001 request reiterated and modified that earlier request.

[62] A copy of the February, 2001 request comprises EPA Doc. ##86, 217, 279, 280, 453, and 454 on the 10/12/06 A.R. Index..

[63] The NPDES permit modification request was not submitted until February 2001, even as the balance of the upgrade and repowering project moved along, in order to satisfy the Region's request for multiple years of river monitoring and sampling data. Also, the repowered plant can operate under the terms of the 1988 NPDES permit.

[64] See Thermal Load Data (September 30, 2002), EPA Doc. #404 on the 10/12/06 A.R. Index; Summer 2002 Aesthetic and Eutrophication Data (October 23, 2002), EPA Doc. #246 on the 10/12/06 A.R. Index; Intake Temperature (December 1, 2002), EPA Doc. #224 on the 10/12/06 A.R. Index; Intake Temperature (December 1, 2002), EPA Doc. #229 on the 10/12/06 A.R. Index; Heat Load Data (December 30, 2002), EPA Doc. #214 on the 10/12/06 A.R. Index; Gillnet Data (November 13, 2003), EPA Doc. #262 on the 10/12/06 A.R. Index; 2002-2004 Biological and Hydrological Sampling (January 1, 2004), EPA Doc. #550 on the 10/12/06 A.R. Index; 2004 Algal Data (January 1, 2005), EPA Doc. #596 on the 10/12/06 A.R. Index; 2005 Field Data (April 5, 2006), EPA Doc. #560 on the 10/12/06 A.R. Index.

[65] RTC, Response to Comment C3, at C5-C22; Response to Comment D3, at D4; Response to Comment D4, at D7-D9.

[66] See the Letter from MassDEP's Glenn Haas, EPA Doc. #163 on the 10/12/06 A.R. Index; EPA Comments Regarding Kendall Upgrade Project on 2/01 NPDES Application (July 9, 2001), EPA Doc. #166 on the 10/12/06 A.R. Index.

[67] The Supplemental Surface Water Modeling Report in Support of Kendall Station NPDES permitting, EPA Doc. #458 on the 10/12/06 A.R. Index.

[68] Letter re: Charles River Data (December 23, 2002), EPA Doc. #240 on the 10/12/06 A.R. Index; Letter re: River Volumes (November 6, 2001), EPA Doc. #265 on the 10/12/06 A.R. Index; Letter re: CZM Federal Consistency (July 9, 2001), EPA Doc. #274 on the 10/12/06 A.R. Index.

[69] See MassDEP's June 23, 2000 letter on the FEIR is provided as Exhibit 18 within the Appendix to this Supplemental Petition.

[70] RTC, Response to C6, at p. C31; Response to C16, at p. C59.

[71] See Letter from J.P. Reynolds re: NPDES Renewal Permit and 316(a) variance request (December 23, 2002), EPA Doc. #241 on the 10/12/06 A.R. Index. The basic concept was first proposed in a Letter from N. Cowden re: River Temperature Compliance Program (March 26, 2002), EPA Doc #259 on the 10/12/06 A.R. Index.

[72] RFI Response, EPA Doc. #472 on the 10/12/06 A.R. Index.

[73] MK Comments D5, D6.

[74] RTC at E1-E4.

[75] EPA Doc. #467 on the 10/12/06 A.R. Index.

[76] For facilities subject only to the impingement performance standard and not proposing to rely on § 125.94(a)(1) to achieve compliance, the Phase II Rule requires development of a CDS including only impingement data. 40 C.F.R. § 125.95(b).

[77] These responses are not listed on the 10/12/06 A.R. Index, but Mirant Kendall requests and anticipates the Region will include then with the Administrative Record it files in April, 2007.

[78] The 2006 effort was incomplete when the Region issued the NPDES renewal permit on September 26, 2006. Mirant Kendall has not completed the compilation of those results and has not yet submitted them to the Region.

[79] See Transmittal of 2005 Field Data (April 5, 2006), EPA Doc. #560 on the 10/12/06 A.R. Index; Transmittal of 2004 and 2005 Field Data (August 30, 2005) EPA Doc. #557 on the 10/12/06 A.R. Index.

[80] See RTC, Response to Comment C3, at C5-C22; Response to Comment D3, at D4; Response to Comment D4, at D7-D9.

[81] EPA Doc. #562 on the 10/14/06 A.R. Index.

[82] See the list of changes from the draft to the final permit, RTC Introduction, P. ii.

[83] The ZPH is defined at Attachment A, n.1 to the NPDES the renewal permit, and the Monitoring Stations used to define the ZPH are depicted on Attachment B to the permit.

[84] NPDES renewal permit, Part I.A.1. n.7, at pp. 4 of 35.

[85] NPDES renewal permit, Attachment D.

[86] NPDES renewal permit, Part I.A.15.b, at pp. 18 to 21 of 35 and Attachments A, B, E.

[87] Id.

[88] Id.

[89] NPDES renewal permit, Attachment A, n.2.

[90] NPDES renewal permit, Appendix A, n.6.

[91] MK Comment D2 (Overbroad Compliance Scheme).

[92] RTC, Response to Comment D2, at pp. D2-D3.

[93] RTC, Response to D2, at pp. D1-D4; Response to F5, at pp. F10-F13.

[94] As noted supra, Mirant Kendall has appealed that certification through state proceedings.

[95] EPA Doc. #472 on the 10/12/06 A.R. Index.

[96] MK Comments K2, K3.

[97] See the Region's comments on the FEIR, a copy of which is attached as Exhibit 19 within the appendix to this supplemental petition.

[98] EPA Doc. #172 on the 10/12/06 A.R. Index.

[99] MK Comments, Comment A10, at p. 6.

[100] RTC, Response to Comment A10, at p. A3.

[101] MK Comments D2, at 54; D6, at p. 58; and E5, at p. 75.

[102] RTC, Response to Comment D5, at p. D8; Response to Comment D6, at pp. D11-D12.

[103] See discussion of the Nutrient TMDL and Modeling of the Proposed Diffuser, supra.

[104] Id.

[105] Id.

[106] See EPA meeting notes, dated July 31, 2006, EPA Doc. #580 on the 10/12/06 A.R. Index.

[107] A copy of the February, 2001 request comprises EPA Doc. ## 86, 217, 279, 280, 453, and 454 on the 10/12/06 A.R. Index.

[108] See Charles River Monitoring Data, provided as Exhibit 22 within the Appendix to this Supplemental Petition.

[109] Transmittal of 2004 and 2005 Field Data (August 30, 2005), EPA Doc. #557 on the 10/12/06 A.R. Index..

[110] See Contour Map, provided as Exhibit 23 within the Appendix to this Supplemental Petition.

[111] See discussion of operational curtailments, supra.

[112] See Exhibit 22.

[113] The Region explained that "scientific literature and reference material at best identify a temperature tolerance range and a general time period when a species life stage is expected in a region. Without taking site-specific information into consideration to

establish representative acclimation temperatures and spawning timing, for example, the permit limits would be overly conservative." RTC, Response to Comment C15, at p. C57.

[114] The Region relied on its analysis in Response to Comment C3, which was also the analysis it relied upon for a finding of appreciable harm, as basis for its selection of an avoidance temperature. As discussed above, the Region cited to this analysis extensively to support rebut several of Mirant Kendall's comments with respect to appropriate thermal limits. See List of Citations to Responses in the RTC Document That Cite Response to Comment C3, provided as Exhibit 24 within the Appendix to this Supplemental Petition.

[115] See Summaries of Environmental Data and Relative Fish Abundance 2003-2005, provided as Exhibit 25 within the Appendix to this Supplemental Petition.

[116] 81° F is about 1 standard deviation above the mean intake temperature for 1998 - 2004, placing it in about the 70th percentile; see Comparison of the Number of Estimated Days Exceeding Final Permit Thermal Limits, provided as Exhibit 26 within the Appendix to this Supplemental Petition.

[117] See the draft TMDL, a copy of which is attached as Exhibit 17 within the Appendix to this supplemental petition.

[118] RTC, Response to Comment A12, at pp. A4.

[119] See Background section, supra.

[120] RTC, Response to Comment A12, at p. A4.

[121] Id.

[122] MassDEP WQC, at pp. 11 - 14, EPA Doc. #673 on the 10/12/06 A.R. Index; RTC, Response to Comment C23, at pp. C76 et seq.

[123] See Background section, supra.

[124] RTC, at pp. ii - iii.

[125] RTC, at pp. ii - iii; Response to Comment A4, at p. A1.

[126] MassDEP WQC, at p. 7, EPA Doc. #673 on the 10/12/06 A.R. Index.

[127] MassDEP WQC, at p. 11, 14, EPA Doc. #673 on the 10/12/06 A.R. Index.

[128] See Background section, supra.

[129] Id.

[130] See Exhibit 5.

[131] 16 U.S.C. § 1456(c)(3) (2006); see also 15 C.F.R. §§ 930.4(b), 930.64, 930.64 (2006).

[132] See Exhibit 8.

[133] See Exhibit 22.

[134] Id.

[135] Id.

[136] See Exhibit 13.

[137] Transmittal of 2004 and 2005 Field Data (August 30, 2005), EPA Doc. #557 on the 10/12/06 A.R. Index.

[138] The ranges here reflect two ways of accounting the September 1, 2005 results for the Old Locks Station because the water temperature reading on the boat was 80.9° F, but the reading from the thermistor located in the sampling area was 81.8° F.

[139] The data for bluebacks is even more clear that 81° F is not an avoidance temperature for that species. See 2003-2006 Biological Sampling Program Results, provided as Exhibit 27 within the Appendix to this Petition.

[140] See Exhibit 27.

[141] Webster's II New Riverside Dictionary 240 (Revised Ed. 1996).

[142] See generally, RTC, Response to Comment Section C.

[143] EPA Doc. # 337 on the 10/12/06 A.R. Index.

[144] Mirant Kendall also believes that the record is sufficient to show that the 1.3 linear mile stretch of the lower basin does not constitute nursery habitat either. The Thermal Guidance Manual defines nursery habitat as "having an abundance of food and cover." The record contains plenty of information to conclude that while limited portions of this 1.3 linear mile stretch may have limited food, it lacks benthic food and cover. The stretch does not provide "abundant" food and cover due to the lack of bottom vegetation, excessive bottom salinity, and low dissolved oxygen.

[145] All the Region does with respect to this issue is put forward the conclusory statement that MADMF has determined that it is spawning habitat.

[146] For example, reference to the 2005 thermistor data for the Boston monitoring station shows that temperatures at that station were below 81° F until June 12th.

[147] EPA Doc. ##489, 557 and 560 in the 10/12/06 A.R. Index.

[148] See Exhibit 27.

[149] The Region cannot side-step this requirement and downplay this significant history of no observed or recorded effects on the basis that Mirant Kendall's repowering has somehow rendered past discharge immaterial to the appreciable harm analysis. Such an argument is a red herring. The Region's appreciable harm analysis is focused on what temperature in the river causes avoidance effects, and not on the level of Kendall Station's discharge. For example, even though Kendall Station's discharge approached historic highs in the summer of 2005, there have been past summers like 2002 (at lower discharge levels) when the temperatures in the Charles River have generally been higher.

[150] The Region's suggestion that Mirant Kendall should have provided evidence of these other factors borders on the absurd given that the Region denied Mirant Kendall's invitations to discuss the 2004 and 2005 data, and given that the Region did not allow Mirant Kendall to provide public comments or further develop the record with respect to the Region's appreciable harm analysis. The Region cannot take steps -- whether intentional or not -- to prevent Mirant Kendall from developing the record on a particular topic, and then blame Mirant Kendall for failing to do so.

[151] Transmittal of 2004 and 2005 Field Data (August 5, 2005), EPA Doc. #557 on the 10/12/06 A.R. Index; Depth Distribution Information (November 5, 2002), EPA Doc. #244 on the 10/12/06 A.R. Index.

[152] Id.

[153] The Region repeatedly acknowledges this fact. See RTC, Response to Comments E11, E21, and E44.

[154] Transmittal of Additional Field Data (November 13, 2003), EPA Doc. #470 on the 10/12/06 A.R. Index.

[155] Transmittal of 2004 and 2005 Field Data (August 30, 2005), EPA Doc. #557 on the 10/12/06 A.R. Index.

[156] For example, September 22, 2004 represents the largest single day catch of juvenile alewives that year, with 48 being caught, which represents a third of the total amount caught all summer. All of the sampling stations were below 69° F that day, which means that distribution of juvenile alewives between these stations is due to factors other than temperature avoidance. All of the juvenile alewives were caught at the farthest stations upstream from the discharge. This can only lead to the conclusion that factors other than temperature explains this distribution. Aggregating the rest of the data from 2004 leads to a similar result with most of the juvenile alewives occupying the upstream areas.

[157] Transmittal of 2005 Field Data (April 5, 2006), EPA Doc. #560 on the 10/12/06 A.R. Index; Transmittal of 2004 and 2005 Field Data (August 30, 2005), EPA Doc. #557 on the 10/12/06 A.R. Index.

[158] See Exhibit ____ [summary chart].

[159] Supplemental Field Data for 2002 and 2003 (January 1, 2004), EPA Doc. #550 on the 10/12/06 A.R. Index.

[160] See Thermistor Data in Transmittal of 2005 Field Data (April 5, 2006), EPA Doc. #560 on the 10/12/06 A.R. Index; Transmittal of 2004 and 2005 Field Data (August 30, 2005), EPA Doc. #557 on the 10/12/06 A.R. Index.

[161] See Transmittal of Field Data (April 5, 2006), EPA Doc. #560 on the 10/12/06 A.R. Index (identifying the following days: July 30, August 2, August 4, August 20-21, August 24-28, August 30-September 1, and September 4, 2005).

[162] High temperatures for each day were: 83.7825 (7/30); 83.8135 (8/2); 84.7835 (8/4); 83.073 (8/20); 83.7825 (8/21); 83.9025 (8/24); 83.724 (8/25); 83.9025 (8/26); 83.5365 (8/27); 83.327 (8/28); 83.827 (8/30); 83.6035 (8/31); 83.925 (9/1); 83.3715 (9/4). See Transmittal of 2005 Field Data (April 5, 2006), EPA Doc. #560 on the 10/12/06 A.R. Index.

[163] August 2, 2005. See Transmittal of 2005 Field Data (April 5, 2006), EPA Doc. #560 on the 10/12/06 A.R. Index.

[164] July 30, August 2, August 20, August 25-27, August 31, September 4, 2005. See Transmittal of 2005 Field Data (April 5, 2006), EPA Doc. #560 on the 10/12/06 A.R. Index.

[165] The Region recognizes this thermodynamic principle, and stated that because "the lower basin adjacent to the Station has a greater volume of water and takes longer to cool also means that this same large volume of water takes longer to heat." Given this recognition of longer heating and cooling times, the Region cannot plausibly argue that a 24-hour averaging regime would allow too much variation of temperature in that 24-hour period.

[166] In fact, yellow perch are almost entirely absent from ZPH in general.

[167] The Region recognized this fact in other portions of its response to comments, including its analysis of appreciable harm that noted "species densities declined with proximity to the discharge and . . . [t]his information supports the hypothesis that MKS' thermal discharge negatively affects . . . usage of the upper water column." RTC, Response to Comment C3, at p. C15.

[168] The Region states "[b]ecause of the fact that alewives prefer to be in low-light when migrating, it is logical to assume that alewife movement into the locks is from a deeper location in the harbor, rather than from the surface." RTC, Response to Comment C35, at p. C108. The results from Mirant Kendall's biological sampling also support the conclusion that in-migrating alewives are generally absent from the upper-water column

during the daytime hours. Supplemental Field Data for 2002 and 2003 (January 1, 2004), EPA Doc. #550 on the 10/12/06 A.R. Index.

[169] See Nine-foot and Twelve-foot Museum and Dam Temperature (April - June, 2005), provided as Exhibit 28 within the Appendix to this Supplemental Petition.

[170] See Exhibit 28.

[171] The Region will likely argue that if there were no exceedances under a four-hour regime then Mirant Kendall cannot complain about having such a regime because they would be able to comply with it. This argument is contrary to the law, as the Region itself has recognized, that requires permit limits to not be any more stringent than necessary to protect the BIP. This means that it is immaterial that Kendall Station could comply with an overly stringent requirement because such requirements are not authorized anyway.

[172] See Alewives Caught at Stations Subsequent to Surface Water Temperature Exceedances, provided as Exhibit 29 within the appendix to this Supplemental Petition.

[173] See also, Exhibit 27.

[174] See 2005 Museum and Dam Nine-Foot and Twelve-foot Temperature Readings (April - October, 2005), provided Exhibit 30 within the Appendix to this Supplemental Petition.

[175] See 2005 Museum and Dam Fifteen-foot Temperature Readings, provided as Exhibit 31 within the Appendix to this Supplemental Petition.

[176] See summary Table of Scientific Literature, provided as Exhibit 32 within the appendix to this Supplemental Petition.

[177] See Exhibit 32.

[178] See Exhibit 25.

[179] For a compilation of these comments and other data in the record submitted by Mirant Kendall on this point, see Exhibit 25.

[180] Mirant Kendall also commented that flow rates in the lower basin of the Charles River are the primary factor on juvenile abundance. This is because spawning alewives are not able to travel very far upstream due to inadequate fish ladders at several man-made dams upstream of Kendall Station. This means that eggs and drifting larvae are more likely to be washed out of the system during instances of high flow. Mirant has provided substantial evidenc that these losses are dominant in determining annual reproductive success, as they correlate directly to juvenile abundance. See Exhibit 25. The Region is wrong in asserting that the effects of river flow conditions are "beyond reasonable regulatory control." RTC, Response to C24, at p C81. Early on, in its comments on the project EIR, the Region urged Mirant to seek opportunities to improve

upstream passage of spawning alewives (which would reduce advection losses and potentially expand by several fold the available spawning habitat). Yet, in the Permit, the Region characterizes the problem of advection only as a reason for more stringent thermal limits, rather than as a major problem that Mirant Kendall could be willing to help solve directly

[181] Mirant Kendall has continuous temperature readings since 2002 from a thermistor in a location that would be the future location of the two-foot compliance point for Monitoring Station 3. Using this data, it is relatively simple to develop an algorithm that allows a prediction -- with greater than 99% certainty -- of the temperature at this location by using the intake temperature from Kendall Station. See Correlations Between Intake and River Tempertures, provided as Exhibit 33 within the appendix to this Supplemental Petition.

[182] Although Mirant performed no in-river sampling of juvenile alewives in 2001, the returning year class from 2001 was extraordinarily strong, rivaled only by that of 1999. See Transmittal of 2004 and 2005 Field Data (August 5, 2003), EPA Doc. #557 on the 10/12/06 A.R. Index. Thus, again, the data indicate that the Region's springtime limits for mid- May to mid-June are irrational in their inconsistency with repeated documentations of superior year class strength following regular exceedences by margins of a few degrees. Strong year classes could not be produced year after year with these exceedences if the limits were valid, hence they are too low. These limits are irrational and should be remanded for appropriate reconsideration.

[183] See DD, at p. 68 (noting that "Kendall Station intake temperatures seemed to be a reasonable approximation of ambient river conditions.").

[184] See Exhibit 25.

[185] Victor Crecco & Thomas Savoy, Effects of Biotic and Abiotic Factors on Growth and Relative Survival of Young American Shad, Alosa sapidissima, in the Connecticut River, 42 Can. J. Fish, Aquat. Sci. 1640-1648 (1985); Victor Crecco & Thomas Savoy, Effects of Fluctuations in Hydrographic Conditions on Year Class Strength of American Shad (Alosa sapidissima) in the Connecticut River, 41 Can. J. Fish, Aquat. Sci. 1216-1223 (1984).

[186] See Exhibit 25.

[187] See e.g. Letter from N. Cowden re: Young of Year Blueback Thermal Tolerance, EPA Doc. #252 on the 10/12/06 A.R. Index.

[188] See Exhibit 32.

[189] DD, at pp. 113.

[190] See Exhibit 32.

[191] MK Comments, Comment C16, at pp. 27-28.

[192] E-mail from D. Keller re: MDFW Follow-upon 8/2/01 meeting (August 13, 2001), EPA Doc. #94 on the 10/12/06 A.R. Index; e-mail from D. Keller re: Yellow Perch - Status in Charles and Spawning (July 10, 2001), EPA Doc. #133 on the 10/12/06 A.R. Index.

[193] See Letter from J. P. Reynolds re: NPDES Permit and Variance Request (July 28, 2003), EPA Doc. #489 on the 10/12/06 A.R. Index; Transmittal of 2005 Field Data (April 15, 2006), EPA Doc. #560 on the 10/12/06 A.R. Index; Transmittal of 2004 and 2005 Field Data (August 30, 2005), EPA Doc. #557 on the 10/12/06 A.R. Index.

[194] See Letter from J. P. Reynolds re: NPDES Permit and Variance Request (July 28, 2003), EPA Doc. #489 on the 10/12/06 A.R. Index; Transmittal of 2005 Field Data (April 15, 2006), EPA Doc. #560 on the 10/12/06 A.R. Index; Transmittal of 2004 and 2005 Field Data (August 30, 2005), EPA Doc. #557 on the 10/12/06 A.R. Index.

[195] Transmittal of 2005 Field Data (April 15, 2006), EPA Doc. #560 on the 10/12/06 A.R. Index; Transmittal of 2004 and 2005 Field Data (August 30, 2005), EPA Doc. #557 on the 10/12/06 A.R. Index.

[196] Once again, Mirant Kendall expresses confusion over how the Region can reach this conclusion when in 2005, juvenile alewives were caught at the very areas of the river and the very temperatures the Region claims were exclusionary.

[197] See Letter from J. P. Reynolds re: NPDES Permit and Variance Request (July 28, 2003), EPA Doc. #489 on the 10/12/06 A.R. Index; Depth Distribution Information (November 5, 2002), EPA Doc. #244 on the 10/12/06 A.R. Index.

[198] The Region identified two other bases for the Delta T requirement. RTC, Response to Comment C26, at pp. C86-C87. Neither of those concerns, even if valid, support the imposition of that requirement. The Region claimed that zooplankton are negatively effected above 77 ° F, but this is an argument for absolute thermal limits (which the NPDES renewal permit has plenty of), and not a Delta T requirement. The Region also claims that surface temperatures of above 81° F cause problems for juvenile alewives. Once again, even if this were true, which it is not, such an argument goes to absolute temperature limits, not the Delta T requirement.

[199] RTC, Response to Comment D24, at p. D34.

[200] Mirant Delta T Proposal (January 9, 2003), EPA Doc. #449 on the 10/12/06 A.R. Index.

[201] The Region admits "EPA and MassDEP recognize that, at times, the ambient water temperature has exceeded the permit site-specific limit." See RTC, Response to Comment C42, at p. C118.

[202] RTC, Response to Comment C5, at p. C28.

[203] MK Comments, Comment C21, at p. C31.

[204] RTC, Response to Comment D4, at p.D7.

[205] RTC, Response to Comment C5, at p. C29.

[206] RTC, Response to Comment C5, at pp. C28-C29.

[207] Id.

[208] MK Comments, Comment D2, at pp 53-54.

[209] MK Comments, Comment D31, at pp. 69-70.

[210] RTC, Response to Comment D2, at pp.D2-D3.

[211] RTC, Response to Comment D2, at p. D3.

[212] DD, at pp. 84, 155 (stating that it "is EPA's objective to [ensure] fish are not prevented from entering the lower Charles River basin to spawn because [of] temperature.").

[213] EPA Doc. #160, included in the 10/12/06 A.R. Index.

[214] See NPDES renewal permit, Attachment B.

[215] The Region concurred with this conclusion numerous time throughout its Response to Comments; see RTC, Response to Comment D3, at p. D4; Response to Comment D24, at p. 34; Response to Comment C48, at C145.

[216] Depth Distribution Information (November 5, 2002), EPA Doc. #244 on the 10/12/06 A.R. Index..

[217] The Region cannot argue that the yellow perch were "excluded" from the upper water column during the daytime hours because water temperatures were too high. The data does not support such an argument. First, many daytime sampling events of the upper water column were conducted when temperatures were below the Region's protective limit for yellow perch (80.6 ° F). Second, many yellow perch were caught at night in temperatures that exceed these limits.

[218] See Salinity Delta Graphs and Perch Decline Graphs, provided as Exhibits 34 and 35, respectively, within the Appendix to this Supplemental Petition.

[219] Id.

[220] See Background section, supra.

[221] MK Comment C21, at pp. 31-32; RTC, Response to Comment C21, at pp. C69-C70.

[222] RTC, Response to Comment K2, at pp. K2-K3.

[223] EPA Doc. #467 on the 10/12/06 A.R. Index.

[224] RTC, Response to Comment E3, at p. E19.

[225] Id..

[226] RTC, Introduction to Section E, at p. E3, referring to the letter from N. Cowden that is EPA Doc. #309 in the 10/12/06 A.R. Index.

[227] EPA Comments Regarding Kendall Upgrade Projection on the 2/01 NPDES Application and Attachment A (July 9, 2001), EPA Doc. #166 on the 10/12/06 A.R. Index.

[228] Letter from N. Cowden re: Eutrophication Monitoring (December 20, 2001), EPA Doc. #309 on the 10/12/06 A.R. Index.

[229] RTC, Response to Comment E19, at pp. E40-E41 (conceding that "data appear to indicate that algal-related water quality problems occur in the lower Basin regardless of the facility's discharge"); TMDL report (December 3, 2006), EPA Doc. #530, on the 10/12/06 A.R. Index.

[230] RTC, Response to Comment E23, at E48.

[231] January 11, 2006 letter from Mark Voorhees re: Status of MKS Comments on Proposed Diffuser, EPA Doc. #615 on the 10/12/06 A.R. Index.

[232] Id.

[233] EPA Doc. #590 on the 10/12/06 A.R. Index.

[234] EPA Doc. #676 on the 10/12/06 A.R. Index.

[235] See EPA Doc. #669 on the 10/12/06 A.R. Index.

[236] RTC, Response to Comment E1, at pp. E5-E11.

[237] RTC Response to Comment E1, at p.E11.

[238] The area experiencing a 2-degree or more increase in temperature from the plume is derived as the sum of 400 meters 200 meters wide plus 1000 meters 400 meters wide, all 3 meters deep which equals 1.4 million cubic meters out of the 12 million cubic meter lower basin, or 12%.

[239] See Transmittal of 2005 Field Data (April 15, 2006), (Perch decline data), EPA Doc. #560 on the 10/12/06 A.R. Index; Transmittal of 2004 and 2005 Field Data (August 30, 2005) Figs. 8 and 10, EPA Doc. #557 on the 10/12/06 A.R. Index; Exhibits 34, 35.

[240] See Exhibits 34, 35.

[241] Spatial Distribution, Temporal Variability, and Chemistry of the Salt Wedge (January 1, 2000), EPA Doc. #150 on the 10/12/06 A.R. Index.

[242] Transmittal of 2005 Field Data (April 15, 2006), EPA Doc. #560 on the 10/12/06 A.R. Index; Transmittal of 2004 and 2005 Field Data (August 30, 2005), EPA Doc. #557 on the 10/12/06 A.R. Index.

[243] Id.

[244] Final Environmental Impact Report (May 1, 2002), EPA Doc. #456 on the 10/12/06 A.R. Index; Supplemental Application (February 14, 2001), EPA Doc. #279 on the 10/12/06 A.R. Index.

[245] Depth Distribution Information (November 5, 2002), EPA Doc. #244 in the 10/12/06 A.R. Index.

[246] Comparison of Air Bubbles and Submerged Thermal Diffusers (June 1, 2003), EPA Doc. #625 on the 10/12/06 A.R. Index.

[247] RTC, Response to Comment E16, at p. E33.

[248] Id.; Review of Oxygenation Techniques (January 1, 2004), EPA Doc. #511 on the 10/12/06 A.R. Index.

[249] Id.

[250] Id.

[251] Section 316(b), 33 U.S.C. § 1326(b), provides:

> Any standard established pursuant to section 301 or section 306 of this Act 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.

[252] All references to "the permit" or "the final permit" in this section allude to the NPDES renewal permit, unless otherwise indicated. References to the "draft permit" allude to the draft NPDES renewal permit.

[253] The Phase II specifies that facilities must reduce entrainment from a "calculation baseline." 40 C.F.R. § 125.94(b)(2). The definition of "calculation baseline" states that a

baseline CWIS uses a 3/8 inch mesh traveling screen. 40 C.F.R. § 125.93. Thus, "entrainable" organisms are those that would pass through a 3/8 inch mesh screen.

[254] See 69 Fed. Reg. 41614 (July 9, 2004) (noting that "averaging over longer time periods (i.e., a full five-year permit term) can substantially reduce the impact of natural variability on the determination of whether standards are met").

[255] The Region also suggests that, even if the costs of all of the final requirements were higher, it could not make the requirements less stringent due to state water quality requirements. See, e.g., RTC, Response to Comment H9, at p. H31; Response to Comment H10, at pp. H35-36. Based on the Agency's repeated statements that it based the impingement-related requirements on its BPJ regarding BTA under § 316(b), Mirant Kendall believes that these statements pertain only to the entrainment-related requirements of the permit. If, however, this is not the case, Region 1 offers no independent analysis of state water quality standards to justify such a conclusion. Thus, its claim is unavailing.

[256] Alewife gillnet totals from first date of capture through May, bluebacks from first date of capture through June 26.

[257] All data used in this chart are taken from the CD accompanying the Transmittal of 2005 Field Data (April 15, 2006), EPA Doc. #560 on the 10/12/06 A.R. Index.

[258] DD, at pp. 208-209, 214.

[259] In the Determination Document, the Region also expressed concern about the "concentration of impingement in the months of May, June, July and August." DD, at p. 214. It did not explain why this is a concern given that a greater impingement rate during periods of peak organism density, which typically occurs in the late spring and summer months, is entirely predictable and consistent with past observations.

[260] Exhibit 4, at pp. 9, 19-20.

[261] See, e.g., Alden Research Lab, Fish Protection Technologies: A Status Report, *Environmental Science & Policy:* 3 (Supplement 1) S349-S359, EPA Doc. #234 on the 10/12/06 A.R. Index).

[262] MK Comments, Comment H31, at pp. 116-117.

[263] As Mirant Kendall noted in its comments, the permit provisions giving the agencies unlimited authority to require adjustments during the permit term, leaves Mirant Kendall without any opportunity for notice and comment, which violates the Administrative Procedures Act. MK Comments, Comment H39, at p. 121.

[264] Mirant Kendall is not suggesting that a BPJ determination must include exactly the same level of detail as will be required for a final determination of Phase II compliance. This would be unreasonable, given that all of the necessary information may not have been submitted yet. The Rule does indicate, however, that basic technological and methodological choices must be made before the Region can determine that a given technology change represents the "best" "available."

[265] This deadline is based on § 124.95(a)(2)(ii) of the Phase II Rule.

[266] Mirant Kendall said in its comments that achieving a through-screen design velocity of less than 0.5 fps, using restoration, and/or developing site-specific alternative standards were all options it wished to explore. MK Comments, Comment H2, at pp. 94-96; Comment H26, at pp. 112-113. The company also explained that the proposed requirements went far beyond those options and would effectively foreclose their consideration when the Phase II Rule was applied. MK Comments, Comment H8, at pp. 100-101. The Region concedes that this is true, but says that, because the Phase II Rule gives it BPJ authority and because it already has spent considerable time developing its preferred CWIS requirements, the balance tips in favor of moving forward. RTC, Response to Comment H.8, at pp. H29-30. This is no answer at all. Nothing in the statute or the Phase II Rule gives EPA a blank check to proceed with whatever requirements the permit writer prefers, once it knows what the law is. Such an interpretation of the "BPJ" provisions would undercut the purposes of establishing national technology-based effluent guidelines (i.e., providing consistency and uniformity) in any case where further information is required prior to guideline application and permits must be renewed in the interim.

[267] Mirant Kendall has learned that another facility recently has proposed to accomplish this by using an air bubbler system to break up ice before it forms. Although we are awaiting further details, this is an option Mirant Kendall certainly would have explored if given the opportunity.

[268] See Exhibit 35.

[269] At the same time, RTC admits that neither the Region nor MassDEP are able to determine, based on the record, that any location is clearly superior to another for purposes of minimizing adverse environmental impacts.

[270] The RTC includes some suggestions that EPA embraces and approves of these provisions. See, e.g., RTC, Response to Comment H1, at pp. H17-18. It states repeatedly, however, that the basis for their application is the Water Quality Certification. Should EPA in the course of this proceeding attempt to show that it has an independent basis for imposing these requirements, Mirant Kendall reserves the right to amend this petition to address the many legal, factual, and policy issues raised by those provisions.

[271] Exhibit 4.

[272] See MassDEP's comment letter of June 23, 2000 on the FEIR, provided at Exhibit 18.

[273] For a description of these algorithms and their predictive ability, see Exhibit 33.

[274] See e-mails re: Data Requests and Responses (January 13-15, 2003), EPA Doc. ##57-59 on the 10/12/06 A.R. Index.

[275] In addition, Mirant Kendall commented that it would voluntarily continue temperature monitoring using thermistors placed in key areas in the lower basin and periodic vertical profiling, which would provide additional assurances (even assuming such additional

assurances were reasonably necessary) with respect to temperatures in the ZPH. MK Comments, Comment I26, at p. 135.

[276] Mirant Kendall also commented that it would be open to considering a real-time in-stream monitoring regime of similar scope to the one in the NPDES renewal permit if the Region were to allow the diffuser. See MK Comments, Comment I12, at p. 128. But without the diffuser -- which would modify Kendall Station's thermal plume -- such an overly intense degree of monitoring is unnecessary given how, as described above, the impact of Kendall Station's current discharge can be accurately predicted with adequate certainty based on algorithms developed from historic temperature data.

[277] MK Comments, Comment I1, at p. 122; Comment I10, at pp. 126-127.

[278] RTC, Response to Comment I1, at p.I2.

[279] MK Comments, Comment I2, at p. 122.

[280] RTC, Response to Comment I10, at p. I11.

[281] RTC, Response to Comment I25, at pp. I21-I23.

[282] MK Comments, Comment I25.1, at pp. 133-134..

[283] MK Comments, Comment I25.1, at p. 133.

[284] RTC, Response to Comment I1, at pp. I1-I2.

[285] MK Comment J2, at pp. 139-140.

[286] RTC, Response to Comment J2, at p. J2.

[287] RTC, Response to Comment J2, at p. J2.

[288] February 2001 Supplemental Application (February 14, 2001) EPA Doc. #279 on the 10/12/06 A.R. Index.

[289] February 2001, Supplemental Application, February 14, 2001), EPA Doc. #279 on the 10/12/06 A.R. Index.

[290] February 2001, Supplemental Application, February 14, 2001), EPA Doc. #279 on the 10/12/06 A.R. Index.

[291] Transmittal of 2005 Field Data (April 15, 2006), EPA Doc. #560 on the 10/12/06 A.R. Index.

[292] MK Comment J11.

[293] RTC Comment J11, p. J6.

[294] Id. and see Part I.A.2.c of the NPDES renewal permit.

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