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EXHIBIT G

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
NEW ENGLAND REGION
ONE CONGRESS STREET
BOSTON, MASSACHUSETTS 02114-2023

FACT SHEET

DRAFT NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) PERMIT TO DISCHARGE TO WATERS OF THE UNITED STATES

PUBLIC NOTICE START DATE:

NPDES PERMIT NO.: NH0100790

NAME AND ADDRESS OF APPLICANT:

City of Keene
City Hall
580 Main Street
Keene, New Hampshire 03431

NAME AND ADDRESS OF FACILITY WHERE DISCHARGE OCCURS:

Keene Wastewater Treatment Plant
420 Airport Road
Swanzey, New Hampshire

RECEIVING WATER: Ashuelot River (Hydrologic Unit Code: 01158000)

CLASSIFICATION: B

I. Proposed Action, Type of Facility and Discharge Location.

The applicant has applied to the U.S. Environmental Protection Agency (EPA) for reissue of its NPDES permit to discharge treated effluent into the designated receiving water (Ashuelot River). The Ashuelot River is used for fishing, swimming, boating and other primary contact recreation. The effluent from the facility does not discharge directly to a designated beach area. The Keene Wastewater Treatment Plant (WWTP) collects and treats domestic, commercial and industrial wastewater from the City of Keene. The facility does accept septage and holding tank waste.

The existing permit was issued on April 15, 1994, and expired on April 15, 1999. The expired

permit (hereafter referred to as the "existing permit") has been administratively extended as the applicant filed a complete application for permit reissuance as per 40 Code of Federal Regulations (CFR) §122.6. The existing permit authorizes discharge from Outfall 001 (Treatment Plant).

The Keene Wastewater Treatment Plant is designed as a 6.0 million gallon per day (MGD) wastewater treatment facility using activated sludge aeration as the plant's treatment process. The influent, after being aerated by injecting liquid oxygen at the main pumping station and passing through an aerated grit chamber, is split between two primary clarifier tanks. Settled sludge is pumped to two aerated holding tanks, while the wastewater stream continues to two aeration basins. After leaving the two aeration basins the wastewater enters two secondary clarifiers for further settling. Sludge deposited in these clarifiers is pumped to the sludge holding tanks. The effluent from the two secondary clarifiers is combined before entering the ultraviolet light disinfection chamber. After disinfection by ultraviolet light the effluent is discharged into the Ashuelot River. Sludge removal is accomplished by first thickening and then dewatering the sludge by a belt filter press. Sludge is then hauled offsite by commercial firms which processes the sludge into compost. A map showing the location of the treatment plant shown in Attachment C.

II. Description of Discharge

A quantitative description of the treatment plant's discharge in terms of recent effluent-monitoring data from January 2004 through July 2005 is shown in Tables One and Two. The data was compiled from Discharge Monitoring Reports (DMR) submitted to the New Hampshire Department of Environmental Services, Water Division (NHDES-WD) and EPA. The draft permit contains limitations for Carbonaceous Biochemical Oxygen Demand ($CBOD_5$), Total Suspended Solids (TSS), pH, Total Zinc, Total Copper, Total Lead, Total Phosphorous, *Escherichia coli* (*E. coli*), Dissolved Oxygen (DO), Ammonia as Nitrogen (NH_3-N), and Whole Effluent Toxicity (WET).

III. Limitations and Conditions

Effluent limitations, monitoring requirements, and any implementation schedule (if required) are found in PART I of the draft NPDES permit. The basis for each limit and condition is discussed in sections IV.D. through IV.H. of this Fact Sheet.

IV. Permit Basis and Explanation of Effluent Limitations Derivation

A. General Regulatory Background

The Clean Water (CWA) prohibits the discharge of pollutants to waters of the United States without a National Pollutant Discharge Elimination System (NPDES) permit unless such a

discharge is otherwise authorized by the CWA. The NPDES permit is the mechanism used to implement technology and water quality based effluent limitations and other requirements including monitoring and reporting. The draft NPDES permit was developed in accordance with various statutory and regulatory requirements established pursuant to the CWA and any applicable State administrative rules. The regulations governing EPA's NPDES permit program are generally found in 40 CFR Parts 122, 124, 125 and 136.

EPA is required to consider technology and water quality-based requirements as well as those requirements and limitations included in the existing permit when developing the revised permit's effluent limits. Technology-based treatment requirements represent the minimum level of control that must be imposed under Sections 301(b) and 402 of the CWA. Secondary treatment technology guidelines, i.e. effluent limitations, for POTWs can be found at 40 CFR §133.

All statutory deadlines for meeting various treatment technology based effluent limitations established pursuant to the CWA have expired. When technology based effluent limits are included in a permit, compliance with those limitations is from the date the issued permit becomes effective. See 40 CFR §125.3(a)(1). Compliance schedules and deadlines not in accordance with the statutory provisions of the CWA cannot be authorized by an NPDES permit.

EPA regulations require NPDES permits to contain effluent limits more stringent than technology based limits where more stringent limits are necessary to maintain or achieve state or federal water quality standards. See Section 301(b)(1)(C) of the CWA. A water quality standard consists of three elements: (1) beneficial designated use or uses for a water body or a segment of a water body; (2) a numeric or narrative water quality criteria sufficient to protect the assigned designated use(s); and (3) antidegradation requirement to ensure that once a use is attained it will not be eroded.

Receiving stream requirements are established according to numerical and narrative standards adopted under state law for each stream classification. When using chemical specific numeric criteria from the state's water quality standards to develop permit limits both the acute and chronic aquatic life criteria are used and expressed in terms of maximum allowable in stream pollutant concentration. Acute aquatic life criteria are considered applicable to daily time periods (maximum daily limit) and chronic aquatic life criteria are considered applicable to monthly time periods (average monthly limit). Chemical specific limits are allowed under 40 CFR §122.44(d)(1) and are implemented under 40 CFR §122.45(d).

B. Development of Water Quality-based Limits

The permit must limit any pollutant or pollutant parameter (conventional, non-conventional, toxic and whole effluent toxicity) that is or may be discharged at a level that causes or has "reasonable potential" to cause or contribute to an excursion above any water quality criterion. An excursion

occurs if the projected or actual in stream concentration exceeds the applicable criterion.

Reasonable Potential

In determining reasonable potential, EPA considers: (1) existing controls on point and non-point sources of pollution; (2) pollutant concentration and variability in the effluent and receiving water as determined from permit application, monthly discharge monitoring reports (DMRs), and State and Federal water quality reports; (3) sensitivity of the species to toxicity testing; (4) statistical approach outlined in *Technical Support Document for Water Quality-based Toxics Controls,* March 1991, EPA/505/2-90-001 in Section 3; and, where appropriate, (5) dilution of the effluent in the receiving water. In accordance with New Hampshire statutes and administrative rules [RSA 485-A:8,VI, Env-Ws 1705.02], available dilution for rivers and streams is based on a known or estimated value of the lowest average annual flow which occurs for seven (7) consecutive days with a recurrence interval of once in ten (10) years (7Q10) for aquatic life and human health criteria for non-carcinogens, or the long-term harmonic mean flow for human health (carcinogens only) in the receiving water at the point just upstream of the outfall. Furthermore, 10 percent (%) of the receiving water's assimilative capacity is held in reserve for future needs in accordance with New Hampshire's Surface Water Quality Regulations Env-Ws 1705.01.

Anti-Backsliding

The permit may not be renewed, reissued or modified with less stringent limitations or conditions than those conditions in the previous permit unless in compliance with the anti-backsliding requirement of the CWA See Sections 402(o) and 303(d)(4) of the CWA and 40 CFR §122.44(l)(1) and (2). Section 402(o) of the CWA sets forth the general rule prohibiting backsliding from effluent limitations contained in previously issued permits that were based on § § 402(a)(1)(B), 301(b)(1)(C), 303(d) or 303(e) unless certain conditions are met. 40 CFR §122.44(l) applies to non-water quality -based effluent limitations, such as permit limits based on effluent limitation guidelines, BJP and new source performance standards. Therefore, unless statutory and, if applicable, regulatory backsliding requirements are met, the limits in the reissued permit must be at least as stringent as those in the previous permit.

State Certification

The CWA requires that EPA obtain State Certification which asserts that all water quality standards will be satisfied. The permit must conform to the conditions established pursuant to a State Certification under Section 401 of the CWA (40 CFR §124.53 and §124.55). EPA regulations pertaining to permit limits based upon water quality standards and state requirements are contained in 40 CFR §122.44(d).

The conditions of the permit reflect the goal of the CWA and EPA to achieve and then to

maintain water quality standards. In order to protect the existing quality of the State's receiving waters, the NHDES-WD adopted anti-degradation requirements in their December 10, 1999, Surface Water Quality Regulations (Env-Ws 1708). Hereinafter, New Hampshire's Surface Water Quality Regulations are referred to as the NH Standards.

C. Development of Water Quality-based Effluent Limitations for Impaired Waters

The state of New Hampshire 2004 303(d) list of impaired waters identifies surface waters which do not currently meet state water quality standards (NHDES 2004). Segments of the Ashuelot River have been identified as violating water quality standards for percent Dissolved Oxygen (DO) saturation, aluminum, pH, and *Escherichia coli.* States are required to prepare Total Maximum Daily Loading (TMDL) analyses for receiving waters listed on the 303(d) list. A TMDL is a scientific analysis which identifies the amount of a pollutant from point, nonpoint and background sources that may be discharged to a water quality-limited receiving water. Any pollutant loading above the TMDL will result in violation of the applicable water quality standards. The State of New Hampshire has performed sampling necessary to perform a TMDL on the segment of the Ashuelot River from the Keene wastewater treatment plant to the West Swanzey wastewater treatment plant, but does not anticipate completing the TMDL until 2009.

In the absence of a TMDL, EPA is required to use available information to establish water quality limits when issuing NPDES permits to impaired waters (40 CFR §122.44). EPA has used the data collected by NHDES for the TMDL, and has established water quality based limits for total phosphorous using this data, the applicable narrative state water quality standards, and federal water quality criteria guidance.

The limits proposed in the draft permit have been developed taking into account that a TMDL will be prepared for the Asheulot River. The EPA believes that the proposed limits represent the minimum levels of control necessary to achieve water quality standards.

While the NPDES Permit will be issued for the normal five year term, it can be reopened and modified due to new information or development of new criteria in accordance with 40 CFR §122.62(a)(2). Accordingly, a reopener condition is being placed in the permit specifying that the permit may be modified based on the results of the TMDL, or by additional water quality studies conducted on the Ashuelot River by the EPA or NHDES-WD.

D. Flow

The design flow rate of 6.0 MGD is used to calculate the mass and concentration limits for Five-Day Carbonaceous Biochemical Oxygen Demand and Total Suspended Solids, as discussed below.

Influent and effluent flow must be continuously monitored. If the effluent discharged for a period

of three consecutive months exceeds 80 percent of the 6.0 MGD design flow (4.8 MGD) the permittee must notify EPA and NHDES-WD, and implement a program for maintaining satisfactory treatment levels. See Part I.A.6 of the proposed draft permit.

E. Conventional Pollutants

Under Section 301(b)(1)(B) of the CWA, POTWs must have achieved effluent limitations based upon **secondary treatment** by July 1, 1977. The secondary treatment requirements are set forth at 40 CFR Part 133. Effluent limitations for monthly and weekly average Carbonaceous Biochemical Oxygen Demand ($CBOD_5$), and Total Suspended Solids (TSS) are based on requirements under Section 301(b)(1)(B) of the CWA and 40 CFR 133.102. The limits for *Fecal coliform* bacteria as well as the range in pH are based upon State Certification requirements for Publicly Owned Treatment Works (POTW) under Section 401(d) of the CWA, 40 CFR 124.53 and 124.55, and water quality considerations.

Five-day Carbonaceous Biochemical Oxygen Demand ($CBOD_5$) and Total Suspended Solids (TSS)

During the review period, January 2004 through July 2005, there were no permit violations for $CBOD_5$ and TSS. Based on DMR data submitted during the review period, the average values for $CBOD_5$ monthly average, weekly average and maximum daily were 3.64 mg/l (range 2.12 mg/l - 4.9 mg/l; n = 19), 4.75 mg/l (range 2.5 mg/l - 8.4 mg/l; n = 19) and 6.03 mg/l (range 2.9 mg/l - 13.1 mg/l; n = 19), respectively. These values are well below the respective permit limits 25 mg/l, 40 mg/l and 45 mg/l. Additionally, the percent removal $CBOD_5$ averaged 93%, which is well above the requirement of 85% removal.

The TSS average values during the review period for the monthly average, weekly average and maximum daily were 5.89 mg/l (range 3.04 mg/l - 7.96 mg/l; n = 19), 9.88 mg/l (range 3.9 mg/l - 25.1 mg/l; n = 19), and 11.1 mg/l (range 5.0 mg/l - 26 mg/l; n = 19), respectively. These values are well below the respective permit limits 30 mg/l, 45 mg/l and 50 mg/l. Additionally, the percent removal TSS averaged 93 %, which is well above the requirement of 85% removal.

$CBOD_5$ and TSS Mass Loading Calculations:
The draft permit also contains average monthly, average weekly and maximum daily mass-based limits (lbs/day) for $CBOD_5$ and TSS. Mass-based limits are incorporated into the permit based on 40 CFR §122.45(f).

Calculations of maximum allowable mass-based loads for average monthly $CBOD_5$ and TSS are based on the following equation:

$L = C \times DF \times 8.34$ where:

L = Maximum allowable load in lbs/day.
C = Maximum allowable effluent concentration for reporting period in mg/l.
DF = Design flow of facility in MGD; 6.0 MGD.
8.34 = Factor to convert effluent concentration in mg/l and design flow in MGD to lbs/day.

CBOD$_5$ Average Monthly and Average Weekly Limits

[25] (Concentration limit) X 6.0 (design flow) X 8.345 (Conversion Factor) = 1,251.75; rounded to 1,252 lbs/day*

[40] (Concentration limit) X 6.0 (design flow) X 8.345 (Conversion Factor)= 2,002.8; rounded to 2003 lbs/day**

[45] (Concentration limit) X 6.0 (design flow) X 8.345 (Conversion Factor)= 2,253.15; rounded to 2,253 lbs/day

TSS Average Monthly and Average Weekly Limits

[30] (Concentration limit) X 6.0 (design flow) X 8.345 (Conversion Factor)= 1,502.1; rounded to 1,502 lbs/day

[45] (Concentration limit) X 6.0 (design flow) X 8.345 (Conversion Factor) = 2,253.15; rounded to 2,253 lbs/day

[50] (Concentration limit) X 6.0 (design flow) X 8.345 (Conversion Factor)=2,503.5; rounded to 2,504 lbs/day***

*The existing permit Average Monthly CBOD$_5$ limit is 1,251 lbs/day. Due to a minor rounding error in the existing permit, this draft limit is proposed to be changed to 1.3 ug/l.

**The existing permit Average Weekly CBOD$_5$ limit is 2002 lbs/day. Due to a minor rounding error in the existing permit, the draft limit is proposed to be changed to 2,003 lbs/day.

***The existing permit Maximum Daily CBOD$_5$ limit is 2,506 lbs/day. Due to a minor rounding error in the existing permit, the draft limit is proposed to be changed to 2,504 lbs/day.

Eighty-Five Percent CBOD$_5$ and TSS Removal Requirement

The provisions of 40 CFR § 133.102(3) requires that the 30 day average percent removal for CBOD$_5$ and TSS be not less than 85%. These limits are maintained in the draft permit.

pH

The pH limit range of 6.5 to 8.0 Standard Units (S.U.) in the draft permit is based upon applying New Hampshire Code of Administrative Rules Part Env-Ws 1703.18(b) at the point of discharge with no allowance for dilution. These limitations are based on State Certification requirements under section 401(d) of the CWA, 40 CFR §§124.53 and 124.55.

Examining Discharge Monitoring Reports (DMRs) from January 2004 to July 2005 (review period), the pH values ranged between 6.5 su to 7.3 su (n= 19). Based on this data, no violations of the existing limits occurred during the review period.

Escherichia coli

The basis for this limitation is found in New Hampshire's State statutes (N.H. RSA 485-A:8) and ENV-WS 1703.06, which requires bacteria criteria to be applied at the end of the wastewater treatment facility's discharge pipe. The average monthly limit, 126 colonies/100 ml, and maximum daily limit, 406 colonies/ml, are for Class B waters not designated as beach area. The calculation for compliance with the average monthly limit for *Escherichia coli* shall be determined by using the geometric mean.

During the review period, the average monthly limit ranged between 2 col/100 ml and 75 col/100 ml (n=19). Thus, no violations occurred. The maximum daily limit, during this period, ranged between 8 col/ 100 ml and 8,900 col/100 ml. The maximum daily limit was exceeded on two occasions; March and April 2005 with values of 8,900 col/100 ml and 670 col/100 ml, respectively.

Dissolved Oxygen (DO)

The State of New Hampshire water quality regulation, Env-WS 1703.07, establishes minimum DO levels for Class B waters, the class to which the Keene POTW discharges. The State's Class B waters shall have an instantaneous minimum DO concentration of at least 5.0 mg/l. The minimum DO limit for the Keene treatment plant is set at 7.0 mg/l. This DO limit was determined by the NHDES in the late 1980's through an effort which sampled the River and modeled the effects of Keene's effluent discharge on the River's water quality. The 7.0 mg/l minimum DO limit is to ensure that the facility's effluent is treated to a sufficient level so any chemical activity in the effluent does not further remove oxygen from the River.

D. Non-Conventional and Toxic Pollutants

Water quality-based limits for specific toxic pollutants such as ammonia, metals, etc. are determined from numeric chemical specific criteria derived from extensive scientific studies. The EPA has summarized and published specific toxic pollutants and their associated toxicity criteria in *Quality Criteria for Water*, 1986, EPA 440/5-86-001 as amended, commonly known as the federal "Gold Book". Each criteria consists of two values; an acute aquatic-life criteria to protect

against short-term effects, such as death, and a chronic aquatic-life criteria to protect against long-term effects, such as poor reproduction or impaired growth. New Hampshire adopted these "Gold Book" criteria, with certain exceptions and included them as part of the State's Surface Water Quality Regulations adopted on December 10, 1999. EPA uses these pollutant specific criteria along with available dilution in the receiving water to determine a specific pollutant's draft permit limit. Available dilution is discussed in the next subheading.

Available Dilution

The available dilution (also referred to as the dilution factor) in the receiving water was determined to be 2.08. The available dilution was calculated by the NHDES-WD and is based on a plant's design flow of 6.0 million gallons/day (MGD) or 9.3 cubic feet/second (cfs), a calculated 7Q10 low flow in the Ashuelot River nearest to the treatment plant's outfall of 12.19 cfs, and a State of New Hampshire prescribed minimum 10% reserve. The State has reserved 10 percent of the Assimilative Capacity of the receiving water for future uses pursuant to RSA 485-A:13,I.(a) and Env-Ws 1705.01.

Given:

7Q10 = 12.19 cfs
Plant Design Flow =.9.3 cfs
Dilution Factor = 0.9 X (7Q10 + Plant Design Flow)/ Plant Design Flow

Dilution Factor = 0.9 X (12.19 cfs + 9.3 cfs)/9.3cfs
Dilution Factor = 2.08

The existing permit's 7Q10 flow is 6.4 cfs. However, it is NHDES policy to update the 7Q10 flows of impaired surface waters for which a TMDL is being developed (personal communication, Dudley 2006). Additionally, the existing permit's 7Q10 flow was based on an analysis conducted in 1989. Since 1989, additional flow data had been recorded, and the West Swanzey gage station was installed (1994) which provided another new source of flow data.

For the purpose of establishing the Asheulot River TMDL, NHDES conducted an investigation of the river's 7Q10 in the vicinity of the WWTF's outfall incorporating new data (Dudley 2004). The revised 7Q10 flow, 12.19 cfs, represents an increase from the existing 7Q10 flow (6.3 cfs) As a result of the increase in 7Q10 flow, the available dilution applied to Keene's draft permit has also increased from a dilution factor of 1.7 used in the existing permit to 2.08.

Ammonia

The existing permit contains summer and winter ammonia limits. The summer monthly average limit is 2.1 mg/l and the maximum daily limit 3.1 mg/l. The winter monthly average limit is 12 mg/l and the maximum daily limit 18 mg/l. These effluent limits were included to prevent ammonia toxicity in the Ashuelot River.

Review of DMR data from January 2004 through July 2005 revealed that the average monthly values for both summer and winter were well below the existing limits (see above) with ranges between 0.3 mg/l-1.3 mg/l and 0.54 mg/l and 3.97 mg/l, respectively. Maximum daily values for winter ranged between 1.21 mg/l - 12.1 mg/l, which are well below the maximum daily limit (18 mg/l). Summer maximum daily values ranged between 0.51 and 3.0 mg/l. These values are below the maximum daily summer limit (3.1 mg/l).

Since Keene's existing NPDES permit became effective, the New Hampshire water quality standards for ammonia were revised. If the revised water quality criteria for ammonia were applied to the draft permit, the resulting draft ammonia limits would be higher than the existing permit limits. For example, during the summer months, the ambient chronic criteria for ammonia is 3.62 mg/l based on a pH of 6.5 standard units (su), the presence of early life stages, and a temperature 24 degrees Celsius. The resulting permit limit would be 7.53 mg/l; as derived by multiplying the ammonia criteria (3.62 mg/l) by the dilution factor (2.08). This limit is nearly two and one-half times the existing limit. The revised water quality criteria were not used in the development of draft permit because the Ashuelot River is currently impaired by low dissolved oxygen for which a TMDL is being developed, and elevating the levels of ammonia could contribute to the additional depletion of instream oxygen levels through the nitrification of ammonia to nitrate. For example, the oxygen required to oxidize ammonia is approximately 4.3 mg oxygen/mg ammonium-nitrogen (Metcalf & Eddy, 1991).

Proposed Ammonia Limits

The existing ammonia limits are proposed to be retained in the draft permit to ensure that ammonia does not contribute to the further depletion of dissolved oxygen levels in the Ashuelot River. This approach is consistent with statutory provisions contained CWA Section 402(o)(3), which prohibit the relaxation of effluent limitations if a revised effluent limit would result in a violation of applicable water quality guidelines or water quality standards, including antidegradation requirements. It should in addition be noted that a relaxation of the ammonia limit based on a revision to the New Hampshire standards would not fall within any exception to anti-backsliding requirements. See CWA Sections 402(o)(2)(B)(i) (stating a revision of standards does not constitute newly available "information" that might otherwise justify a less stringent limit).

Additionally, EPA has recently noticed its intention to re-evaluate the current aquatic life ambient water quality criteria for ammonia to determine whether it should be revised based on new toxicity data for aquatic organisms (USEPA 2004). If future ammonia criteria demonstrate that more stringent ammonia limits are needed to meet water quality standards, this permit may be re-opened and modified.

Metals:
Certain metals in water can be toxic to aquatic life. There is a need to limit toxic metal

concentrations where the discharge has the reasonable potential to cause or contribute to an exceedance of water quality standards. The current permit includes acute and chronic effluent concentration limits for zinc, copper and lead. These limits have been retained in the draft permit. However, the limitations have been recalculated because a new 7Q10 value was used, subsequently resulting in a new dilution factor. Refer to Attachment A for the calculations of the effluent concentrations limits for zinc, copper and lead contained in the draft permit.

Aluminum: Aluminum monitoring has been proposed in the draft permit to report on a once per week basis. These monitoring requirements are proposed given that polyaluminum chloride is currently used for copper removal. Data collected from the monitoring will be used to determine whether there is a reasonable potential for aluminum to cause or contribute to a water quality exceedence of criteria. The Federal Register, December 10, 1998, National Recommended Water Quality Criteria for aluminum are 87 ug/l (CCC) and 750 ug/l (CMC).

Also, it is recognized that some form of alum may be used to remove phosphorous. Thus, the draft permit proposes that aluminum sampling be conducted simultaneously with phosphorous sampling, if, and when, it is used for phosphorous removal.

Copper: Existing Monthly average and maximum daily copper limits are 6.2 mg/l and 8.2 mg/l, respectively. Review of monthly Discharge Monitoring Reports (DMR) from January 2004 to July 2005 (review period) indicate that average maximum daily and monthly average values for copper were 21.3 ug/l (range 6.3 ug/l - 43.0 ug/l, n=19) and 17.5 ug/l (range 5.9 ug/l - 37.5 ug/l, n=19), respectively (see attached Table Two).

Based on the DMR data, it has been determined that a reasonable potential exists for copper concentrations discharged in the effluent to cause or contribute to an exceedance of water quality criteria for copper given that effluent concentrations are well above the criteria. Thus, pursuant to 40 CFR § 122.44(d)(1)(iii), the draft permit includes monthly average and maximum daily limits of 5.9 mg/l and 7.9 mg/l, respectively. See Attachment A for the calculations. **The proposed limits are more stringent than the existing limits given that the copper criteria have changed since the issuance of the existing permit.**

Lead: Existing average monthly and maximum daily limits for lead are 0.92 ug/l and 23.8 ug/l, respectively. Monthly DMR data for the review period indicates that all values for both the average maximum daily and monthly average were below the minimum level (5 ug/l) for total lead (see Table 2). However, a more recent minimum level (ML) has been established as 3 ug/l for total lead using the Furnace Atomic Absorption analytical method (EPA Method 220.2). This lower ML will provide better data to evaluate compliance with the monthly average limit of 1.1 ug/l. However, because the average monthly limit is lower than the ML, compliance/non-compliance will be determined based on the ML. Sample results of

less than 3 ug/l for the average monthly value will be reported as zero on the DMRs (see attached Table Two).

In accordance with statutory anti-backsliding provisions, it is recognized that reissued permit effluent limits must be at least as stringent as the effluent limitations in the existing permit. However, since the issuance of the existing permit, NHDES recalculated the Ashuelot River's 7Q10 flow for the development of a TMDL. The recalculated 7Q10 flow was subsequently used to recalculate the dilution factor for the Keene WWTF and resulted in raising the dilution factor from1.7 to 2.08. Thus, the existing permit's average monthly and maximum daily lead limits, 0.92 ug/l and 23.8 ug/l, respectively, were changed to 1.1 ug/l and 29.1 ug/l, respectively. Although the proposed limits are higher than the existing limits, this increase is consistent with applicable anti-backsliding provisions, which state that permit may be reissued with a less stringent effluent limitation, if information is available which was not available at the time of the issuance of the existing permit, and would have justified the application of a less stringent effluent limitation at the time of issuance. See Section 402(o)(2)(B)(ii). Furthermore, given the increase 7Q10 flow in the Asheulot River, and that the average maximum daily and average monthly values during the review period were below the ML for detection, the proposed limits will be protective of water quality. See 402(o)(3).

Zinc: Existing maximum daily and monthly average zinc limits are 61.5 mg/l and 55.7 mg/l, respectively. Review of the DMR data reveals that Zinc's average maximum daily and average monthly values reported during the review period were 51.8 ug/l (range 36 ug/l - 90 ug/l, n=19) and 44.3 ug/l (range 33.5 ug/l and 61.8 ug/l; n=19), respectively (see Table Two).

Based on the DMR data, it has been determined that a reasonable potential exists for zinc concentrations discharged in the effluent to cause or contribute to an exceedance of water quality criteria for zinc given that effluent concentrations are well above the criteria. Thus, pursuant to 40 CFR § 122.44(d)(1)(iii), the draft permit includes a value of 77 mg/l for both the monthly average and maximum daily zinc limits. See Attachment A for the calculations. The draft limits are higher than the existing limits given that the 7Q10 flow and dilution factor have increased since the issuance of the existing permit. Although the proposed limits are higher than the existing limits, this increase falls within an exception to the anti-backsliding prohibition set forth in CWA Section 402(o)(2)(B)(ii).

Nutrients

Phosphorous and other nutrients (i.e., nitrogen) promote the growth of nuisance algae and rooted aquatic plants. Typically, elevated levels of nutrients will cause excessive algal and/or plant growth resulting in reduced water clarity and poor aesthetic quality. Also, through respiration, and the decomposition of dead plant matter, excessive algae and plant growth can reduce in-

stream dissolved oxygen concentrations to levels that could negatively impact aquatic life and/or produce strong unpleasant odors.

EPA has produced several guidance documents which contain recommended total phosphorous criteria for receiving waters. The 1986 Quality Criteria of Water (Gold Book) recommends in-stream phosphorous concentrations of 0.05 mg/l in any stream entering a lake or reservoir, 0.1 mg/l for any stream not discharging directly to lakes or impoundments, and 0.025 mg/l within the lake or reservoir.

In December 2000, EPA released "Ecoregional Nutrient Criteria," (USEPA 2000) established as part of an effort to reduce problems associated with excess nutrients in water bodies located within specific areas of the country. The published criteria represent conditions in waters within each specific ecoregion which are minimally impacted by human activities, and thus are representative of waters without cultural eutrophication. Swanzey is within Ecoregion VIII, *Nutrient Poor Largely Glaciated Upper Midwest and Northeast.* Recommended criteria for this eco-region is a Total Phosphorous criteria of 10 ug/l (0.010 mg/l) and chlorophyll *a* criteria of 0.63 ug/l (0.0063 mg/l). These recommended criteria are found in the *Ambient Water Quality Criteria Recommendations, Information Supporting the Development of State and Tribal Nutrient Criteria, Rivers and Streams in Ecoregion VIII* (USEPA 2001).

More recently, Mitchell, Liebman, Ramseyer, and Card (in draft 2004), in conjunction with the New England States, developed potential nutrient criteria for rivers and streams in New England. Using several river examples representative of typical conditions for New England streams and rivers, they investigated several approaches for the development of river and stream nutrient criteria that would be dually protective of designated uses in both upstream reaches and downstream impoundments. Based on this investigation an instream total phosphorous concentration of 0.020 - 0.022 mg/l was identified as protective of designated uses for New England rivers and streams. The development of this New England-wide total phosphorous concentration was based on more recent data than the National Ecoregional nutrient criteria, and have been subject to quality assurance measures. Additionally, the development of the New England-wide concentration included reference conditions for waters presumed to be protective of designated uses.

The New Hampshire Surface Water Quality Regulations contain a narrative criteria which states phosphorous contained in effluent shall not impair a water body's designated use. Specifically, the New Hampshire Surface Water Quality Regulations, Chapter Env-Ws 1700, Section 1703.14(b) states that, "Class B waters shall contain no phosphorous or nitrogen in such concentrations that would impair any existing or designated uses, unless naturally occurring." Env-Ws Section 1703.14(c) further states that, "Existing discharges containing either phosphorous or nitrogen which encourage cultural eutrophication shall be treated to remove phosphorous or nitrogen to ensure attainment and maintenance of water quality standards." Cultural eutrophication is defined in Env-Ws Section 1702.15 as, "... the human- induced addition of wastes containing nutrients

which results in excessive plant growth and/or decrease in dissolved oxygen." Although numeric nutrient criteria have not yet been developed in New Hampshire, a total phosphorous concentration of 0.05 mg/l is considered by the NHDES as a level of concern (NHVRAP & NHDES 2002, 2003, and 2005).

As noted earlier, Section 303(d) of the CWA requires states to identify those waterbodies that are not expected to meet surface water quality standards after the implementation of technology-based controls and, as such, require the development of total maximum daily loads (TMDL). Impaired water quality conditions persist in the Ashuelot River and have resulted in its listing in the State of New Hampshire's *Final List of Threatened or Impaired Waters That Require a TMDL* (NHDES 2004), formerly referred to as the 303(d) list. Aquatic life use is not supported in segments of the Ashuelot River due to dissolved oxygen saturation. A TMDL was scheduled to be developed for dissolved oxygen saturation in 2007, but has been extended until 2009. During the summers of 2001 and 2002, NHDES collected water samples from the Ashuelot River for the development of the TMDL. This data, and data from the NHDES OneStop Data Retieval Site, were used as the basis for developing the total phosphorous limit in the draft permit.

Instream Sampling in the Asheulot River: Total Phosphorous and Chlorophyll *a*

The segment of the Asheulot River between Keene and Swanzey is at particular risk of eutrophication given the rivers morphology and the existing sources of phosphorous within it (i.e., Keene and Swanzey WWTFs). The first 30 miles of the Ashuelot River drops quickly at a rate of 37 feet per mile. However, the river has a particularly low gradient through Keene, Swanzey and Winchester. For example, the gradient from the Colony Mill dam in Keene to the Homestead Dam in West Swanzey is approximately 12 feet over 8.7 miles (VHB 2005). This translates to an average of 1.4 feet per mile, which is considered quite flat, especially when compared to the upper portions of the watershed (VHB 2005). Given the low gradient and known point sources of phosphorous, the Ashuelot River is at considerable risk for eutrophication.

During 2001 and 2002, the NH DES sampled the Ashuelot River to collect data for the TMDL. The river was sampled on August 16, 23, 29, 2001, and on August 28, 2002. A summary of pertinent data obtained during the sampling is presented below in Table Three. The data represents samples taken from the two POTWs in the study area, Keene and Swanzey, and from the Ashuelot River upstream and downstream of these facilities. A map showing the location of the POTWs and the location of the Ashuelot River sampling sites is also contained in Attachment C. The sampling stations are numbered sequentially from upstream to downstream, with the upstream stations having the higher numbers. Station 2- Sba is a sampling station on the South Branch of the Ashuelot River, which discharges to the main branch just downstream of Station16D - Ash. Refer to the Ashuelot River TMDL Sampling Station map contained in Attachment C.

Table Three

Station*	Ortho Phosphorous (mg/l)				Total Phosphorous (mg/l)				Chlorophyll *a* (ug/l)			
	2001			2002	2001			2002	2001			2002
	8/16	8/23	8/29	8/28	8/16	8/23	8/29	8/28	8/16	8/23	8/29	8/28
16D-Ash	0.031	<0.005	<0.005	<0.01	0.018	0.014	0.016	0.022	1.97	2.16	3.44	1.91
Keene WWTF	3.053	3.68	2.89	3.72	3.44	3.4	3.25	3.72	1.38	1.66	1.78	NA
16B-Ash	0.638	0.102	0.898	1.06	0.644	0.125	0.955	1.132	2.3	2.89	3.65	2.97
2-Sba	0.047	0.005	0.005	<0.01	0.023	0.017	0.02	0.015	3.23	2.13	2.73	2.2
16-Ash	0.145	0.241	0.246	0.245	0.16	0.271	0.287	0.268	3.44	1.8	3.84	NA
15E-Ash	0.187	0.231	0.257	0.196	0.203	0.265	0.31	0.235	4.72	10.3	6.04	3.97
15-Ash	0.179	0.169	0.206	0.209	0.197	0.197	0.265	0.263	7.09	11.4	10.43	4.93
14T-Ash	0.181	0.161	0.201	0.21	0.193	0.192	0.244	0.29	4.31	5.83	6.92	6.23
Swanzey WWTF	4.153	4.64	4.95	5.67	4.65	4.65	5.69	5.517	250.8	114	237.6	7.65
14-Ash	0.12	0.117	0.136	0.141	0.158	0.18	0.277	0.213	7.83	16.3	69.64	13.64
12-Ash	0.112	0.085	0.116	0.097	0.123	0.123	0.191	0.143	5.76	3.82	23.77	19.02

Except at stations located above the Keene WWTF and on the South Branch of the Ashuelot River (Stations 16D-Ash and 2-Sba, respectively), the data in Table Three illustrates that total phosphorous concentrations at all sampling stations on the mainstem exceed all the Gold Book recommended criteria (0.02 mg/l, 0.05 mg/l, 0.10 mg/l), New England-wide recommended criteria (0.020 mg/l - 0.022 mg/l), Ecoregion criterion (0.010 mg/l), and the NHDES level of concern (0.05 mg/l)

As discussed above, while phosphorous is often used as a causal indicator of eutrophication because its presence results in plant growth, chlorophyll *a* and dissolved oxygen are response indicators. Measures of chlorophyll *a* in surface waters may be correlated with the amount of suspended algae ("phytoplankton"). The recommended total chlorophyll *a* criteria for Ecoregion VIII, *Nutrient Poor Largely Glaciated Upper Midwest and Northeast* is 0.63 ug/l. This value can be found in the *Ambient Water Quality Criteria Recommendations, Information Supporting the Development of State and Tribal Nutrient Criteria, Rivers and Streams in Ecoregion VIII* , EPA 822-B-01-015, December, 2001.

As illustrated in Table Three, chlorophyll *a* data exceed the recommended National chlorophyll *a* criterion (0.63 ug/l) at all stations. To demonstrate, the range of instream chlorophyll *a*,

excluding the WWTF's, is 1.97 ug/l - 69.64 ug/l). Overall, there is a general increase in the concentration of chlorophyll *a* moving downstream. Although the available chlorphyll *a* data set for the Ashuelot River is limited by the number of sampling events, the data are useful for evaluating whether algal blooms occurred and providing general insight into the trophic status of the Ashuelot River.

Table Four provides a summary from the literature of the trophic status for fresh water systems as characterized by mean chlorophyll *a*. Although, the data for chlorophyll *a* measures in the Ashuelot River are based on single samples, a comparison of these values with those in Table 2 serves to generally demonstrate that eutrophic conditions exist in the Ashuelot River, in particular downstream of the West Swanzey WWTF. Also, during water quality surveys conducted in August of 2001 and 2002, total chlorophyll *a* concentrations increased with distance downstream, and were highest downstream of the West Swanzey WWTF. Based on the values presented in Table Four, the Ashuelot River would be considered, at a minimum, mesotrophic and, thus at risk for eutrophication, and eutrophic.

Table 4. Freshwater System Trophic Status Based on Mean Chlorophyll *a* *

Trophic Status	Wetzel (2001)	Ryding and Rast (1989)	Smith (1998)	Novotny and Olem (1994)
Eutrophic	>10 ug/l	6.7 - 31 ug/l	----------	>10 ug/l
Mesotrophic	2- 15 ug/l	3 - 7.4 ug/l	3.5 - 9 ug/l	4 - 10 ug/l
Oligotrophic	0.3 - 3 ug/l	0.8 - 3.4 ug/l	----------	< 4 ug/l

*Adapted from USEPA 2003

Another indication of eutrophication in the Ashuelot River is the macrophyte and periphyton growth observed downstream of the Keene WWTF discharge in August of 2001 (NHDES 2001). Upstream of the discharge, macrophyte and periphyton growth was sparse while downstream the channel had 75% coverage of periphyton and macrophyte growth was observed to be scattered/common.

Dissolved oxygen data was reviewed at the NHDES OneStop Data Retrieval site for the percent saturation in the Ashuelot River. Supersaturation can occur under conditions of excessive algae/plant growth which produce oxygen during photosynthesis (Thomann and Mueller 1987). Hence, the supersaturation can be indicative of eutrophic conditions. Summer data from 1990 - 1995, and 1997 and 1998 were provided for Station16 - ASH, located below the Keene WWTF. The average percent saturation for dissolved oxygen was 88.71% with a range of 67.90 % to 114 % (n=18). Although this data is limited, it indicates that supersaturated conditions occur and

serve as another indicator of eutrophic conditions in the Ashuelot River.

Eutrophic conditions have also been noted by the Ashuelot River Local Advisory Committee (ARLAC). In the *Ashuelot River Corridor Management Plan* (ARLAC 2001, with the assistance of the NHDES), a number of issues are presented, which include eutrophic conditions and low dissolved oxygen during summer low flow conditions, and phosphorous loading from the Keene WWTF. The management goals in this plan recognize the need for reducing nutrient and chemical pollutant loads from the Keene WWTF (ARLAC 2001).

Conclusion: Proposed Total Phosphorous Limit

An estimate of the existing total phosphorous concentration from the Keene WWTF discharge is approximately 3.5 mg/l (based on data in Table Two). Assuming an effluent total phosphorous concentration of 3.5 mg/l and a dilution factor of 2.08, the estimated instream concentration of phosphorous due to this discharge is 1.7 mg/l (3.5 mg/l / 2.08). Thus, the discharge has a reasonable potential to cause or contribute to violations of water quality standards. It is estimated that a total phosphorous limit of 0.2 mg/l would result in an instream contribution of total phosphorous of 0.096 mg/l (0.2 mg/l divided by the dilution factor 2.08), which would meet the Gold Book criterion for free flowing streams (0.1 mg/l).

Based on the discussion above, it has been demonstrated that effluent discharged from the Keene WWTF contributes to the eutrophic conditions and impairment of the Ashuelot River. Thus, based on the New Hampshire narrative criteria, which requires the removal of phosphorous from effluent causing impairment of a water body [Env-Ws Section 1703.14(c)], the draft permit proposes a warm weather limit of 0.2 mg/l total phosphorous, and cold weather limit of 1 mg/l.

The total phosphorous warm weather limit (0.2 mg/l) is applied April 1st to October 31st. During the warm weather months, it is necessary to limit phosphorous because this is the period when eutrophication is considered most detrimental to water quality goals. The total phosphorous cold weather limit (1.0 mg/l) applies November 1st to March 31st. Limiting phosphorous during the cold weather months is also necessary to ensure that phosphorous discharged during the cold weather months does not result in the accumulation of phosphorous in the sediments, and subsequent release during the warm weather growing season. Finally, a monitoring requirement for orthophosphorous has been included for the cold weather months (November 1st - March 31st) in order to determine the dissolved particulate fraction.

It is recognized that the NHDES is currently in the process of conducting a Total Maximum Daily Load (TMDL) study for dissolved oxygen on the Ashuelot River, and that phosphorous will be allocated in the TMDL. The original target date for completion of the TMDL was 2007, but has been rescheduled for September 30, 2009.

E. Whole Effluent Toxicity

EPA's *Technical Support Document for Water Quality-based Toxics Control*, EPA/505/2-90-001, March 1991, recommends using an "integrated strategy" containing both pollutant (chemical) specific approaches and whole effluent (biological) toxicity approaches to control toxic pollutants in effluent discharges from entering the nation's waterways. EPA-New England adopted this "integrated strategy" on July 1, 1991, for use in permit development and issuance. These approaches are designed to protect aquatic life and human health. Pollutant specific approaches such as those in the Gold Book and State regulations address individual chemicals, whereas, the whole effluent toxicity (WET) approach evaluates interactions between pollutants thus rendering an "overall" or "aggregate" toxicity assessment of the effluent. Furthermore, WET measures the "Additive" and/or "Antagonistic" effects of individual chemical pollutants which pollutant specific approaches do not, thus the need for both approaches. In addition, the presence of an unknown toxic pollutant can be discovered and addressed through this process.

Section 101(a)(3) of the CWA specifically prohibits the discharge of toxic pollutants in toxic amounts and New Hampshire law states, "all waters shall be free from toxic substances or chemical constituents in concentrations or combination that injure or are inimical to plants, animals, humans, or aquatic life;...." [N.H. RSA 485-A:8, VI and the N.H. Code of Administrative Rules, PART Env-Ws 1703.21(a)]. The federal NPDES regulations at 40 CFR §122.44(d)(1)(v) require whole effluent toxicity limits in a permit when a discharge has a "reasonable potential" to cause or contribute to an excursion above the State's narrative criterion for toxicity. WET tests of the Keene WWTF's effluent in June 2005 demonstrated toxicity for Daphnid (*Ceriodaphnia dubia*). Furthermore, the low dilution, 2.08, calculated for the receiving water at the Keene's treatment plant's outfall contributes to a "reasonable potential" to cause an excursion of the no toxics provision in the State's regulations. Inclusion of the whole effluent toxicity limit in the draft permit will ensure compliance with both the CWA's and the State's narrative water quality criterion of "no toxics in toxic amounts".

EPA New England's current policy requires toxicity testing in all municipal permits until no toxicity is demonstrated at the permit level. The type of whole effluent toxicity (WET) test, acute and/or chronic and effluent limitations (LC50 and/or C-NOEC), are based on available dilution (See Attachment B).

The draft permit requires the permittee to perform the quarterly toxicity tests using two (2) species and the permit contains an LC50 limit of 100% effluent concentration. The two species are Daphnid (*Ceriodaphnia dubia*) and Fathead Minnow (*Pimephales promelas*). The draft permit contains an LC50 limit of 100 percent effluent concentration (See Appendix B for the LC50 limit). The LC50 is defined as the concentration of toxicant, or in this draft permit, as the percentage of effluent lethal to 50% of the test organisms during a specific length of time.

The Chronic-No Observed Effect Concentration (C-NOEC) is defined as the highest concentration to which test organisms are exposed in a life cycle or partial life cycle test, which

causes no adverse effect on growth, survival or reproduction during a specific time of observation. Based on the revised dilution factor for the Keene WWTF, the C-NOEC limit has been recalculated based on the revised dilution factor, as follows;

Chronic NOEC Limit Calculation

$$\frac{1.0}{2.08} * 100 = 48\%$$

The test results (growth, survival or reproduction) at a specific time of observation as determined from hypothesis testing should exhibit a linear dose-response relationship. However, where the test results do not exhibit a linear dose-response relationship, the draft permit requires the permittee to report the lowest concentration where there is no observable effect. See the draft permit's ATTACHMENT A (VII. TOXICITY TEST DATA ANALYSIS) for additional clarification in selecting appropriate C-NOEC values. The modified acute toxicity test required in the draft permit is measured 48 hours into the chronic test.

The quarterly sampling for the WET test requirement shall be collected and tests completed during the calender quarters ending in March 31st, June 30th, September 30th and December 31st each year. Results are to be submitted to the EPA and the NHDES-WD by the 15th day of the month following the end of the quarter sampled. For example, tests results for the quarter beginning on April 1st and ending June 30th , are due by July 15th .

Results of these toxicity tests will demonstrate compliance with the no toxic provision of the CWA. If the results of these tests are consistently negative during a one year period, the monitoring frequency and testing requirements may be reduced to not less than one test per year. As a special condition of this draft permit, the frequency of testing may be reduced by a certified letter from the EPA. This permit provision anticipates that the permittee may wish to request a reduction in WET testing. After a minimum of four complete and consecutive WET tests, all of which must be valid and demonstrate compliance with the permit limits for whole effluent toxicity, the permittee may submit a written request to the EPA seeking a review of the toxicity test results. The EPA will review the test results and other pertinent information to make a determination. The permittee is required to continue testing at the frequency specified in the permit until the permit is either formally modified or until the permittee receives a certified letter from the EPA indicating a change in the permit conditions. This special condition does not negate the permittee's right to request a permit modification at any time prior to the permit expiration.

Alternatively, if toxicity is found, monitoring frequency and testing requirements may be increased. The permit may also be modified, or alternatively, revoked and reissued to incorporate additional toxicity testing requirements or chemical specific limits. These actions will occur if the Regional Administrator determines the NH Standards are not adequately enforced and users of the

waterways are not adequately protected during the remaining life of the permit. Results of these toxicity tests are considered "new information not available at permit development"; therefore, the permitting authority is allowed to use said information to modify an issued permit under authority in 40 CFR §122.62(a)(2).

This draft permit requires the reporting of selected parameters determined from the chemical analysis of the WET tests 100% effluent samples. Specifically, parameters for the constituents of aluminum, ammonia nitrogen as nitrogen, hardness, and total recoverable cadmium, copper, chromium, lead, nickel, and zinc are to be reported on the appropriate Discharge Monitoring Reports for entry into the EPA's Permit Compliance Systems Data Base. EPA - New England does not consider reporting these requirements an unnecessary burden as the reporting these constituents is required with the submission of each toxicity report (See Draft Permit, ATTACHMENT A, page A-8).

F. Sludge

Domestic sludges which are land applied; disposed of in a surface disposal unit; or fired in a sewage sludge incinerator are subject to Part 503 technical standards and NH Standard Env-Ws 800. Part 503 regulations have a self-implementing provision, however, the CWA requires implementation through permits. The existing permit contains conditions intended to implement the Part 503 regulations. These conditions include: required notifications for any planned changes in sludge use or disposal practices; causes for modification of the permit; and specific conditions relative to the permittee's method of sludge disposal. The draft permit has been conditioned such that EPA and NHDES-WD are notified 180 days prior to a change in the sludge use or disposal method employed at permit reissuance.

Presently, sludge is hauled offsite by a commercial firm. The facility in the draft permit, as the existing permit, is required annually to monitor the sludge for the following parameters: Arsenic; Cadmium; Chromium; Copper; Lead; Mercury; Molybdenum; Nickel; Selenium and Zinc. Reports are to be submitted to EPA by February 19, of each year.

G. Essential Fish Habitat and Endangered Species

Essential Fish Habitat

The Magnuson-Stevens Fishery Conservation and Management Act, as amended by the Sustainable Fisheries Act of 1996 (Public Law 104267), established a new requirement to describe and identify (designate) "essential fish habitat" (EFH) in each federal fishery management plan. Only species managed under a federal fishery management plan are covered. Fishery Management Councils determine which areas will be designated as EFH. The Councils have prepared written descriptions and maps of EFH, and include them in fishery management plans or their amendments. EFH designations for New England were approved by the Secretary of

Commerce on March 3, 1999.

The 1996 Sustainable Fisheries Act broadly defined essential fish habitat as "waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." Waters include aquatic areas and their associated physical, chemical and biological properties. Substrate includes sediment, hard bottom, and structures underlying the waters. Necessary means the habitat required to support a sustainable fishery and the managed species' contribution to a healthy ecosystem. Spawning, breeding feeding, or growth to maturity covers all habitat types utilized by a species throughout its life cycle. Adversely affect means any impact which reduces the quality and/or quantity of EFH. Adverse affects may include direct (i.e. contamination; physical disruption), indirect (i.e. loss of prey), site specific or habitat wide impacts, including individual, cumulative or synergistic consequences of actions.

The Magnuson-Stevens Act requires all federal agencies to consult with National Marine Fisheries Service (NMFS) on all actions, proposed actions, permitted, funded, undertaken by the agency, that "may adversely affect any essential fish habitat." The Connecticut River and its tributaries, including the Ashuelot River, are designated EFH for Atlantic salmon (*Salmo salar*). According to New Hampshire Fish and Game Department (NHFGD), the stocking of Atlantic salmon fry occurs in three tributaries well upstream from the Keene POTW. NHFGD estimates there are approximately 4,087 units of suitable Atlantic salmon rearing habitat upstream from the Keene plant. One rearing unit equals a 100 square-yard area. There are no areas in close proximity to, or downstream from, the Keene plant on the Ashuelot River that are stocked, and future stocking efforts will likely remain focused on upstream areas.

While this segment of the Ashuelot River is not considered to be spawning or rearing habitat for Atlantic salmon, migrating smolts will pass by the plant as they move downstream on their seaward migration. Based on recent annual fall surveys, NHFGD estimates that approximately 5,470 smolts will migrate past the plant. In addition to Atlantic salmon, pre-spawn adult blueback herring (*Alosa aestivalis*) and American shad (*Alosa sapidissma*) are stocked in this general vicinity given the suitable habitat for juveniles of those species. Finally, the availability of forage and overall habitat value in the Ashuelot below the plant is also suitable for adult trout, and as such, this stretch is stocked annually with rainbow (*Salmo gairdneri*) and brown trout (*Salmo trutta*).

The conditions, limitations, and monitoring requirements contained in this permit are designed to be protective of all sensitive aquatic species in the Ashuelot River. Accordingly, it is EPA's opinion that adverse impacts to Atlantic salmon EFH have been minimized to the extent they are negligible, and no additional mitigation is warranted. If adverse affects to EFH do occur as a result of this permit action, or if new information changes the basis for this conclusion, then NMFS will be notified and consultation will be re-initiated.

Endangered Species

The Endangered Species Act (16 USC 1451 et seq), Section 7, requires the EPA to ensure, in

consultation with the U.S. Fish and Wildlife Service (USFWS) and/or NMFS, as appropriate, that any action authorized by EPA is not likely to jeopardize the continued existence of any endangered or threatened species, or adversely affect its critical habitat.

The dwarf wedge mussel (*Alasmidonta heterodon*) resides in multiple locations in the Ashuelot River. Freshwater mussel communities, including the dwarf wedge mussel, have been sited immediately downstream of the Keene WWTP effluent discharge. In an August 2003 report titled, *Freshwater Mussels of the Ashuelot River*, submitted to the USFWS the authors, Ethan Nedeau and Sean Werle, state, "It appears as though the wastewater effluent (from the Keene WWTP) is not effecting freshwater mussels." community. .... All species found at Site 9 (at the Keene WWTP effluent discharge) were present on the right side of the river less than 20 yards downstream of the outfall, meaning that these animals were living almost entirely within the effluent plume. Animals appear healthy and there is no evidence of mortality."

Based on discussions with the USFWS, it is recognized that concerns exist for the potential negative impact(s) to dwarf wedge mussel communities downstream of the Keene WWTP. It is understood that the USFWS has concerns regarding the assumption of complete mixing. The USFWS will likely conduct a survey of the dwarf wedge mussel communities in the immediate area of the Keene WWTP in Spring 2006, and pursue a dye study to characterize the size and shape of the mixing zone under various flow conditions. Based on the results of this work, the permit may be modified, or alternatively, revoked and reissued, if future analysis demonstrates the need for more stringent pollutant limits; in particular, for copper. The USFWS has concerns that copper discharged from the Keene WWTP may have a potential negative impact on the mussel communities. Results from a TMDL or any other water-quality study, not available at permit reissuance, are considered "New Information". Modification of a permit based on New Information is provided in 40 CFR §122.62(a)(2).

H. Industrial Users (Pretreatment Program)

The permittee is required to administer a pretreatment program based on the authority granted under 40 CFR §122.44(j), 40 CFR §403 and Section 307 of the CWA. The Keene Wastewater Treatment Facility pretreatment program received EPA approval on November 6, 1984, and, as a result, appropriate pretreatment program requirements were incorporated into previous permits commensurate with that approval and Federal Pretreatment Regulations in effect when the permit was issued.

In October 1988 and July 1990, the Federal Pretreatment Regulations at 40 CFR §403 were amended. Those amendments established new requirements for implementation of pretreatment programs. By reissuing this NPDES permit, the permittee is obligated to modify, if necessary, and implement its pretreatment program to be consistent with current Federal Regulations. Those activities that the permittee must address include, but are not limited to, the following: (1) Develop and enforce specific effluent limits (technically-based local limits); (2) revise its local sewer-use ordinance, as appropriate, to be consistent with Federal Regulations; (3) develop an enforcement response plan; (4) implement a slug control evaluation program; (5) track significant

noncompliance for industrial users; and (6) establish a definition of significant industrial user. These requirements are necessary to ensure continued compliance with the POTW's NPDES permit and its sludge use or disposal practices.

By November 1, 2006, the permittee is required to prepare and submit a final technically based local limit report. The report shall incorporate EPA's December 16, 2005 comments regarding the City's December 2004 Local Limit Evaluation Report. The Permittee shall carry out the local limit revisions in accordance with EPA's *Local Limits Development Guidance (July 2004).*

In addition to the requirements described above, the draft permit requires the permittee to submit to EPA in writing, within 180 days of the permit's effective date, a description of proposed changes to permittee's pretreatment program deemed necessary to assure conformity with current federal pretreatment regulations. These requirements are included in the draft permit to ensure that the pretreatment program is consistent and up-to-date with all pretreatment requirements in effect. Lastly, the permittee must continue to submit, annually on November 1, a pretreatment report detailing the Activities of the program for the twelve month period ending 60 days prior to the due date.

I. Additional Requirements and Conditions

The effluent monitoring requirements have been established to yield data representative of the discharge under the authority of Section 308(a) of the CWA in accordance with 40 CFR § 122.41(j), 122.44(i) and 122.48. Compliance monitoring frequencies for Flow, $CBOD_5$, TSS, Ammonia, pH and *Escherichia coli* in the draft permit have been established in accordance with the EPA/NHDES-WD Effluent Monitoring Guidance mutually agreed upon and implemented in July 19, 1999. The draft permit's monitoring frequency for $CBOD_5$, TSS and Ammonia have been decreased in accordance with the revised EPA/NHDES-WD Effluent Monitoring Guidance. It's the intent of EPA and NHDES-WD to establish minimum monitoring frequencies in all NPDES permits at permit modification and/or reissuance in accordance with this Effluent Monitoring Guidance.

WET test monitoring requirements have been set according to EPA New England's Municipal Toxicity Policy. As explained in the Whole Effluent Toxicity section, section IV.E., the quarterly WET testing frequency is maintained from the existing permit.

Monitoring requirements for Dissolved Oxygen, Total Copper, Total Lead, Total Zinc and Total Phosphorous have been carried over from the existing permit.

Parameter	Existing Permit		Draft Permit	
	Sampling Frequency	Sample Type	Sampling Frequency	Sample Type
Flow	Continuous	Recorder	Continuous	Recorder
$CBOD_5$	3/Week	24-hr Composite	2/Week	24-hr Composite
TSS	3/Week	24-hr Composite	2/Week	24-hr Composite
Dissolved Oxygen	Daily	Grab	Continuous	Recorder
pH	Daily	Grab	Daily	Grab
Escherichia coli	3/Week	Grab	3/Week	Grab
Total Aluminum	Not Required	Not Required	1/Week	24-Hour Composite
Total Ammonia	3/Week	24-Hour Composite	2/Week	24-Hour Composite
Total Copper	2/Month	24-Hour Composite	2/Month	24-Hour Composite
Total Lead	2/Month	24-Hour Composite	2/Month	24-Hour Composite
Total Zinc	2/Month	24-hr	2/Month	24-Hour Composite
Tot. Phosphorous April 1st -Oct. 31st	2/Month (year round)	24-Hour Composite	1/Week April 1 - Oct. 31	24-Hour Composite
Tot. Phosphorous Nov. 1 - Mar. 31	Not Required	Not Required	1/Week Nov. 1 - Mar. 31	24-Hour Composite
Ortho Phosphorous Nov. 1 - Mar. 31	Not Required	Not Required	1/Week Nov. 1 - Mar. 31	24-Hour Composite
WET	1/3 Months	24-Hour Composite	1/3 Months[1]	24-Hour Composite

Footnotes:

1. Both species, Daphnid (*Ceriodaphnia dubia*) and Fathead Minnow (*Pimephales promelas*), are required for the WET.

The remaining conditions of the permit are based on the NPDES regulations 40 CFR Parts 122 through 125 and consist primarily of management requirements common to all permits.

V. Antidegradation

This draft permit is being reissued with additional wasteloads limitations than those found in the existing permit and no change in the outfall location. As discussed in the Zinc, Copper and Lead section of the Fact Sheet, the effluent limits for these metals have been recalculated based on the revised 7Q10 for the Ashuelot River, and revised water quality criteria. This recalculation has resulted in a slight increase of the metal's effluent limits. The EPA asserts the water quality of the Ashuelot River will not be aversely affected by the increase of the metal's limits.

The State of New Hampshire has also indicated there will be no lowering of water quality and no loss of existing uses. No additional antidegradation review, therefore, is warranted.

VI. State Certification Requirements

EPA may not issue a permit unless the State Water Pollution Control Agency with jurisdiction over the receiving water(s) either certifies that the effluent limitations and/or conditions contained in the permit are stringent enough to assure, among other things, that the discharge will not cause the receiving water to violate NH Standards or waives its right to certify as set forth in 40 CFR §124.53.

Upon public noticing of the draft permit, EPA is formally requesting that the State's certifying authority make a written determination concerning certification. The State will be deemed to have waived its right to certify unless certification is received within 60 days of receipt of this request.

The NHDES-WD is the certifying authority. EPA has discussed this draft permit with the Staff of the Wastewater Engineering Bureau and expects that the draft permit will be certified. Regulations governing state certification are set forth in 40 CFR §§124.53 and 124.55.

The State's certification should include the specific conditions necessary to assure compliance with applicable provisions of the Clean Water Act, Sections 208(e), 301, 302, 303, 306 and 307 and with appropriate requirements of State law. In addition, the State should provide a statement of the extent to which each condition of the draft permit can be made less stringent without violating the requirements of State law. Since the State's certification is provided prior to permit issue, any failure by the State to provide this statement waives the State's right to certify or object to any less stringent condition. These less stringent conditions may be established by EPA during the permit issuance process based on information received following the public noticing. If the State believes that any conditions more stringent than those contained in the draft permit are necessary to meet the requirements of either the CWA or State law, the State should include such conditions and, in each case, cite the CWA or State law reference upon which that condition is based. Failure to provide such a citation waives the right to certify as to that condition. The only exception to this is the sludge conditions/requirements implementing Section 405(d) of the CWA are not subject to the Section 401 State Certification requirements.

Reviews and appeals of limitations and conditions attributable to State certification shall be made

through the applicable procedures of the State and may not be made through the applicable procedures of 40 CFR Part 124.

VII. Comment Period, Hearing Requests, Procedures for Final Decisions, and EPA Contact

All persons, including applicants, who believe any condition of the draft permit is inappropriate must raise all issues and submit all available arguments and all supporting material for their arguments in full by the close of the public comment period, to:

Ms. Jeanne Voorhees
U.S. Environmental Protection Agency
1 Congress Street
Suite 1100 (Mailcode CMP)
Boston, Massachusetts 02114-2023
Telephone: (617) 918-1686
FAX No.: (617) 918-1505

Any person, prior to such date, may submit a request in writing for a public hearing to consider the draft permit to EPA and the State Agency. Such requests shall state the nature of the issue proposed to be raised in the hearing. A public hearing may be held after at least thirty (30) days public notice whenever the Regional Administrator finds that response to this notice indicates significant public interest. In reaching a final decision on the draft permit, the Regional Administrator will respond to all significant comments and make these responses available to the public at EPA's Boston Office.

Following the close of the comment period, and after a public hearing, if such hearing is held, the Regional Administrator will issue a final permit decision and forward a copy of the final decision to the applicant and each person who has submitted written comments or requested notice. Within 30 days following the notice of the final permit decision, any interested person may submit a request for a formal hearing to reconsider or contest the final decision. Requests for formal hearing must satisfy the requirement of 40 CFR §124.74.

Information conceming the draft permit may be obtained between the hours of 9:00 a.m. and 5:00 p.m., Monday through Friday, excluding holidays.

_____
Date

Linda M. Murphy, Director
Office of Ecosystem Protection
U.S. Environmental Protection Agency

USEPA. 1986. *Quality Criteria for Water* ("the Gold Book"). Office of Water. Document No. EPA 440/5-86-001. Washington, D.C.

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USEPA. 2003. *Ambient Water Quality Criteria for Dissolved Oxygen, Water Clarity and Chlorophyll a for the Chesapeake Bay and Its Tidal Tributaries.* USEPA Region III, Chesapeake Bay Program Office and USEPA - Region III, Water Protection Division in coordination with Office of Water, Office of Science and Technology;

USEPA 2004. Federal Register: *Notice of Intent To Re-Evaluate the Aquatic Life Ambient Water Quality Criteria for Ammonia.* July 8, 2004; Volume 69, Number 130 Page 41262-41264.

Wright-Pierce. 1996. *Phosphorous Minimization Study for the Keene Wastewater Treatment Plant, City of Keene, New Hampshire.* Prepared for City of Keene by Wright-Pierce, Engineers and Surveyors, Topsham, Maine.

Table 1. Outfall 001 Effluent Characteristics Based on Average Monthly Data

Date	Flow (MGD)	$CBOD_5$ (mg/l)			$CBOD_5$ % Removal	TSS (mg/l)			TSS % Removal	E.coli (thermatol col/100ml)		Ammonia Nitrogen (mg/l)		pH (su)		C-NOEL 7-Day		LC50		Dissolved Oxygen (mg/l)	Total Phosphorus (mg/l)
	MonthlyAverage	MonthlyAverage	Weekly Average	Maximum Daily	MonthlyAverage	MonthlyAverage	Weekly Average	Maximum Daily	MonthlyAverage	Geometric Mean	Maximum Daily	MonthlyAverage	Maximum Daily	Minimum	Maximum	Ceriodaphina	Pimephles	Ceriodaphina	Pimephles	Minimum	MonthlyAverage
Existing Limits	6.0	25	40	45	85	30	45	50	85	126	406	See Note 1	See Note 1	6.5	8.0	59	59	100	100	7.0	Report
July 2005	2.947	3.11	6.6	6.4	98.0	5.7	25.1	14.6	98.0	15	71	0.7	2.10	6.6	7.1	***	***	***	***	7.0	1.9
June 2005	2.993	4.32	5.0	7.2	96.7	***	***	***	94.8	***	***	***	***	**	***	25	100	38.8	100	***	***
May 2005	3.761	2.93	3.3	3.6	97.6	5.63	6.8	7.60	97.3	3	52	0.95	3.00	6.6	7.1	***	***	***	***	7.4	1.15
Apr. 2005	5.494	4.06	8.4	5.2	95.5	6.18	18.5	9.4	95.8	75	670	3.78	8.40	6.6	7.0	***	***	***	***	7.0	0.55
Mar. 2005	3.497	3.97	3.8	13.10	97.4	7.96	7.4	26.0	96.3	28	8900	2.99	8.00	6.6	7.0	100	100	100	100	7.0	1.60
Feb. 2005	3.244	3.48	4.8	5.0	97.3	6.58	9.8	10.8	96.5	11	30	1.71	4.40	6.7	7.1	***	***	***	***	8.2	1.30
Jan. 2005	3.628	4.23	5.1	6.2	96.5	7.32	11.0	12.6	96.6	43	333	1.88	5.00	6.6	7.1	***	***	***	***	7.4	0.75
Dec. 2004	3.633	4.51	5.0	7.8	97.1	7.08	11.7	14.0	96.8	54	129	2.72	5.90	6.6	7.0	100	100	100	100	7.6	1.05
Nov. 2004	2.860	4.54	5.8	7.5	97.3	7.43	9.7	11.6	97.6	17	70	0.54	1.21	6.7	7.2	***	***	***	***	7.7	2.65
Oct. 2004	3.005	4.05	4.70	6.90	98.2	7.13	8.6	10.6	98.0	19	44	1.56	4.0	6.8	7.2	***	***	***	***	7.3	2.05
Sept. 2004	3.386	3.59	4.4	5.0	97.8	5.26	6.9	11.4	97.8	54	144	0.3	0.51	6.6	7.1	100	100	100	100	7.3	1.70
Aug. 2004	2.693	2.12	2.5	2.90	98.7	3.04	3.9	5.0	99.1	36	124	0.34	0.83	6.7	7.2	***	***	***	***	7.0	2.4
July 2004	2.557	2.91	3.7	4.5	98.2	6.25	10.1	12.4	97.8	13	126	0.39	0.90	6.6	7.2	***	***	***	***	7.0	2.95
June 2004	3.173	3.96	4.5	5.7	97.2	6.4	8.7	10.0	98.0	13	34	1.3	2.8	6.6	7.1	100	100	100	100	7.5	3.4

Table 2. Outfall 001 Effluent Metals Characteristics Based on Average Monthly Data

Date	Total Copper (ug/l)		Total Lead (ug/l)		Total Zinc (ug/l)	
	MonthlyAverage	Maximum Daily	MonthlyAvcrage	Maximum Daily	MonthlyAverage	Maximum Daily
Existing Limits	6.2	8.2	0.92	23.8	55.7	61.5
July 2005	16.0	17.0	0	0	39.5	40.0
June 2005	21.5	35.3	0	0	47.3	59.0
May 2005	7.4	10.0	0	0	43.0	48.0
Apr. 2005	5.9	6.3	0	0	34.5	43.0
Mar. 2005	7.1	8.3	0	0	42.7	45.0
Feb. 2005	7.5	10.0	0	0	47.0	52.0
Jan. 2005	14.3	17.0	0	0	47.2	59.0
Dec. 2004	14.5	22	0	0	40.5	43.0
Nov. 2004	20.5	21.0	0	0	34.0	36.0
Oct. 2004	18	20	0	0	45.3	51.0
Sept. 2004	16	16	0	0	38.0	43.0
Aug. 2004	19	25	0	0	47.5	51.0
July 2004	37.5	43.0	0	0	49.3	90.0
June 2004	35.5	43.0	0	0	43.5	53.0
May 2004	10.1	11.9	0	0	49.0	53.0
Apr. 2004	9.2	13.0	0	0	33.5	47.0
Mar. 2004	26.5	32.0	0	0	60.3	66.0
Feb. 2004	22	24	0	0	61.8	66.0
Jan. 2004	26	29	<5	<5	37.5	40.0
Maximum	37.5	43	5	5	61.8	90
Minumum	5.9	6.3	0	0	33.5	36
Average	17.6	21.25	0.263	0.263	44.28	51.84

BLACKSTONE RIVER WATERSHED

DISSOLVED OXYGEN WASTELOAD ALLOCATION

for

MASSACHUSETTS AND RHODE ISLAND

(NOVEMBER 1997)

Coordinated Effort by the USEPA, MADEP and RIDEM

Model developed by Dr. Raymond Wright
University of Rhode Island

INTRODUCTION:

The purpose of a wasteload allocation (WLA) is to establish effluent discharge limits for point sources in a given watershed that will ensure compliance with water quality standards. This WLA addresses dissolved oxygen (DO) and eutrophication concerns in the Blackstone River. The pollutants targeted in the WLA include biochemical oxygen demand (BOD), ammonia (NH3), and phosphorus (P). The discharges affected by this WLA include two large municipal wastewater treatment facilities (WWTFs), Upper Blackstone Water Pollution Abatement District (UBWPAD) and Woonsocket, and four smaller municipal WWTFs, Millbury, Grafton, Northbridge, and Uxbridge. Municipal treatment plants discharging to large tributaries to the Blackstone River were determined to have a minor impact on water quality in the main stem of the river and were not included in this WLA. Limits have been established separately for these facilities to ensure that water quality standards are achieved in the tributaries.

This WLA is based on a DO model developed by the University of Rhode Island and funded by EPA, MADEP, and RIDEM. The DO model QUAL2E was calibrated and verified using low flow dry weather ambient and discharge data collected in July and August of 1991. This data is contained in the document Phase 1: Dry Weather Assessment-Interim Report of Data 1991. The DO model development is discussed in the report entitled Dissolved Oxygen Modeling of the Blackstone River in Massachusetts and Rhode Island (Wright, 1994).

WLA's are required by Section 303(d) of the Clean Water Act. This WLA was a joint effort by the US Environmental Protection Agency (EPA), the Massachusetts Department of Environmental Protection (MADEP), and the Rhode Island Department of Environmental Management (RIDEM).

Remediation and restoration work in the Blackstone River watershed needs to be addressed on a number of levels to control both point and nonpoint sources. This report addresses only the wasteload allocation to control municipal wastewater, which is the primary contributor to the dissolved oxygen and eutrophication impacts. It should be kept in mind that additional work is being undertaken concurrently to address impacts from industrial wastewater, municipal and industrial stormwater, and nonpoint sources of pollution in the watershed. These include increased efforts in stormwater permitting/enforcement and CSO remediation, as well as efforts to attenuate resuspension of contaminated sediments. Grants have also been awarded to support projects in these areas. These additional projects are discussed later in this report.

HISTORICAL PERSPECTIVE:

Development of an interstate WLA for the Blackstone River is one

segment of a comprehensive initiative which began in the watershed in 1991. The original basis for selecting the Blackstone River as a target for extensive study and restoration resulted from the identification of this watershed system as key to the health of Narragansett Bay. The Bay has been recognized as an important and highly threatened resource for the Northeast. As a result of visible and measurable changes to the water quality and resources of the Bay a number of actions were taken:

1. The USEPA created the Narragansett Bay Project (NBP) as part of the National Estuary Program. The NBP produced a Comprehensive Conservation and Management Plan (CCMP) which summarized the "blueprint" for present and long-term management actions which should be undertaken by governmental and local agencies and authorities. The CCMP targeted an interstate assessment and cleanup of the Blackstone River system as key to maintaining the health of Narragansett Bay.

2. To implement this recommendation, the USEPA established the Blackstone River Initiative (BRI) in 1991. This Initiative, coordinated by the USEPA, the University of Rhode Island, the MADEP, and the RIDEM focused on an intensive environmental sampling and assessment program. The program was designed to describe interstate water quality, biology, and toxicity in the river system, under both low flow and stormwater conditions. The information was to be used to develop low flow models for dissolved oxygen and metals that are capable of predicting water quality under a variety of receiving water and pollutant loading conditions and for identifying wet weather pollutant sources in order to target cleanup efforts.

3. To underscore the importance of the Blackstone River projects, the Governors of the Commonwealth of Massachusetts and the State of Rhode Island signed a Memorandum of Understanding in 1992 which stated their support for these projects and the continued cooperation of MA and RI in the restoration of the watershed system and the attenuation of pollutants to Narragansett Bay.

4. To further support these efforts, the Office of Watershed Management of the MADEP established an interdepartmental team to perform follow up assessments, provide outreach, and implement recommendations from the BRI report. The RIDEM targeted similar efforts to key subwatershed areas in RI.

A previous WLA was developed for the MA segment of the river using a Stream 7B model developed in the late 1970s. This WLA established the level of treatment necessary for the UBWPAD

discharge which is in effect today.

The current URI modeling effort included a post audit of the older Stream 7B model predictions. This was done in order to verify that the water quality conditions predicted under this model were accurate and that treatment levels required of the UBWPAD were appropriate. The post calibration matched very closely with the Stream 7B model predictions. Unfortunately, the Stream 7B model only covered the MA portion of the river and did not simulate algal growth which has a significant impact on DO in the Blackstone River.

The current modeling effort, which simulates algal growth and includes the RI portion of the river, indicates that significant problems in the river still need to be addressed. The postcalibration of the earlier model enhances confidence in the current model and model outputs.

MODEL DEVELOPMENT:

The inability to sample the river under critical flow and pollutant loading conditions, as well as access limitations to several critical DO sag points, necessitated the development of a mathematical model. The model simulates water quality parameters under critical river flow and discharge loading conditions in order to determine compliance with water quality standards. Seasonal differences in river flow and temperature were also evaluated.

The water quality surveys conducted in 1991 indicate a significant DO affect resulting from phosphorus driven algal growth and respiration. This is evidenced by the large chlorophyll a values and the daily variations in DO, including frequent occurrences of DO values greater than saturation levels (see Tables I and II and Figures I-III). Water quality station locations are given in Table III and Figure IV. The algal growth also has a significant affect on pH values, often resulting in violations of the pH standard (see Tables IV and V). The algal growth potential in the Blackstone River is enhanced by the numerous dams (see Table VI) which reduce the flow velocity in the river and increase the water temperature.

The model is capable of being run in a steady state or dynamic mode. In addition to simulations resulting from the steady state mode, the dynamic mode simulates the daily variations in DO caused by algal photosynthesis and respiration. This is necessary in order that the daily minimum DO values can be compared to the water quality standard, which is 5.0 mg/l minimum. The climatological data used in the algal simulations for the critical summer period represents typical August conditions.

TABLE I

DISSOLVED OXYGEN (mg/l)									
STATION	RIVER MILE	JULY 10				JULY 11			
		400	1000	1600	2200	400	1000	1600	2200
BLK01	45.7	6.4	7.7	7.8	6.4	6.4	7.1	8.3	6.5
BLK02	43.9	6.3	7.2	7.2	6.4	6.8	7.2	8.2	6.7
BLK03	41.3	7.5	7.9	8.0	7.4	7.3	7.9	7.9	7.5
BLK04	39.8	8.1	8.1	8.0	7.9	8.0	8.0	7.8	8.0
BLK06	36.3	7.1	8.4	8.5	7.3	7.1	8.1	8.7	7.4
BLK07	31.9	7.3	7.6	10.0	9.2	7.9	10.5	12.7	8.8
BLK07.1							8.3	8.5	
BLK08	27.8	6.1	9.8	13.0	6.9	6.0	10.2	12.9	7.9
BLK08.1							9.4	10.5	
BLK11	23.2	6.6	9.6	9.5	6.4	6.9	9.6	10.2	7.4
BLK12	19.1	6.9	11.2	11.5	8.2	7.0	12.0	11.8	8.4
BLK13	16.6	8.2	10.7	11.0	9.3	9.1	12.0	12.2	9.9
BLK17	12.8	7.5	9.5	8.9	7.1	7.3	9.4	8.8	7.0
BLK18	9.9	8.0	8.0	7.9	8.0	8.1	8.0	8.0	7.7
BLK19	8.1	7.6	8.1	8.0	7.3	7.2	7.9	7.8	7.3
BLK20	3.7	5.6	8.1	9.1	6.4	5.3	8.5	10.2	6.4
BLK21	0.2	7.0	8.9	9.0	7.2	7.3	8.7	9.2	6.8
TRIBUTARIES									
BLK05	36.7,2.1	6.0	6.8	7.0	5.5	5.7	6.5	6.8	5.4
BLK09	25.5,0.6	5.4	7.1	8.0	8.6	5.5	6.1	10.0	8.8
BLK09.1		7.6	7.8	10.0	7.8	7.5	7.7	8.0	8.2
BLK10	24.2,0.6	6.3	6.9	7.0	6.0	6.3	6.5	7.5	6.2
BLK14	17.4,0.8	7.2	7.7	7.8	6.9	7.0	8.0	7.9	7.1
BLK15	13.3,0.7	6.8	8.1	7.9	6.7	7.8	8.1	7.9	6.6
BLK16	13.1,1.1	5.1	4.9	6.2	4.9	5.2	5.3	6.7	5.4

TABLE II

DISSOLVED OXYGEN (mg/l)

Note: Meter readings were used for Stations 2, 3, 4, 5, 6, 7, 8 and 9.1 on August 14 at 1000 hr.

STATION	RIVER MILE	AUGUST 14				AUGUST 15			
		400	1000	1600	2200	400	1000	1600	2200
BLK01	45.7	6.2	7.2	7.2	5.9	6.0	6.9	7.0	4.9
BLK02	43.9	6.2	10.2	7.5	6.3	6.0	7.2	7.4	6.4
BLK03	41.3	7.1	10.1	7.7	7.1	7.0	7.8	7.9	7.4
BLK04	39.8	7.8	10.2	7.8	7.4	7.2	7.7	8.0	7.7
BLK06	36.3	7.2	10.0	8.1	7.0	6.8	7.9	8.3	7.4
BLK07	31.9	7.4	9.3	12.0	8.8	7.9	7.0	7.9	8.0
BLK07.1									
BLK08	27.8	6.2	10.0	10.3	6.2	5.6	7.9	9.4	6.3
BLK08.1			9.9				7.9	8.9	
BLK11	23.2	6.4	8.8	7.7	6.8	6.4	7.8	8.5	6.9
BLK12	19.1	6.3	9.3	9.3	6.9	6.2	7.5	9.7	7.7
BLK13	16.6	7.3	8.9	8.8	8.0	7.4	8.5	9.0	8.1
BLK17	12.8	7.4	8.7	8.5	7.1	8.0	8.1	8.8	7.1
BLK18	9.9	7.7	7.4	7.8	7.8	7.6	7.5	7.4	7.5
BLK19	8.1	7.7	8.0	7.7	7.4	7.1	7.6	7.5	7.2
BLK20	3.7	6.2	9.1	9.0	6.5	5.5	6.5	8.3	6.4
BLK21	0.2	7.3	9.2	8.8	7.3	7.1	7.5	8.6	7.2
TRIBUTARIES									
BLK05	36.7,2.1	6.3	10.2	6.9	5.9	5.8	7.1	6.9	5.9
BLK09	25.5,0.6	4.7	9.6	9.0	5.6	4.4	5.7	8.2	6.8
BLK09.1		7.3	8.7	7.7	7.2	7.2	7.2	7.5	7.6
BLK10	24.2,0.6	6.0	6.2	5.8	5.8	5.6	5.8	5.9	5.9
BLK14	17.4,0.8	6.9	7.5	7.8	6.6	6.8	7.2	7.7	6.8
BLK15	13.3,0.7	6.6	8.3	7.3	6.4	6.4	7.5	7.8	6.8
BLK16	13.1,1.1	6.4	6.1	6.4	5.6	5.6	5.8	5.8	5.1

FIGURE I

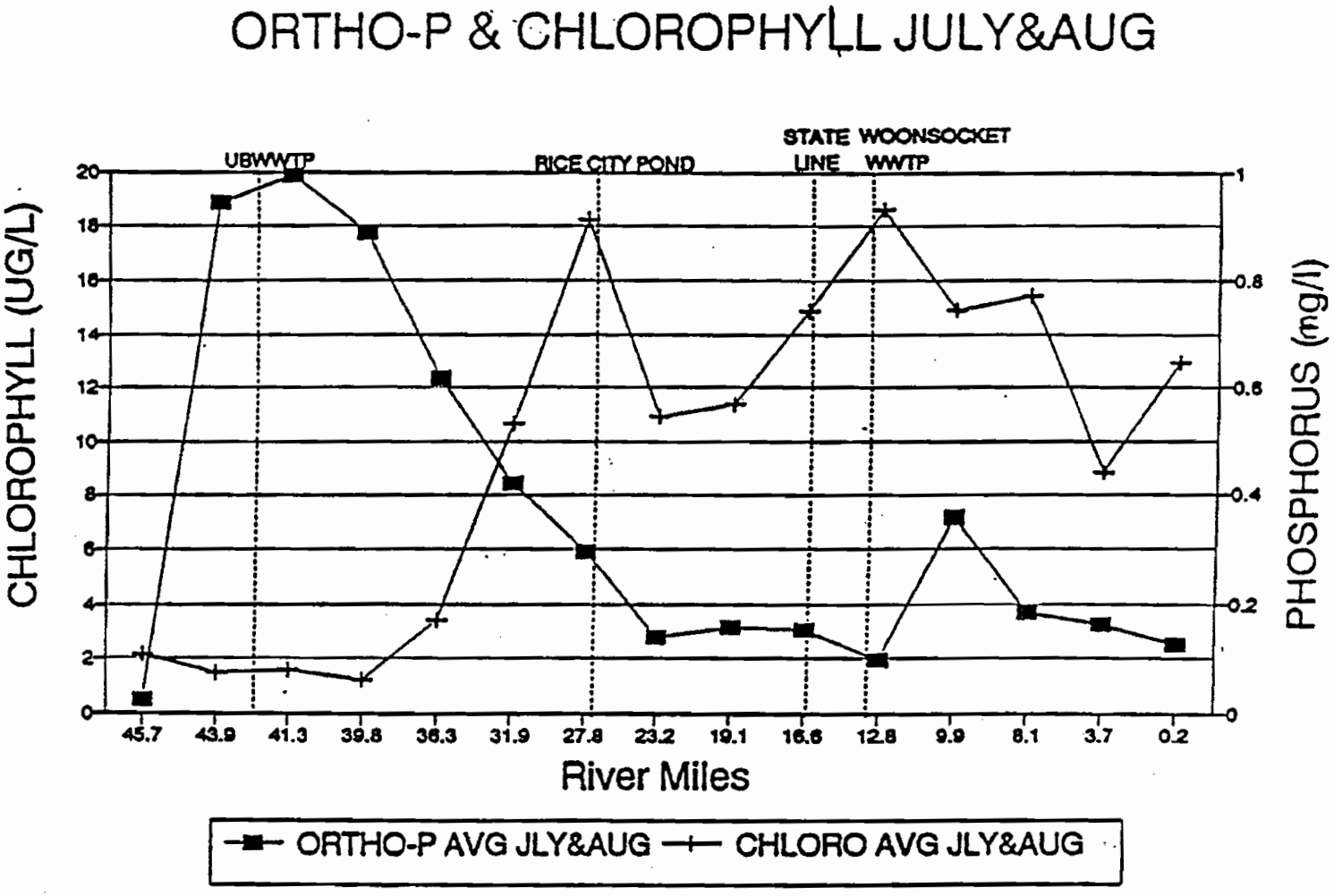

ORTHO-P & CHLOROPHYLL JULY&AUG
UBWWTP
RICE CITY POND
STATE LINE
WOONSOCKET WWTP
CHLOROPHYLL (UG/L)
PHOSPHORUS (mg/l)
0
2
4
6
8
10
12
14
16
18
20
0
0.2
0.4
0.6
0.8
1
45.7
43.9
41.3
39.8
36.3
31.9
27.8
23.2
19.1
16.6
12.8
9.9
8.1
3.7
0.2
River Miles
ORTHO-P AVG JLY&AUG
CHLORO AVG JLY&AUG

FIGURE IIa

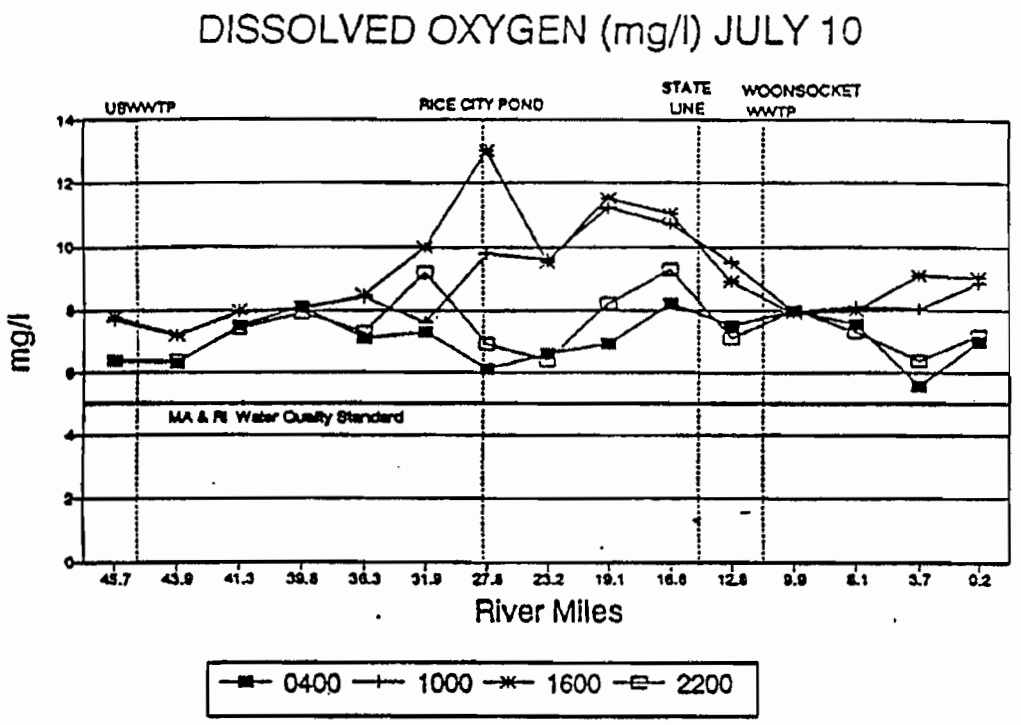


FIGURE IIb

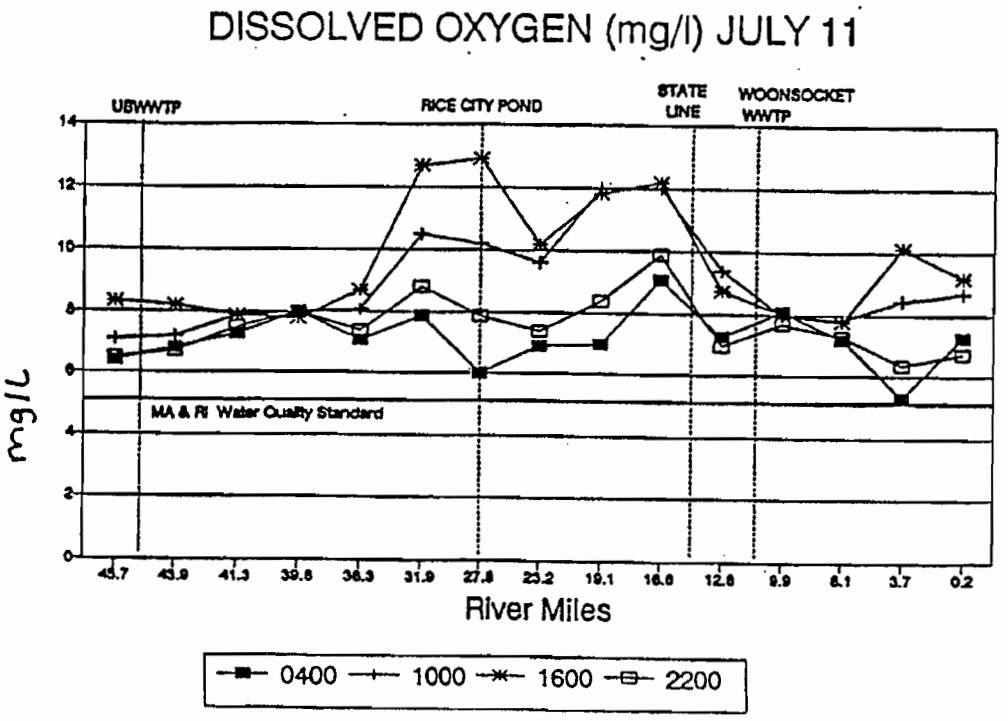


FIGURE IIIa

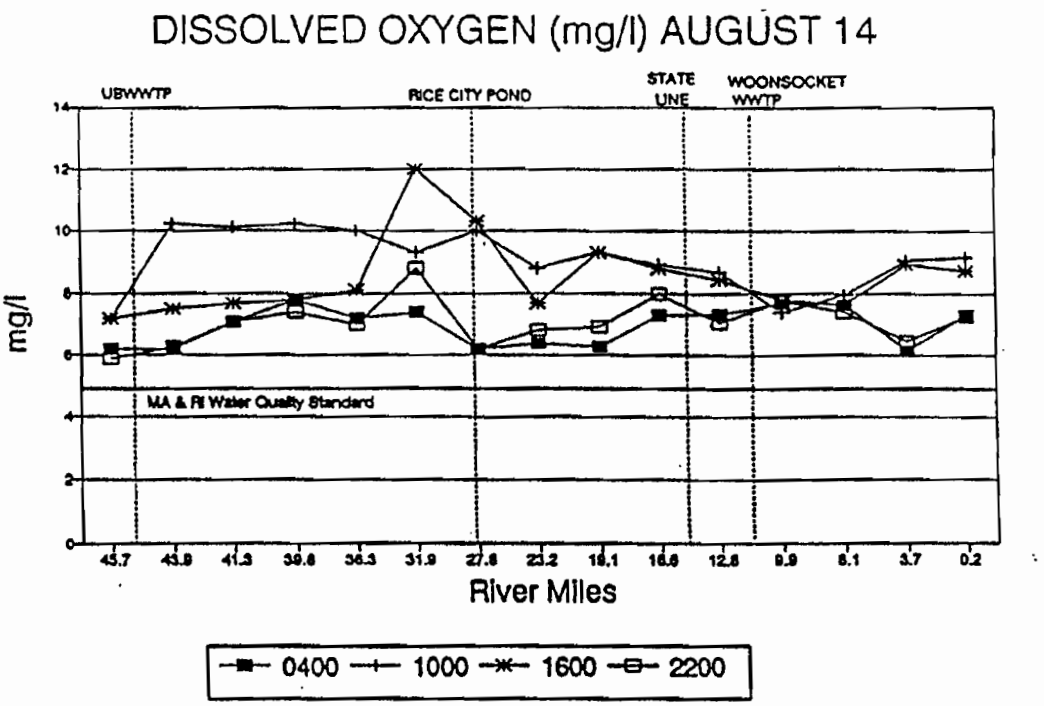


FIGURE IIIb

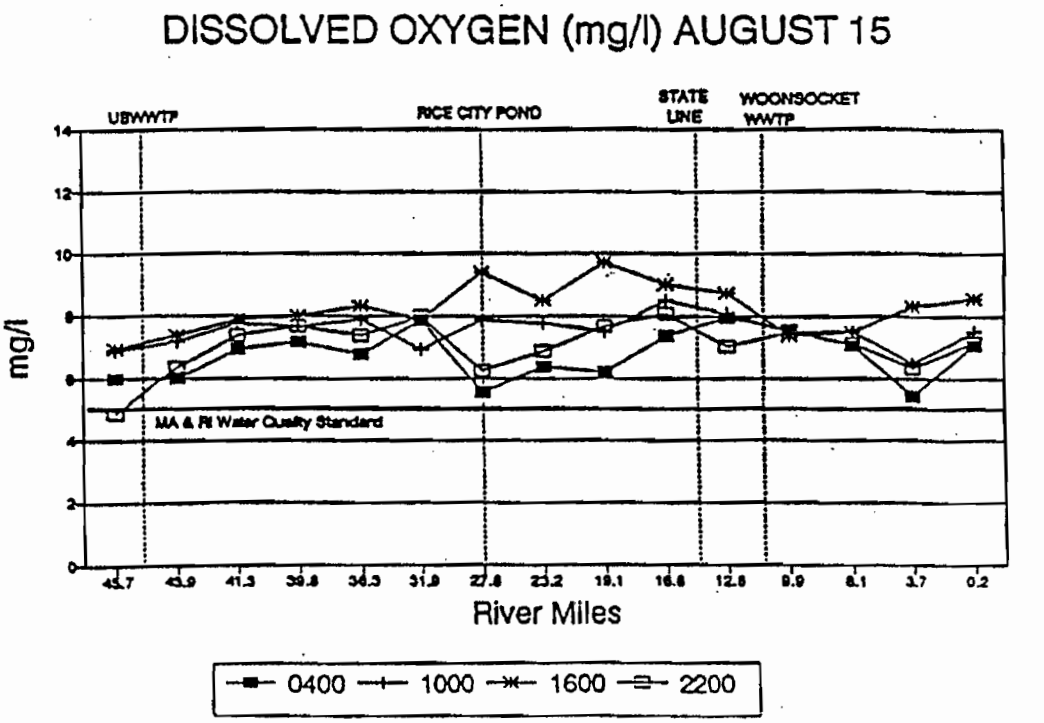


TABLE III

WATER QUALITY STATION LOCATIONS

STATION	DESCRIPTION	TOWN	KM	MI
BLK1	Millbury St.	Worcester	73.7	45.7
BLK2	McCraken Rd.	Millbury	70.7	43.9
BLK3	Riverlin St.	Millbury	66.6	41.3
BLK4	Blackstone St. (Singing Dam)	Sutton	64.2	39.8
BLK5:QR	Millbury St.	Grafton	59.2:3.4	36.7:2.1
BLK6	Route 122A	Grafton (Fisherville)	58.6	36.3
BLK7	Riverdale St.	Northbridge (Riverdale)	51.5	31.9
BLK8	Hartford St. (Rice City Pond)	Uxbridge	44.9	27.8
BLK9:MR	Mendon St. (Rt. 16)	Uxbridge	41.2:1.0	25.5:0.6
BLK10:WR	Hecla St. (Off Rt. 16)	Uxbridge (Centerville)	39.1:1.0	24.2:0.6
BLK11	Route 122 Bridge	Uxbridge	37.4	23.2
BLK12	Route 122 (First RR bridge south of Millville Center)	Millville	30.8	19.1
BLK13	Bridge St.	Blackstone	26.7	16.6
BLK14:BR	Route 146A	Forestdale	28.01:1.3	17.4:0.8
BLK15:MI	Privilege St.	Woonsocket	21.4:1.2	13.3:0.7
BLK16:PR	Route 114 (Diamond Hill Rd.)	Woonsocket	21.2:1.8	13.1:1.1
BLK17	Route 122 (upstream POTW)	Woonsocket	20.6	12.8
BLK18	Manville Hill Rd. (Main St.)	Cumberland	15.9	9.9
BLK19	School St./Albion Rd.	Cumberland (Albion)	13.1	8.1
BLK20	Whipple Bridge, Lonsdale Ave./Mendon Rd.	Cumberland (Lonsdale)	5.9	3.7
BLK21	Exchange St. (Old Slater Mill)	Pawtucket	0.3	0.2

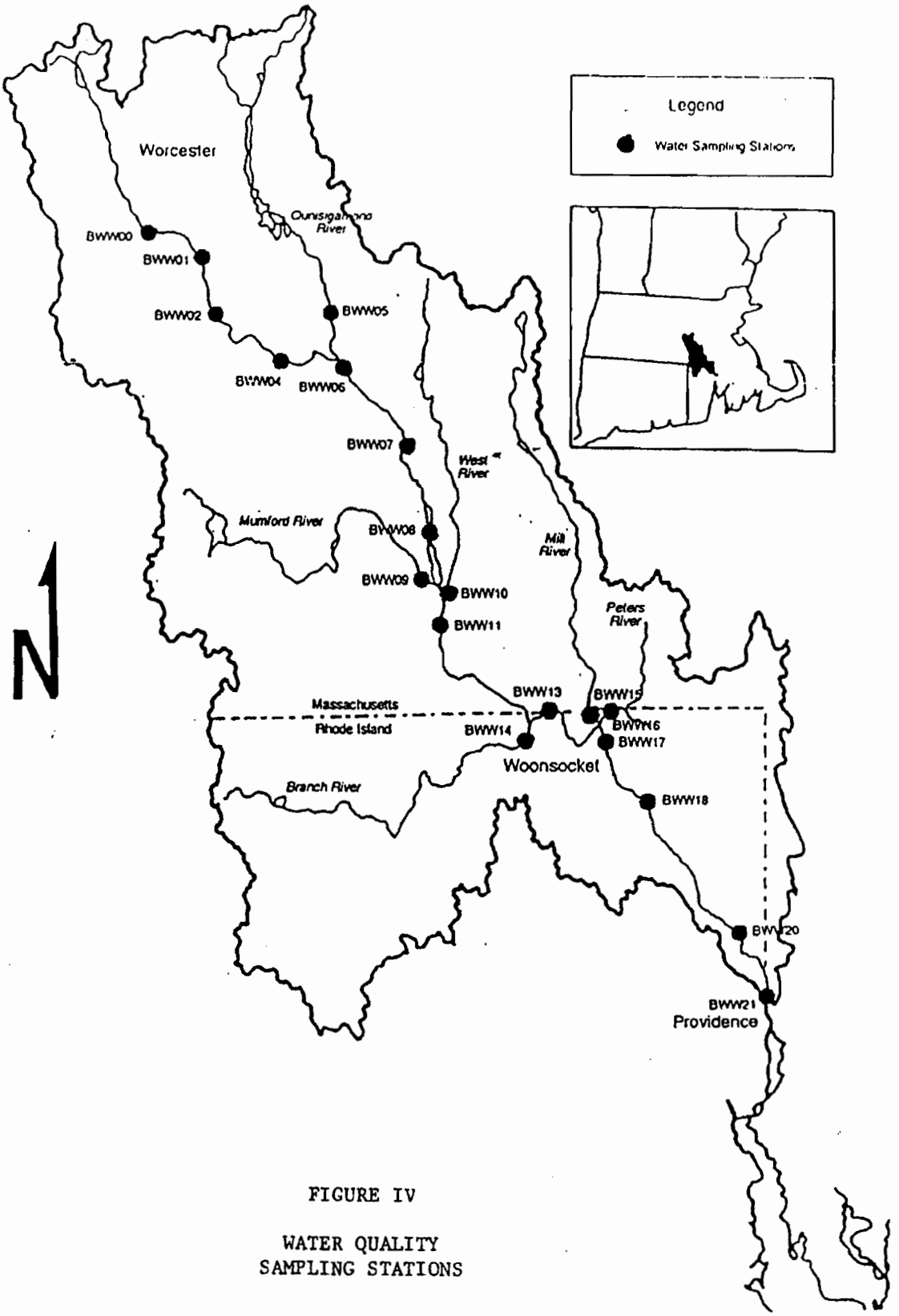


FIGURE IV

WATER QUALITY
SAMPLING STATIONS

TABLE IV

pH MEASUREMENTS (standard units)

STATION	RIVER MILE	JULY 10				JULY 11			
		400	1000	1600	2200	400	1000	1600	2200
BLK01	45.7	7.0	7.2	7.2	7.0	7.0	7.1	7.2	7.1
BLK02	43.9	6.9	7.0	6.8	6.7	6.8	6.9	6.8	6.8
BLK03	41.3	6.9	7.4	7.3	7.1	7.2	7.3	7.5	7.2
BLK04	39.8	7.2	7.4	7.5	7.4	7.3	7.3	7.7	7.4
BLK06	36.3	7.2	7.6	8.4	7.3	7.2	7.4	7.9	7.4
BLK07	31.9	7.2	7.4	8.0	7.8	7.3	7.8	9.1	7.5
BLK07.1							7.6	8.2	
BLK08	27.8	7.1	8.1	8.6	7.2	7.1	7.9	9.4	7.4
BLK08.1							8.2	9.2	
BLK11	23.2	7.2	8.8	7.6	7.5	6.8	8.1	8.6	7.5
BLK12	19.1	7.2	8.7	8.0	7.2	6.8	9.1	9.3	8.1
BLK13	16.6	7.4	8.6	8.0	8.4	7.4	9.2	9.4	8.9
BLK17	12.8	6.8	8.7	9.3	8.3	7.8	9.1	9.4	8.7
BLK18	9.9	7.2	7.9	8.2	7.8	7.3	7.9	8.1	7.6
BLK19	8.1	7.3	7.6	8.6	7.7	7.4	7.8	8.0	7.5
BLK20	3.7	7.0	7.0	7.5	7.3	7.0	7.6	8.3	7.2
BLK21	0.2	7.1	7.1	8.0	7.3	7.2	7.7	8.7	7.3
TRIBUTARIES									
BLK05	36.7,2.1	7.1	7.5	7.2	7.2	7.1	7.2	7.2	7.2
BLK09	25.5,0.6	6.9	7.1	7.5	7.5	6.3	7.0	8.0	7.5
BLK09.1		7.0	7.5	7.1	7.6	6.5	7.1	7.7	7.4
BLK10	24.2,0.6	6.8	7.2	6.3	6.9	6.3	6.9	7.0	6.9
BLK14	17.4,0.8	6.5	6.7	6.7	6.9	7.0	7.4	7.5	6.8
BLK15	13.3,0.7	6.8	6.5	7.3	7.2	7.0	7.4	7.6	7.3
BLK16	13.1,1.1	6.8	6.5	6.6	6.9	6.6	7.0	6.9	6.9

TABLE V

pH MEASUREMENTS (standard units)

STATION	RIVER MILE	OCTOBER 2				OCTOBER 3			
		400	1000	1600	2200	400	1000	1600	2200
BLK01	45.7	7.1	7.4	7.3	7.1	7.0	7.1	6.7	7.1
BLK02	43.9	7.0	7.1	6.6	6.9	6.9	7.0	6.6	7.1
BLK03	41.3	7.3	7.4	7.1	7.2	7.2	7.3	6.9	7.3
BLK04	39.8	7.4	7.5	7.2	7.4	7.4	7.5	7.2	7.2
BLK06	36.3	7.2	7.3	7.1	7.3	7.3	7.3	7.1	7.2
BLK07	31.9	7.2	7.1	7.0	7.2	7.2	7.2	7.2	6.2
BLK07.1		7.2	7.4	7.1		7.4	7.4	7.3	
BLK08	27.8	7.2	7.1	6.8	7.1	7.2	7.2	7.2	6.2
BLK08.1		7.3	7.1	6.9		7.2	7.2	7.3	
BLK11	23.2	7.1	7.2	6.6	7.0	7.1	7.1	6.9	7.2
BLK12	19.1	7.4	7.2	6.7	7.1	7.1	7.2	7.0	7.5
BLK13	16.6	7.2	7.2	6.7	7.0	7.1	7.1	6.9	7.4
BLK17	12.8	7.1	7.2	7.2	7.2	7.1	7.2	7.2	7.1
BLK18	9.9	7.2	7.2	7.2	7.2	7.2	7.2	7.2	7.1
BLK19	8.1	7.2	7.3	7.3	7.3	7.3	7.3	7.2	7.3
BLK20	3.7	7.1	7.2	7.2	7.1	7.1	7.1	7.1	7.1
BLK21	0.2	7.1	7.3	7.2	7.2	7.2	7.2	7.2	7.1
TRIBUTARIES									
BLK05	36.7,2.1	7.3	7.4	7.1	7.3	7.4	7.4	7.0	7.2
BLK09	25.5,0.6	6.9	7.1	6.8	6.8	7.2	7.0	6.7	6.7
BLK09.1		7.2	7.2	6.8	8.7	7.2	7.1	6.6	6.7
BLK10	24.2,0.6	6.8	6.9	6.4	6.6	6.8	6.7	6.5	7.0
BLK14	17.4,0.8	6.8	6.8	6.9	6.8	6.8	6.9	6.9	6.8
BLK15	13.3,0.7	7.1	7.1	7.1	7.0	7.0	7.3	7.1	7.0
BLK16	13.1,1.1	6.7	6.8	6.7	6.7	6.7	6.8	6.7	6.7

TABLE VI

No	Name	River Mile	Reach	Reach Element Below Dam	Height (ft)	Ref
1	McCracken Rd.	43.9	2	2	4	2
2	Millbury Electric Substation	41.0	3	3	4	3
3	Singing Dam	39.8	5	2	14	2
4	Wilkinsonville	39.2	5	4	4	3
5	Saundersville	38.7	5	7	4	3
6	Fisherville	36.5	7	3	4	2
7	Farnumsville	35.6	7	7	4	3
8	Riverdale	31.9	9	2	10	2
9	Rice City Pond	27.8	11	2	10	2
10	Tupperware	17.8	16	3	15	2
11	Blackstone	16.5	18	2	4	3
12	Thundermist	14.3	19	2	18	2
13	Manville	9.9	21	2	17	2
14	Albion	8.2	22	2	6	2
15	Ashton	6.8	23	2	7	3
16	Lonsdale	4.1	23	15	4	1
17	Central Falls	2.0	25	2	13	1
18	Pawtucket	0.8	25	7	14	1
19	Slaters Mill	0.0	25	10	18	1

Ref. = Reference; 1 = Army Corps of Engineers (1973); 2 = Personal communication (MADEP 1992); 3 = Field Survey

TABLE VII

BLACKSTONE RIVER WLA - BASELINE CONDITIONS FOR POINT SOURCE INPUTS

Point Source	Flow cfs	DO mg/l	BOD mg/l	NH3 mg/l	Phos mg/l	Chlor a ug/l
Headwaters	6.52	6.8	1.4	0.4	0.02	2.2
Quinsig. River	3.03	6.5	1.2	0.2	0.04	1.5
Mumford River	5.89	7.8	1.2	0.1	0.05	1.5
West River	3.22	6.2	1.2	0.2	0.04	1.5
UBWPAD	86.60	6.0	10.0	2.0	2.4	
Millbury	1.85	5.0	30.0	15.0	3.3	
Grafton	2.46	5.0	30.0	15.0	1.9	
Northbridge	2.77	5.0	30.0	15.0	3.2	
Uxbridge	3.88	5.0	30.0	15.0	3.7	
Branch River	13.76	7.3	1.3	0.2	0.05	2.4
Mill River	1.97	7.3	1.6	0.2	0.04	4.6
Peters River	1.00	5.6	1.2	0.2	0.03	3.1
Woonsocket	24.64	5.0	30.0	5.8	3.8	

1. Headwater and tributary flows are from the 7Q10 flow balance in the model and WWTF flows are current design flows.

2. Headwater and tributary dissolved oxygen values are an average of the 1991 July and August survey data and WWTF dissolved oxygen values are estimated, with the exception of UBWPAD which is based on a permit limit.

3. Headwater and tributary BOD and NH3 values are an average of the 1991 July and August survey data. WWTF BOD values are based on permit limits. WWTF NH3 values are based on permit limits. A value of 15 mg/l was used for secondary treatment plants without permit limits.

4. Headwater and tributary phosphorus values are an average of the 1991 July and August survey data with the exception of the Mumford River value which was reduced to reflect recent source reductions. WWTF phosphorus values for UBWPAD and Woonsocket are an average of the 1991 July and August survey data and values for all other WWTFs are from data collected by MDEP in 1988.

5. Headwater and tributary chlorophyll a values are an average of the 1991 July and August survey data.

WASTE LOAD ALLOCATION:

All simulations were conducted using the dynamic mode for estimating the DO level at 6:00 a.m., which was determined to be the minimum daily value. The initial simulation was designed to reflect DO levels at critical low flow and current permitted discharge loadings. The initial assumptions for this baseline condition are detailed in Table VII.

The results of this simulation indicate that the dissolved oxygen standard will be violated for 4.4 river miles in Massachusetts and 1.6 river miles in Rhode Island. There are a total of 28 river miles in Massachusetts and 18 river miles in Rhode Island. The critical areas for DO in the Massachusetts section are Fisherville impoundment in Grafton and Rice City Pond in Uxbridge. The critical area for DO in the Rhode Island section is Central Falls, upstream of a series of three large dams. The minimum projected DO values are 4.1 mg/l in Massachusetts and 2.7 mg/l in Rhode Island.

In Massachusetts, the DO sag is primarily driven by sediment oxygen demand (SOD) and BOD/NH3 decay. In Rhode Island, the DO sag is primarily driven by phosphorus, SOD, and NH3 decay. The chlorophyll a values in Rhode Island are indicative of highly eutrophic conditions. Projected DO and chlorophyll a values for the baseline conditions are graphed in Figure V.

During development of the wasteload allocation, three facilities on the mainstem river in Massachusetts (Millbury, Grafton and Northbridge) requested increases in their discharge flow. These flow increases are included under scenario #1 and are used as the basis for all future WLA scenarios. Flow increases are tabulated below.

	Present Flows		Requested Flows	
Millbury	1.85 cfs	1.2 mgd	4.19 cfs	2.7 mgd
Grafton	2.46 cfs	1.6 mgd	3.72 cfs	2.4 mgd
Northbridge	2.77 cfs	1.8 mgd	3.1 cfs	2.0 mgd
TOTAL WWTF FLOWS	7.08 cfs	4.6 mgd	11 cfs	7.1 mgd

Successive simulations were designed to demonstrate the water quality improvements resulting from various levels of additional treatment for the WWTF discharges. The treatment level for each scenario was selected based on the component analysis of the model which indicates the parameters contributing the most to the DO sag, including the relative importance of these components. These simulations are summarized in Table VIII. A comparative analysis of effluent treatment levels by scenario is provided in Table IX. DO graphs are included for selected simulations (Figures VI-XI).

TABLE VIII

BLACKSTONE RIVER DISSOLVED OXYGEN WLA SIMULATIONS

Scenario	Minimum DO (mg/l)	# of Miles Violated	Chla(ug/l)	Location	
Baseline:	All WWTFs at current permitted levels (see Table VII)				
MA	4.5	0.8	0.5	Fisherville	(R7E1)
	4.7	1.2	0.9	Riverdale	(R9E1)
	4.1	2.4	3.0	Rice City Pond	(R10E7)
RI	2.7	1.6	61.4	Central Falls	(R9E9)
	* maximum chlorophyll a = 67.0 ug/l at R8E11 in RI				
Scenario #1:	Baseline + Smaller MA WWTFs at higher requested flows				
MA	4.3	0.8	0.5	Fisherville	(R7E2)
	4.3	1.8	0.8	Riverdale	(R9E1)
	3.7	3.0	2.8	Rice City Pond	(R10E7)
RI	3.2	1.4	64.2	Central Falls	(R9E9)
	* maximum chlorophyll a = 67.7 ug/l at R9E1 in RI				
Scenario #2:	Scenario #1 + Woonsocket with AT (BOD/NH3 = 10/2 mg/l)				
MA	4.3	0.8	0.5	Fisherville	(R7E2)
	4.3	1.8	0.8	Riverdale	(R9E1)
	3.7	3.0	2.8	Rice City Pond	(R10E7)
RI	3.7	1.2	64.2	Central Falls	(R9E9)
	* maximum chlorophyll a = 67.6 ug/l at R9E1 in RI				
Scenario #3:	Scenario #2 + Woonsocket with phosphorus at 0.75 mg/l				
MA	4.3	0.8	0.5	Fisherville	(R7E2)
	4.3	1.8	0.8	Riverdale	(R9E1)
	3.7	3.0	2.8	Rice City Pond	(R10E7)
RI	3.1	1.4	47.4	Central Falls	(R9E9)
	* maximum chlorophyll a = 55.0 ug/l at R7E7 in RI				

TABLE VIII (Continued)

Scenario	Minimum DO (mg/l)	# of Miles Violated	Chla(ug/l)	Location	
Scenario #4: Scenario #3 + UBWPAD with phosphorus at 1.0 mg/l					
MA	4.3	0.8	0.5	Fisherville	(R7E2)
	4.3	1.8	0.8	Riverdale	(R9E1)
	3.7	3.0	2.6	Rice City Pond	(R10E7)
RI	4.8	0.2	27.7	Ashton	(R7E7)
	3.9	1.2	22.7	Central Falls	(R9E9)
	* maximum chlorophyll a = 31.9 ug/l at R6E4 in RI				
Scenario #5: Scenario #3 + UBWPAD with phosphorus at 0.75 mg/l					
MA	4.3	0.8	0.5	Fisherville	(R7E2)
	4.3	1.8	0.8	Riverdale	(R9E1)
	3.7	3.0	2.5	Rice City Pond	(R10E7)
RI	4.7	0.4	23.1	Ashton	(R7E7)
	4.2	1.0	19.0	Central Falls	(R9E9)
	* maximum chlorophyll a = 27.5 ug/l at R6E2 in RI				
Scenario #6: Scenario #5 + Woonsocket P at 1.00 mg/l					
MA	4.3	0.8	0.5	Fisherville	(R7E2)
	4.3	1.8	0.8	Riverdale	(R9E1)
	3.7	3.0	2.5	Rice City Pond	(R10E7)
RI	4.7	0.2	24.3	Ashton	(R7E7)
	4.1	1.2	20.0	Central Falls	(R9E9)
	* maximum chlorophyll a = 28.6 ug/l at R6E3 in RI				
Scenario #7: Scenario #6 + Smaller MA WWTFs with phosphorus at 1.0 mg/l					
MA	4.3	0.8	0.5	Fisherville	(R7E2)
	4.3	1.8	0.8	Riverdale	(R9E1)
	3.7	3.0	2.5	Rice City Pond	(R10E7)
RI	4.9	0.2	19.8	Ashton	(R7E1)
	4.7	0.4	18.1	Ashton	(R7E7)
	4.4	0.8	15.0	Central Falls	(R9E9)
	* maximum chlorophyll a = 22.2 ug/l at R5E14 in RI				

TABLE VIII (Continued)

Scenario	Minimum DO (mg/l)	# of Miles Violated	Chla(ug/l)	Location	
Scenario #8: Scenario #7 + Smaller MA WWTFs at advanced secondary (BOD/NH3=20/5mg/l)					
MA	4.6	0.6	0.5	Fisherville	(R7E2)
	4.9	0.4	0.8	Riverdale	(R9E1)
	4.6	1.8	2.5	Rice City Pond	(R10E7)
RI	4.7	0.6	15.0	Central Falls	(R9E9)

* maximum chlorophyll a = 22.2 ug/l at R5E14 in RI

Scenario #9: Scenario #8 + SOD reduction of 25%

no miles in MA or RI violating WQS

* maximum chlorophyll a = 22.2 ug/l at R5E14 in RI

Scenario #9a: Scenario #8 + UBWPAD (BOD/NH3/P = 5/1/0.5 mg/l) and Woonsocket (BOD/NH3/P = 10/1/0.75 mg/l)

no river miles in MA or RI violating WQS

* maximum chlorophyll a = 16.3 ug/l at R5E13 in RI

Scenario #10: Scenario #8 + UBWPAD flow at 35 mgd (54.25 cfs)

MA	4.8	0.4	0.5	Singing Dam	(R5E1)
	3.9	1.0	0.9	Fisherville	(R7E1)
	4.7	1.2	1.5	Riverdale	(R9E1)
	4.9	1.0	5.6	Rice City Pond	(R10E4)
RI	4.4	0.8	14.7	Ashton	(R7E1)
	4.6	0.6	13.4	Ashton	(R7E7)
	4.5	0.8	11.0	Central Falls	(R9E9)

* maximum chlorophyll a = 18.0 ug/l at R3E6 in RI

TABLE IX
Comparative Analysis of Treatment Levels by Scenario

		BASELINE	1* (B)	2 (1)	3 (2)	4 (3)	5 (3)	6 (5)	7 (6)	8 (7)	9 (8)	9A (8)	10 (8)	11 (10)
UBWPAD	DO	6	6	6	6	6	6	6	6	6	6	6	6	6
	BOD	10	10	10	10	10	10	10	10	10	10	5	10	10
	NH3	2	2	2	2	2	2	2	2	2	2	1	2	2
	P	2.4	2.4	2.4	2.4	1	.75	.75	.75	.75	.75	.5	.75	.75
	FLOW	56	56	56	56	56	56	56	56	56	56	56	35	35
WOONSOCKET	DO	5	5	5	5	5	5	5	5	5	5	5	5	5
	BOD	30	30	10	10	10	10	10	10	10	10	10	10	10
	NH3	5.8	5.8	2	2	2	2	2	2	2	2	1	2	2
	P	3.8	3.8	3.8	.75	.75	.75	1	1	1	1	.75	1	1
	FLOW	16	16	16	16	16	16	16	16	16	16	16	16	16
MILLBURY GRAFTON NORTHBRIDGE UXBRIDGE	DO	5	5	5	5	5	5	5	5	5	5	5	5	5
	BOD	30	30	30	30	30	30	30	30	20	20	20	20	20
	NH3	15	15	15	15	15	15	15	15	5	5	5	5	5
MILLBURY	PHOS	3.3	3.3	3.3	3.3	3.3	3.3	3.3	1	1	1	1	1	1
GRAFTON	PHOS	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1	1	1	1	1	1
NORTHBRIDGE	PHOS	3.2	3.2	3.2	3.2	3.2	3.2	3.2	1	1	1	1	1	1
UXBRIDGE	PHOS	3.7	3.7	3.7	3.7	3.7	3.7	3.7	1	1	1	1	1	1
MILLBURY	FLOW	1.2	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7
GRAFTON	FLOW	1.6	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4
NORTHBRIDGE	FLOW	1.8	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
UXBRIDGE	FLOW	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
SOD		100%	100	100	100	100	100	100	100	100	-25%	100	100	-25%

NOTE: DO, BOD, NH3 and P are in mg/l and flow is in MGD.
* Number in () indicates which scenario was used as the basis from which to make changes.

Seasonal simulations were also conducted in order to reflect higher flows and lower temperatures representing critical conditions at different times of the year.

WASTE LOAD ALLOCATION RESULTS/DISCUSSION:

The greatest incremental improvement in water quality for the Massachusetts section of the river results from additional BOD and NH3 removal at the smaller WWTFs. The greatest incremental improvement in water quality for the Rhode Island section of the river results from phosphorus control at UBWPAD and Woonsocket, and additional NH3 removal at Woonsocket. Scenario #8 reflects all of these improvements and the result is a significant reduction in the number of miles for which DO criteria are violated. The minimum DO increases from 3.7 mg/l to 4.6 mg/l in Massachusetts and from 3.2 mg/l to 4.7 mg/l in Rhode Island, and the maximum chlorophyll a levels in the river reduce from 68 ug/l to 22 ug/l, as compared to scenario #1.

While the smaller WWTFs do not have a significant affect individually, collectively they have a significant affect as indicated by scenarios #7 and #8. When advanced secondary treatment (including phosphorus removal) was evaluated, the river miles not meeting standards dropped by 3.6 mi. In addition, the minimum DO in Massachusetts increased by 0.9 mg/l, and the minimum DO in Rhode Island increased by 0.6 mg/l. The maximum chlorophyll a was reduced by 7 ug/l.

Once the point source loads from the treatment facilities are reduced, sediment oxygen demand (SOD) becomes the remaining major component of the DO sag at several locations. Scenario #9 indicates that SOD would have to improve by 25% in order to meet DO standards with the treatment levels evaluated in scenario #8.

Assuming no improvement in SOD levels, scenario #9a indicates the amount of additional phosphorus, NH3, and BOD control required at the two larger treatment facilities in order to meet DO standards. This requires a reduction in the phosphorus discharge to 0.5 mg/l at UBWPAD and 0.75 mg/l at Woonsocket, a reduction in the NH3 discharge to 1.0 mg/l for UBWPAD and Woonsocket, and a reduction in the BOD to 5 mg/l for UBWPAD.

SOD and assumptions related to improvements in SOD over time are a significant issue. Information on SOD values is available through both the literature and actual field sampling in the Blackstone River. During the Blackstone River Initiative, SOD sampling was conducted at a number of sites. This information was used, in combination with the literature values, in the calibration and verification process for the model. The values used in the model closely resemble the values measured in the field and are well within the range of literature values. Literature values, average

field data results, and the final numbers selected for the WLA model are summarized below.

Average Values of SOD from EPA Rates Manual

Bottom Type	Range**	Average**
WWTF outfall	2-10.0	4
WWTF downstream	1-2	1.5
Sandy bottom	0.2-1.0	0.5
Mineral Soils	0.05-0.1	0.07

** Uptake values (g O^2/m^2/day at 20 degrees Celsius)

Range of Values for SOD from the WLA

Massachusetts SOD values in WLA model	Rhode Island SOD values in WLA model
1.6-5.9 g O^2/m^2/day	1.6-4.0 g O^2/m^2/day

Range of Average Values for SOD Measured in the Blackstone River

Massachusetts SOD values measured instream	Rhode Island SOD values measured instream
1.5-6.0 g O^2/m^2/day	1.5-5.8 g O^2/m^2/day

Wet weather and dry weather sources of pollutants other than WWTF discharges are being dealt with on a number of levels in the watershed, especially in the upper reaches. The first two miles of the system were identified during the comprehensive Blackstone River Initiative sampling as contributing extensive solids during wet weather. The federal and state agencies are attempting to reduce these sources through the permit and grant process. The City of Worcester Stormwater Permit is under development and the City is moving forward with remediation efforts in their collection and distribution system. EPA is supporting source reduction activities in the City of Worcester through a grant for stormdrain and catchment identification and GIS mapping. The Worcester CSO facility is also being evaluated relative to the need for improvement of the quality of the discharge. In addition, EPA is funding an individual to assist in the implementation of state and federal stormwater regulations in the watershed and EOEA has given a Massachusetts Watershed Initiative Capacity Building Grant to develop and reinforce mechanisms for control on a local level.

Efforts are also being directed at moderating resuspension and

movement of contaminated sediments. The USACOE is evaluating sediment stabilization as part of their ongoing work in the Blackstone watershed. In addition, a MADEP grant has been issued to moderate flow impacts in the Rice City Pond impoundment through changes to the dam and biostabilization of the sediments.

SOD will also benefit from the proposed point source reduction levels. In particular the decrease in phosphorus should result in decreased algal growth and therefore decreased deposition of organic matter.

Another issue of concern is that the UBWPAD discharge is unlikely to reach the design discharge volume which is traditionally used in developing WLA's. Scenario #10 evaluates water quality with a reduced UBWPAD flow volume. Under the reduced flow scenario, the DO profile is actually worse at most locations. This is primarily due to a decrease in flow velocities which can increase the impacts of algal respiration, SOD, BOD, and NH3.

In addition to establishing treatment requirements necessary to meet DO standards during the critical low flow and high temperature summer period of June - September, treatment requirements were evaluated for higher flow and lower temperature periods. Treatment requirements necessary to achieve DO standards throughout the year are given in the table below. In this table, the design flow of UBWPAD is used and the river flows reflect the flow at the Woonsocket gage.

Seasonal Limits

	June-Sept. 7Q10 77 deg	Oct. 7Q10 60 deg	Nov. 152 cfs 50 deg	Dec.-March 152 cfs 40 deg	April 152 cfs 50 deg	May 152 cfs 60 deg
	BOD/NH3 mg/l	BOD/NH3 mg/l	BOD/NH3 mg/l	BOD/NH3 mg/l	BOD/NH3 mg/l	BOD/NH3 mg/l
UBWPAD	10/2	20/4	30/8	30/15	30/8	20/5
Smaller WWTFs	20/5	20/10	30/10	30/15	30/10	20/10
Woon-socket	10/2	30/15	30/15	30/15	30/15	30/12

The major components affecting DO in the non-summer period are BOD/NH3 and SOD. Algal growth is insignificant due to the cooler water temperatures. All of the above treatment levels include the assumption that SOD will decrease by 25% over time.

RECOMMENDATIONS:

Under design discharge flow conditions, the treatment levels evaluated under scenario #9a would be required to meet water quality standards for DO. However, the importance of SOD at several of the critical DO sag points cannot be understated. It is reasonable to assume that SOD levels will decrease with improved discharge treatment levels and ongoing work to control other wet weather and dry weather sources of pollution. A SOD reduction of 25%, when combined with the discharge treatment levels evaluated in scenario #8, will achieve DO standards. In addition to significant improvements in DO, the recommended treatment levels will also result in a significant reduction in eutrophication and less extreme variations in DO and pH over a 24 hour period.

Treatment levels under Scenario #8 are outlined below:

	Flow MGD	DO mg/l	BOD mg/l	NH3 mg/l	Phos mg/l
UBWPAD	56.0	6.0	10	2.0	0.75
Millbury	2.7	5.0	20	5.0	1.00
Grafton	2.4	5.0	20	5.0	1.00
Northbridge	2.0	5.0	20	5.0	1.00
Uxbridge	2.5	5.0	20	5.0	1.00
Woonsocket	16.0	5.0	10	2.0	1.00

Although WLAs are generally developed for design discharge volumes, it is appropriate to evaluate water quality under reduced discharge volumes when actual discharge volumes are significantly lower than design volumes. This is the case with the UBWPAD discharge. Scenario #10 indicates that the DO profile is worse under the reduced discharge volume. With the 25% reduction in SOD, one remaining DO criteria violation exists at Fisherville Impoundment in Massachusetts (4.5 mg/l). The US Army Corps of Engineers is currently evaluating modifications at Fisherville Impoundment to enhance water quality and habitat.

The treatment levels evaluated in scenario #10 are still the recommended alternative. Given the uncertainties of SOD reduction levels and the potential for future modifications to the Fisherville Impoundment, additional treatment requirements may not be warranted at this time. This approach is consistent with the phased WLA approach identified in EPA guidance documents for developing WLAs. The phased approach requires post implementation monitoring to determine if additional treatment is required. Post implementation monitoring should focus on evaluating SOD reduction levels at key locations and the effect of any changes made to the Fisherville Dam, as well as how treatment improvements at the WWTFs are being translated into water quality improvements in the river.

Current requirements at all WWTFs during the non-summer period are

for secondary treatment only. This WLA identifies the need for seasonal effluent limits more stringent than secondary limits. These limits are outlined in the table in the previous section. The method for incorporating these limits into permits should be addressed during the permit process.

As part of the permitting strategy, the Agencies (EPA, MADEP and RIDEM) will be conducting an informational workshop and public outreach effort. This effort will provide an opportunity to discuss the above recommendations, including the potential for alternative strategies for achieving the same desired environmental results.

The Blackstone River Initiative (BRI) and the Narragansett Bay studies have also shown that dry weather loadings of nitrogen to Narragansett Bay are significant and may be contributing to excessive productivity and DO concerns in the Bay. The BRI concluded that 78% of the annual nitrogen load to Narragansett Bay occurs during dry weather, and over 90% of the dry weather load is from point sources. A WLA for Narragansett Bay is currently under development. Once this WLA is completed, total nitrogen limits may be recommended for point sources discharging to the Blackstone River. Facility planning efforts should include an evaluation of denitrification options.

Figure V

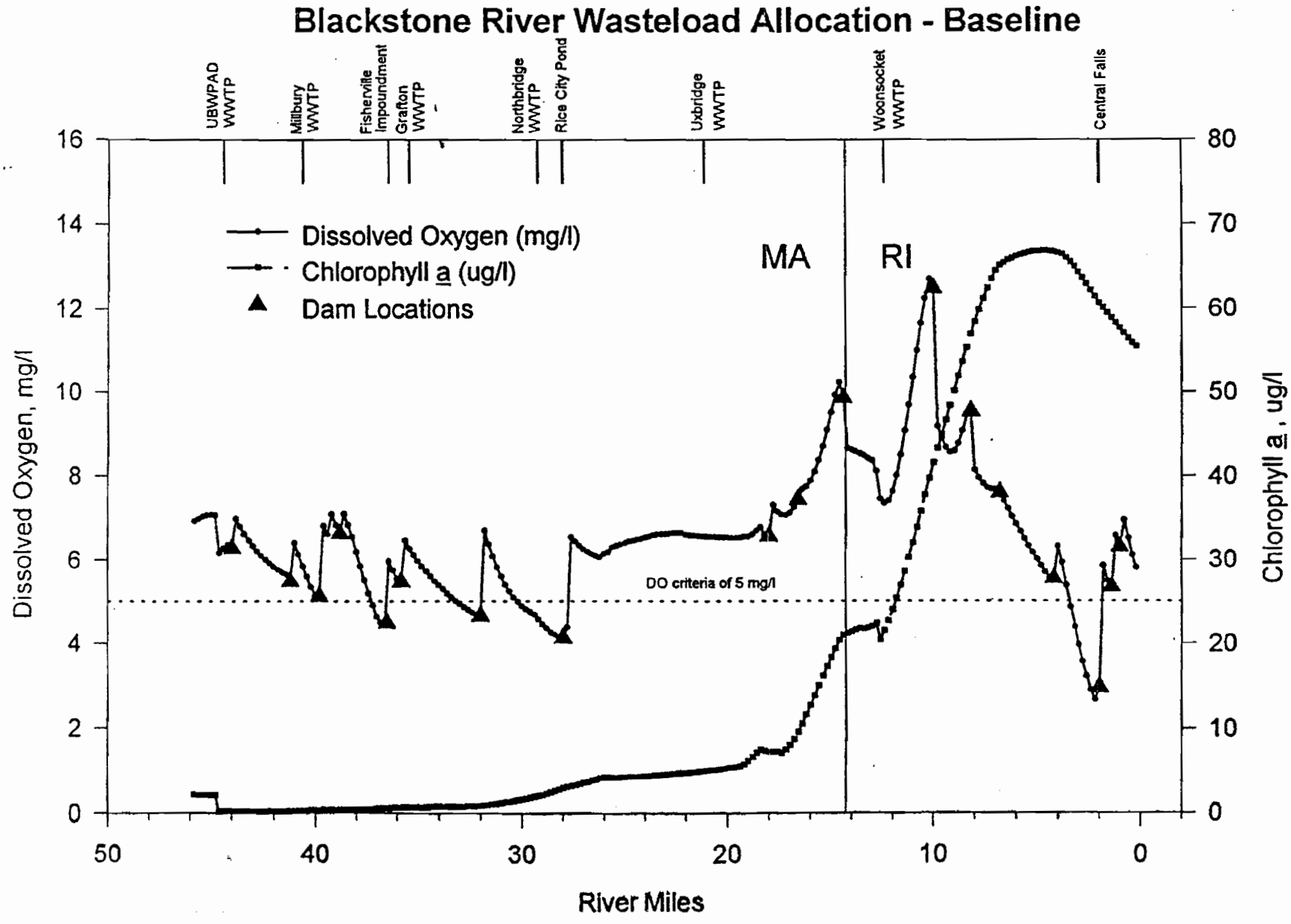

Blackstone River Wasteload Allocation - Baseline
UBWPAD WWTP
Millbury WWTP
Fisherville Impoundment
Grafton WWTP
Northbridge WWTP
Rice City Pond
Uxbridge WWTP
Woonsocket WWTP
Central Falls
Dissolved Oxygen (mg/l)
Chlorophyll a (ug/l)
Dam Locations
MA
RI
DO criteria of 5 mg/l
Dissolved Oxygen, mg/l
Chlorophyll a , ug/l
River Miles
16
14
12
10
8
6
4
2
0
80
70
60
50
40
30
20
10
0
50
40
30
20
10
0

Figure VI

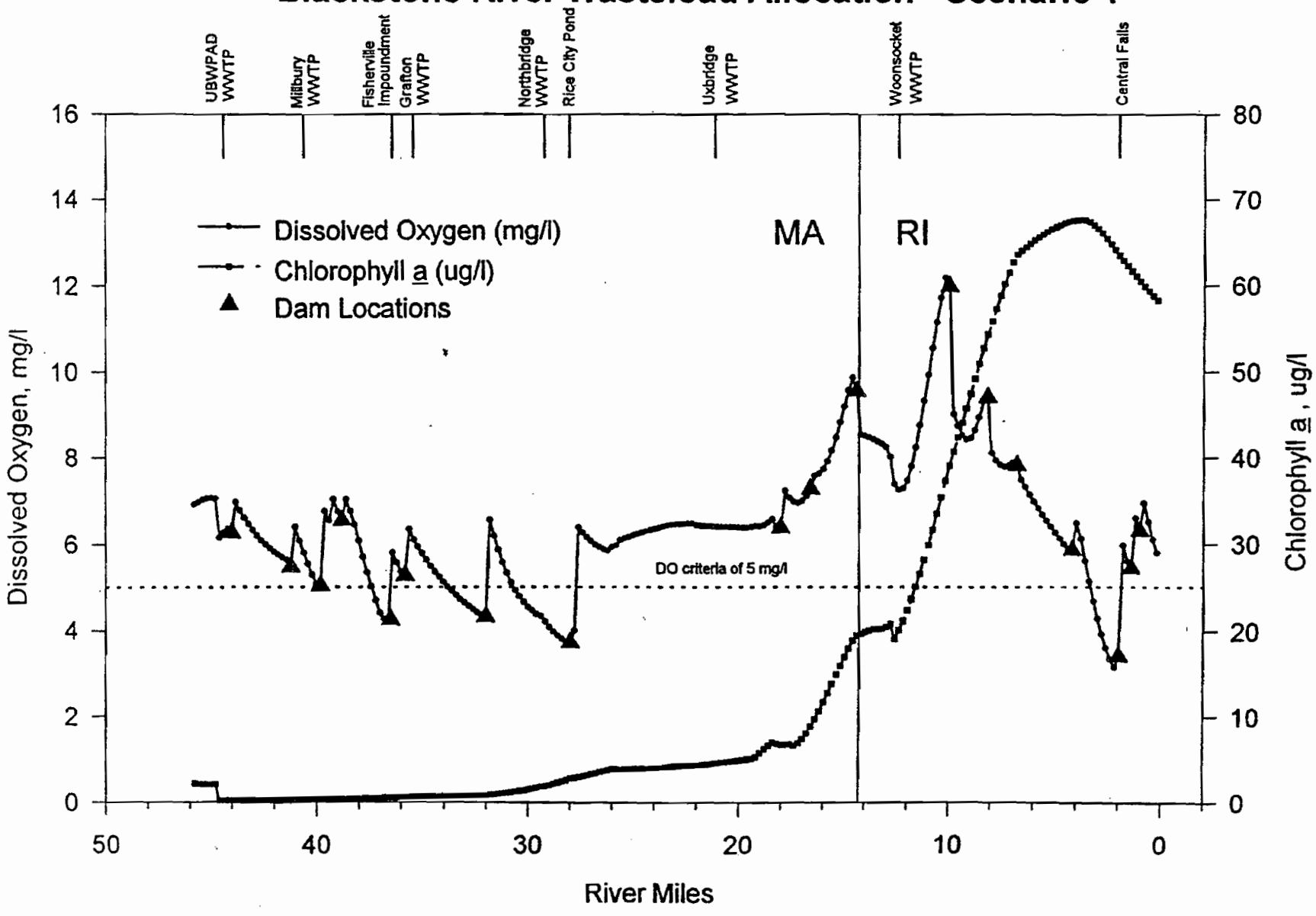

Blackstone River Wasteload Allocation - Scenario 1
UBWPAD WWTP
Millbury WWTP
Fisherville Impoundment
Grafton WWTP
Northbridge WWTP
Rice City Pond
Uxbridge WWTP
Woonsocket WWTP
Central Falls
Dissolved Oxygen (mg/l)
Chlorophyll a (ug/l)
Dam Locations
MA
RI
DO criteria of 5 mg/l
Dissolved Oxygen, mg/l
Chlorophyll a , ug/l
River Miles
16
14
12
10
8
6
4
2
0
80
70
60
50
40
30
20
10
0
50
40
30
20
10
0

Figure VII

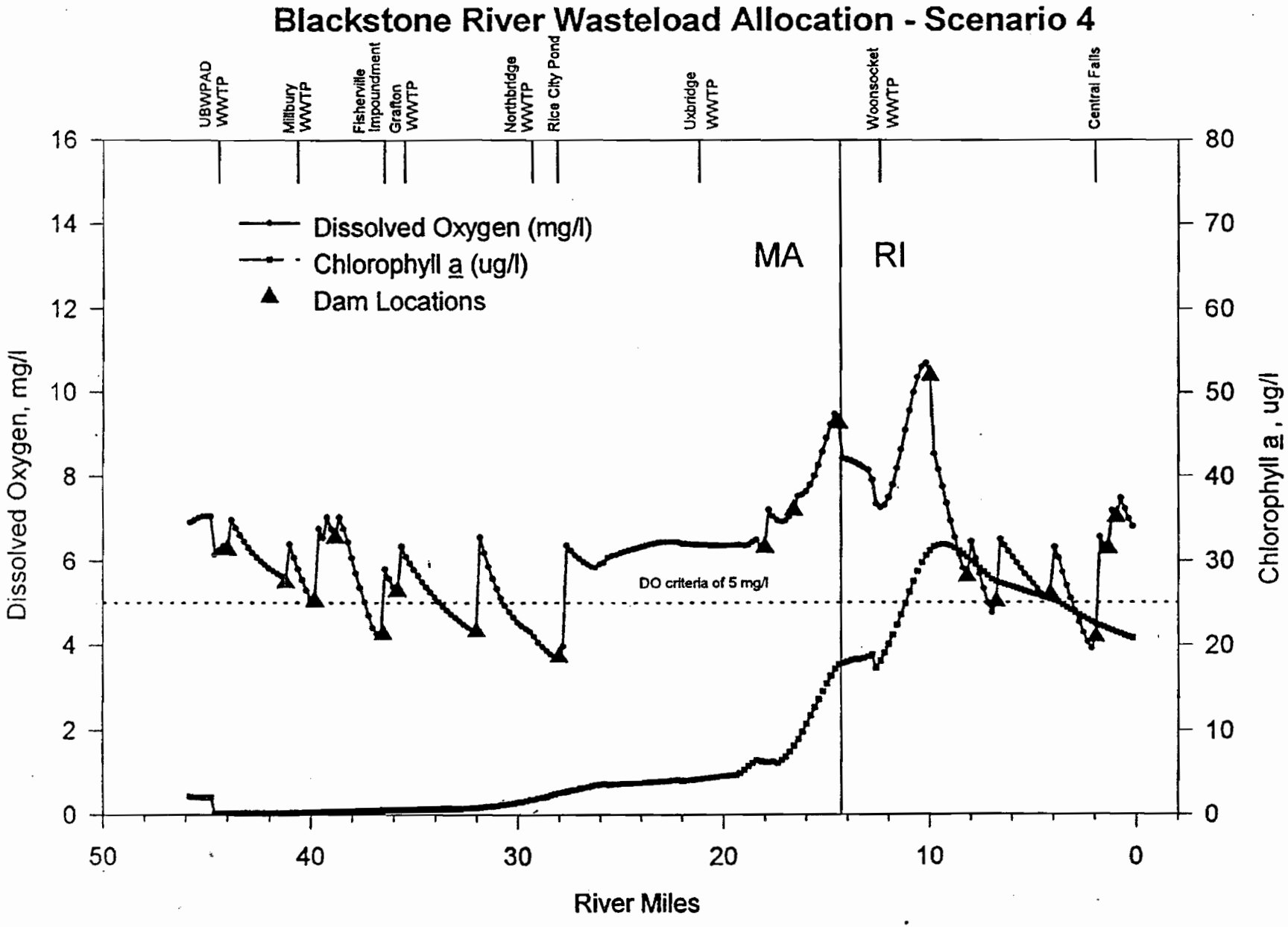

Blackstone River Wasteload Allocation - Scenario 4
UBWPAD WWTP
Millbury WWTP
Fisherville Impoundment
Grafton WWTP
Northbridge WWTP
Rice City Pond
Uxbridge WWTP
Woonsocket WWTP
Central Falls
Dissolved Oxygen (mg/l)
Chlorophyll a (ug/l)
Dam Locations
MA
RI
DO criteria of 5 mg/l
Dissolved Oxygen, mg/l
Chlorophyll a , ug/l
River Miles
16
14
12
10
8
6
4
2
0
80
70
60
50
40
30
20
10
0
50
40
30
20
10
0

Figure VIII

Blackstone River Wasteload Allocation - Scenario 5

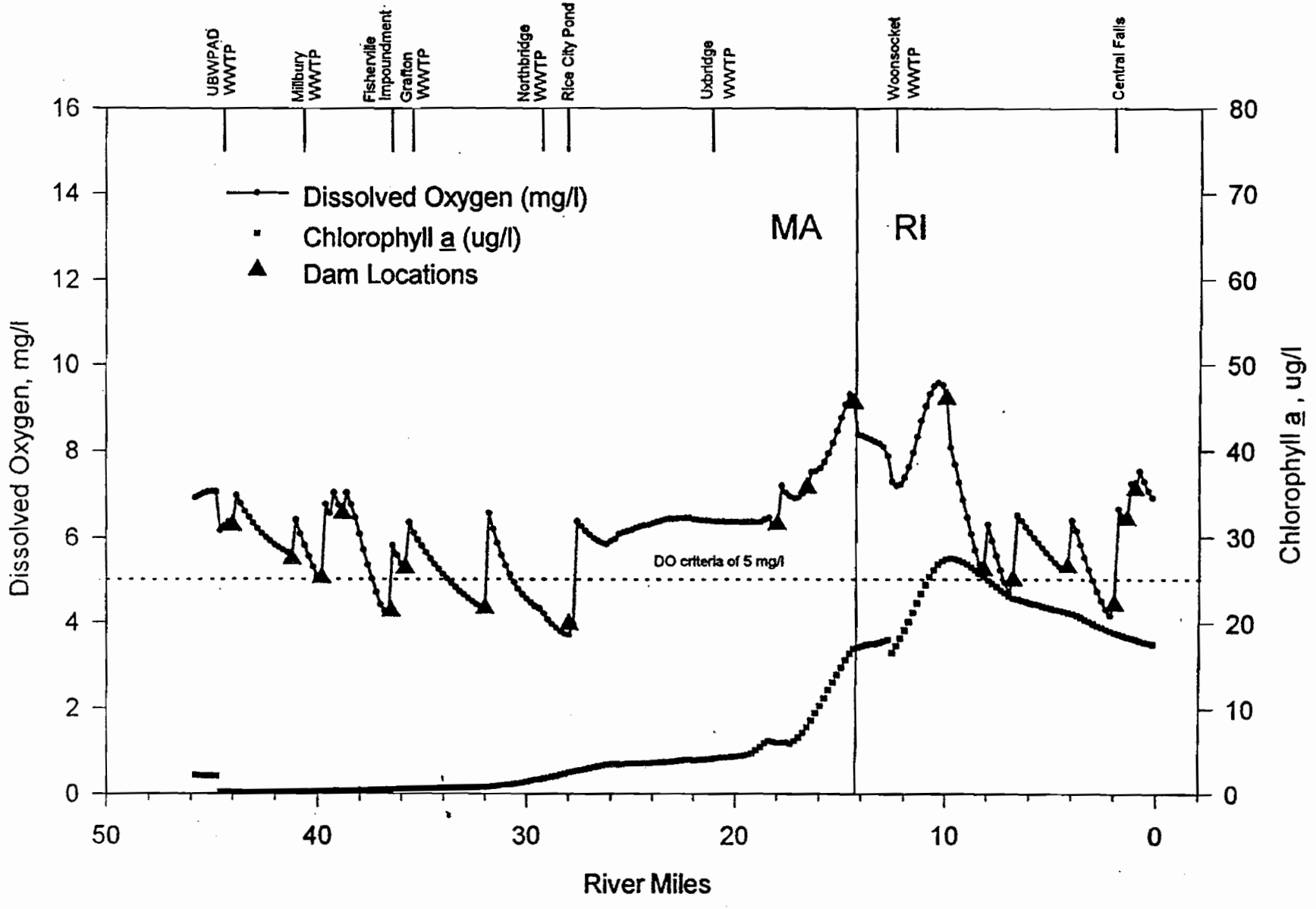


Figure IX

Blackstone River Wasteload Allocation - Scenario 8

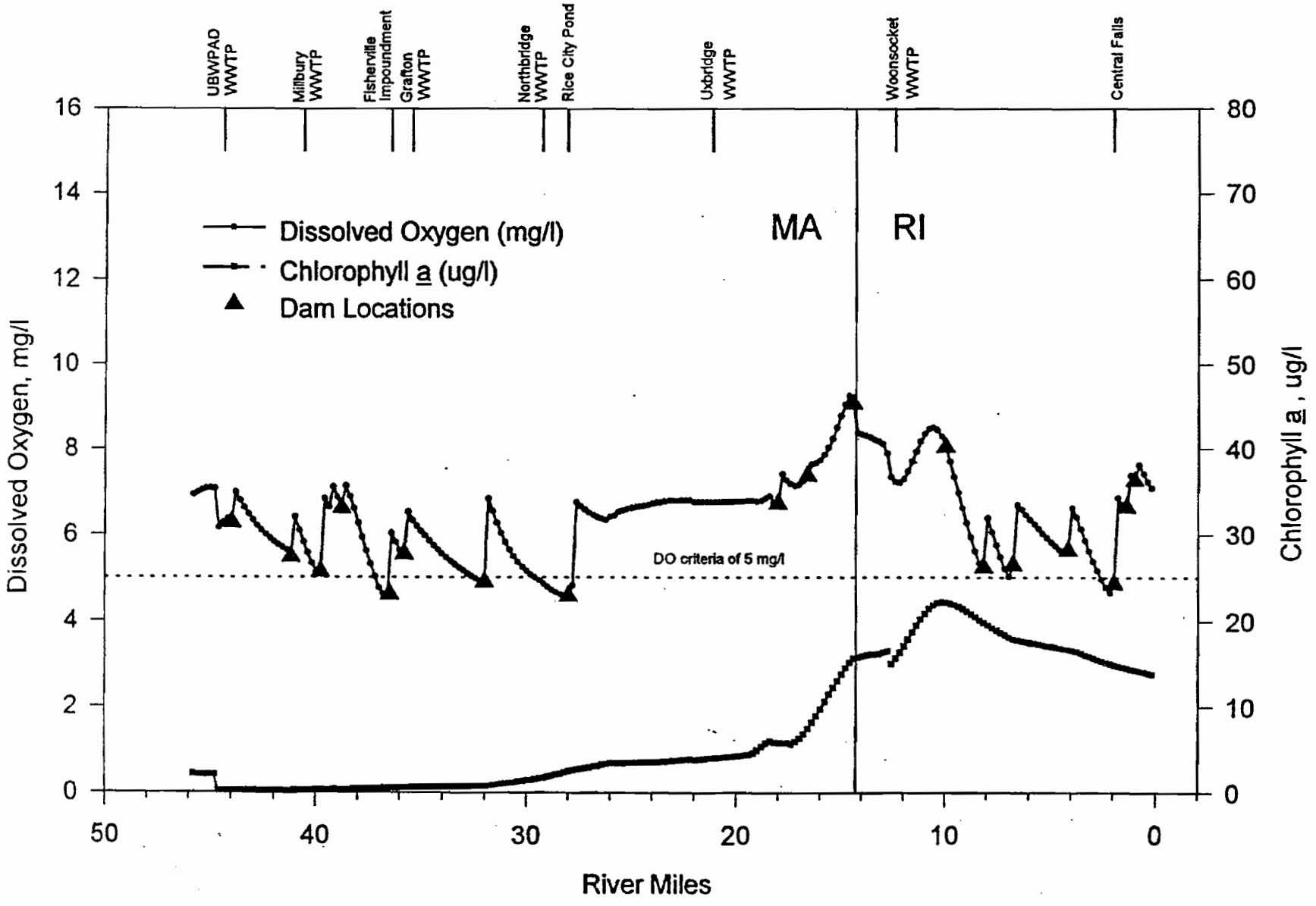


Figure X

Blackstone River Wasteload Allocation - Scenario 9

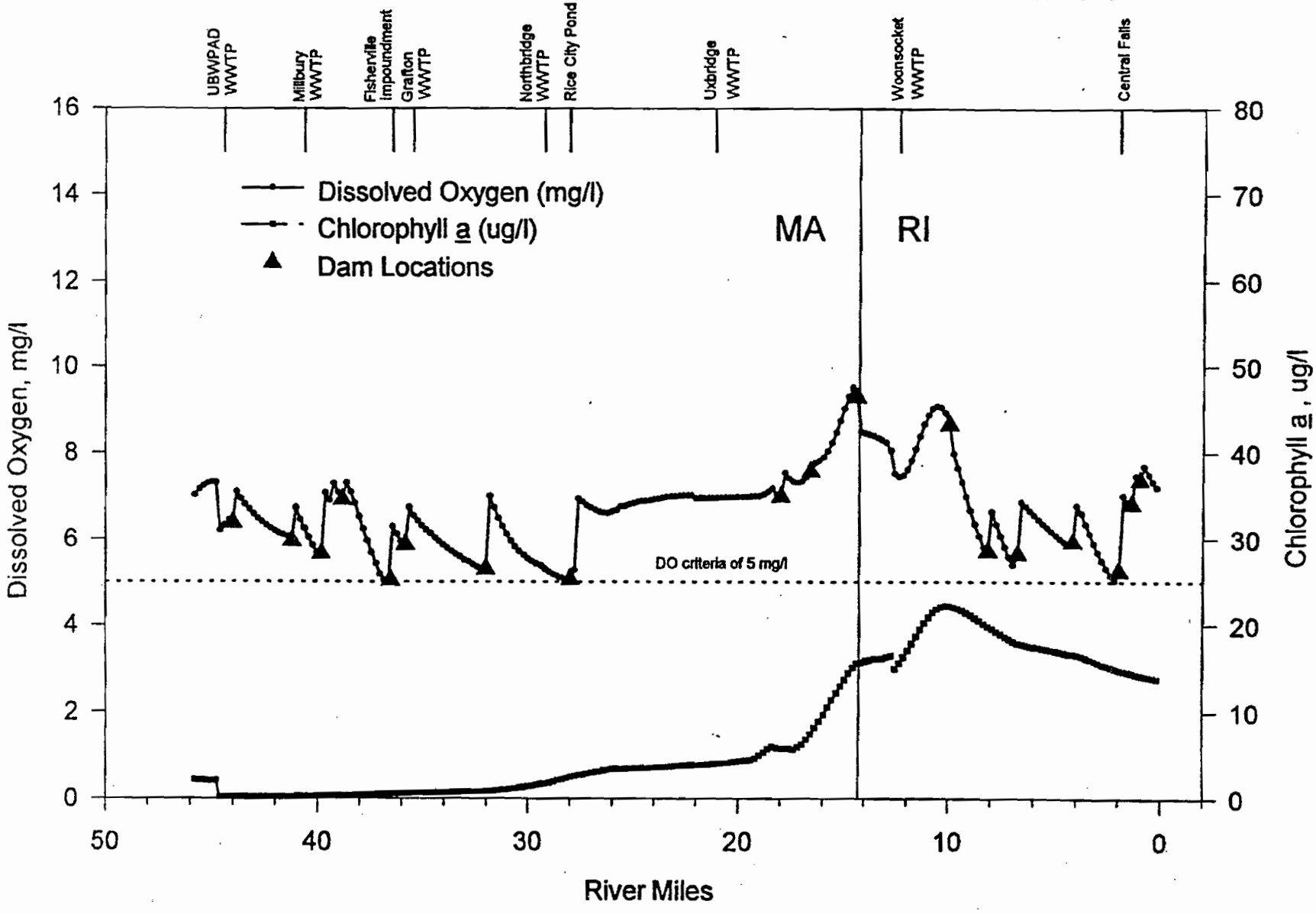
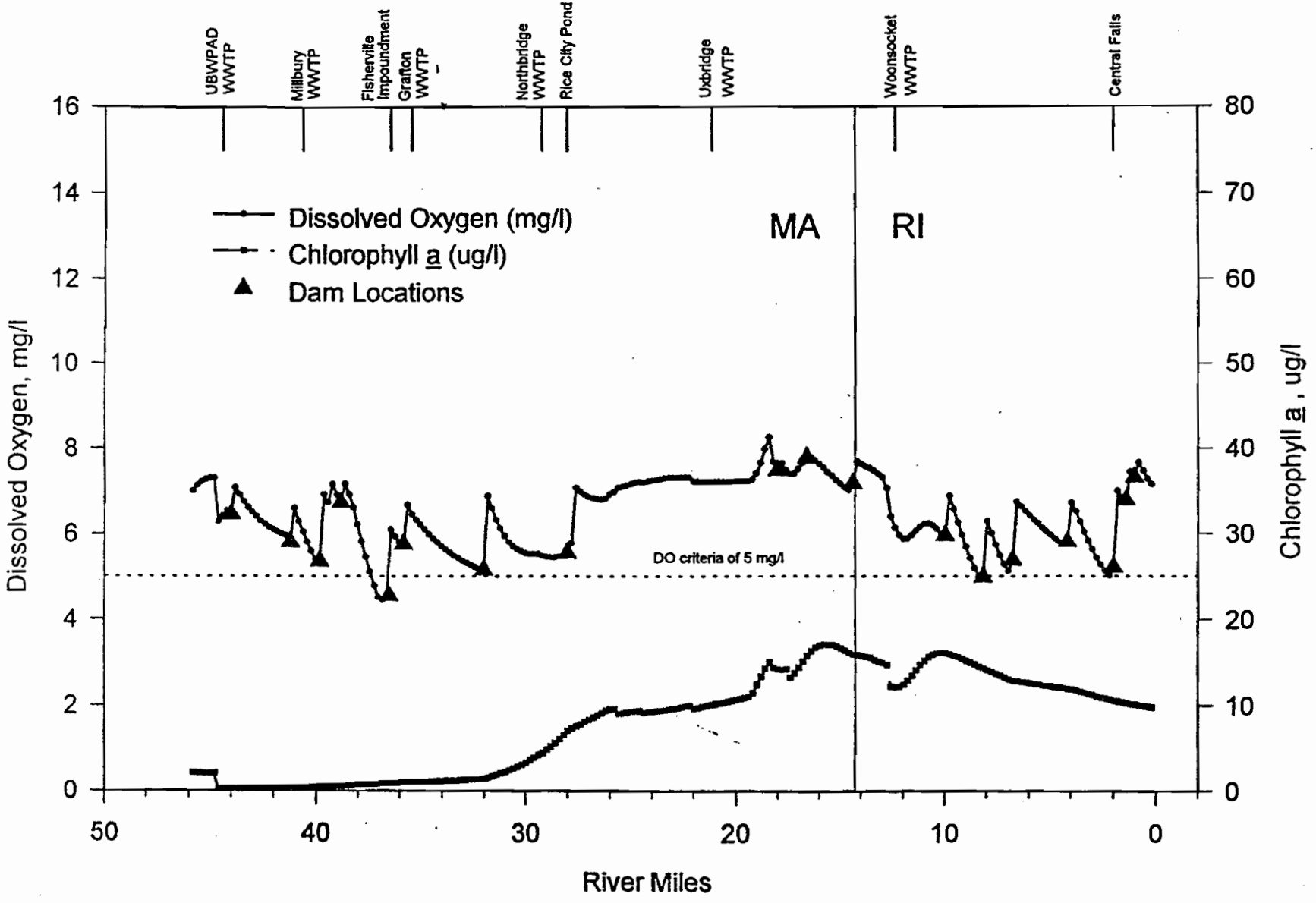
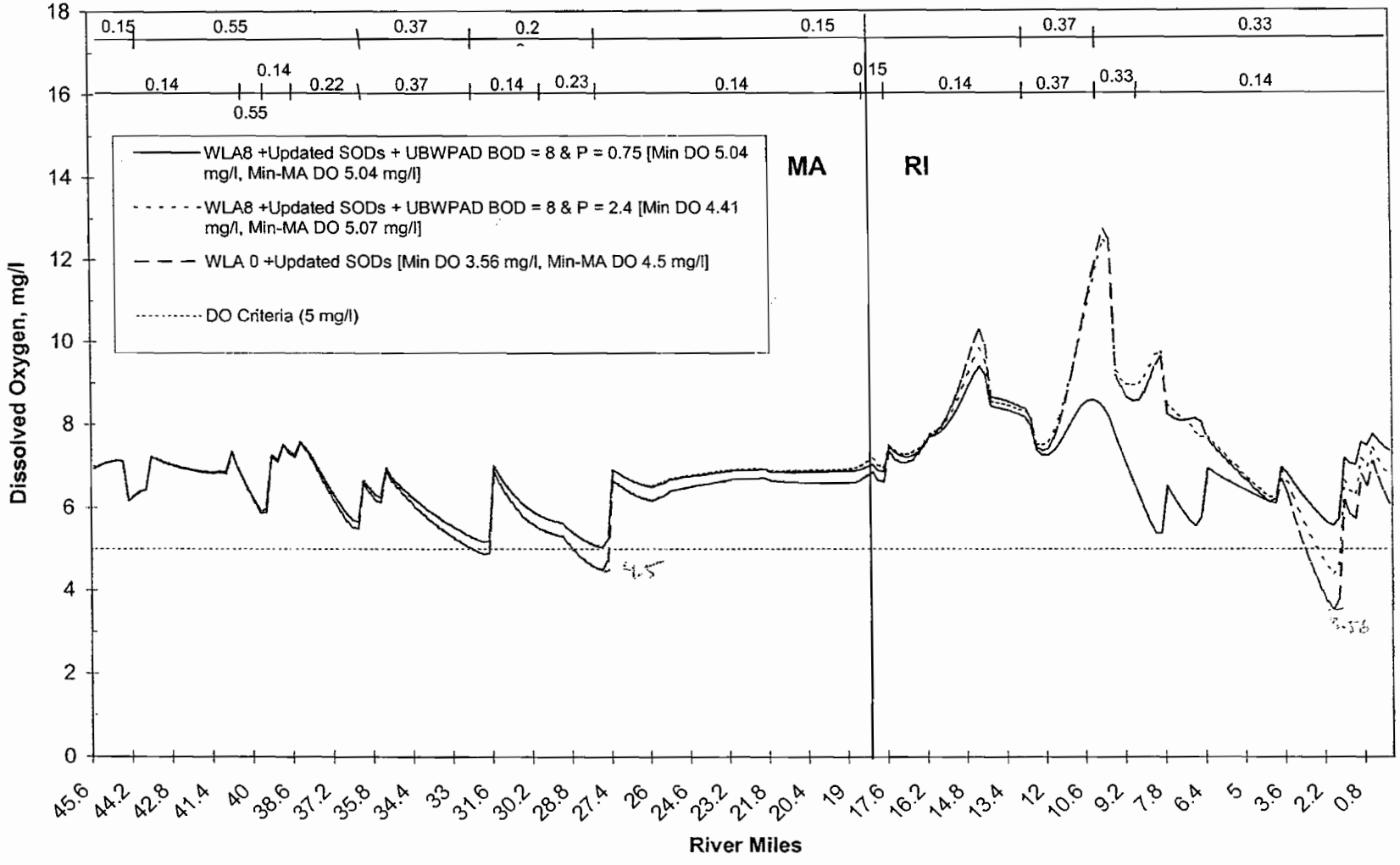


Figure XI

Blackstone River Wasteload Allocation - Scenario 11



Blackstone River Model - WLA 0 (Baseline Condition)



[Code of Federal Regulations]
[Title 40, Volume 21]
[Revised as of July 1, 2005]
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[**CITE: 40CFR122.2**]

[Page 132-139]

TITLE 40--PROTECTION OF ENVIRONMENT

CHAPTER I--ENVIRONMENTAL PROTECTION AGENCY (CONTINUED)

PART 122_EPA ADMINISTERED PERMIT PROGRAMS: THE NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM--Table of Contents

Subpart A_Definitions and General Program Requirements

Sec. 122.**2** Definitions.

The following definitions apply to parts 122, 123, and 124. Terms not defined in this section have the meaning given by CWA. When a defined term appears in a definition, the defined term is sometimes placed in quotation marks as an aid to readers.

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Administrator means the Administrator of the United States Environmental Protection Agency, or an authorized representative.

Animal feeding operation is defined at Sec. 122.23.

Applicable standards and limitations means all State, interstate, and federal standards and limitations to which a ``discharge,'' a ``sewage sludge use or disposal practice,'' or a related activity is subject under the CWA, including ``effluent limitations,'' water quality standards, standards of performance, toxic effluent standards or prohibitions, ``best management practices,'' pretreatment standards, and ``standards for sewage sludge use or disposal'' under sections 301, 302, 303, 304, 306, 307, 308, 403 and 405 of CWA.

Application means the EPA standard national forms for applying for a permit, including any additions, revisions or modifications to the forms; or forms approved by EPA for use in ``approved States,'' including any approved modifications or revisions.

Approved program or approved State means a State or interstate program which has been approved or authorized by EPA under part 123.

Aquaculture project is defined at Sec. 122.25.

Average monthly discharge limitation means the highest allowable average of ``daily discharges'' over a calendar month, calculated as the sum of all ``daily discharges'' measured during a calendar month divided by the number of ``daily discharges'' measured during that month.

Average weekly discharge limitation means the highest allowable average of ``daily discharges'' over a calendar week, calculated as the sum of all ``daily discharges'' measured during a calendar week divided by the number of ``daily discharges'' measured during that week.

Best management practices (``BMPs'') means schedules of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the pollution of ``waters of the United States.'' BMPs also include treatment requirements, operating procedures, and practices to control plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage.

BMPs means ``best management practices.''

Class I sludge management facility means any POTW identified under

40 CFR 403.8(a) as being required to have an approved pretreatment program (including such POTWs located in a State that has elected to assume local program responsibilities pursuant to 40 CFR 403.10(e)) and any other treatment works treating domestic sewage classified as a Class I sludge management facility by the Regional Administrator, or, in the case of approved State programs, the Regional Administrator in conjunction with the State Director, because of the potential for its sludge use or disposal practices to adversely affect public health and the environment.

Bypass is defined at Sec. 122.41(m).

Concentrated animal feeding operation is defined at Sec. 122.23.

Concentrated aquatic animal feeding operation is defined at Sec. 122.24.

Contiguous zone means the entire zone established by the United States under Article 24 of the Convention on the Territorial Sea and the Contiguous Zone.

Continuous discharge means a ``discharge'' which occurs without interruption throughout the operating hours of the facility, except for infrequent shutdowns for maintenance, process changes, or other similar activities.

CWA means the Clean Water Act (formerly referred to as the Federal Water Pollution Control Act or Federal Water Pollution Control Act Amendments of 1972) Public Law 92-500, as amended by Public Law 95-217, Public Law 95-576, Public Law 96-483 and Public Law 97-117, 33 U.S.C. 1251 et seq.

CWA and regulations means the Clean Water Act (CWA) and applicable regulations promulgated thereunder. In the case of an approved State program, it includes State program requirements.

Daily discharge means the ``discharge of a pollutant'' measured during a calendar day or any 24-hour period that reasonably represents the calendar day for purposes of sampling. For pollutants with limitations expressed in units of mass, the ``daily discharge'' is

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calculated as the total mass of the pollutant discharged over the day. For pollutants with limitations expressed in other units of measurement, the ``daily discharge'' is calculated as the average measurement of the pollutant over the day.

Direct discharge means the ``discharge of a pollutant.''

Director means the Regional Administrator or the State Director, as the context requires, or an authorized representative. When there is no ``approved State program,'' and there is an EPA administered program, ``Director'' means the Regional Administrator. When there is an approved State program, ``Director'' normally means the State Director. In some circumstances, however, EPA retains the authority to take certain actions even when there is an approved State program. (For example, when EPA has issued an NPDES permit prior to the approval of a State program, EPA may retain jurisdiction over that permit after program approval, see Sec. 123.1.) In such cases, the term ``Director'' means the Regional Administrator and not the State Director.

Discharge when used without qualification means the ``discharge of a pollutant.''

Discharge of a pollutant means:

(a) Any addition of any ``pollutant'' or combination of pollutants to ``waters of the United States'' from any ``point source,'' or

(b) Any addition of any pollutant or combination of pollutants to the waters of the ``contiguous zone'' or the ocean from any point source other than a vessel or other floating craft which is being used as a means of transportation.

This definition includes additions of pollutants into waters of the United States from: surface runoff which is collected or channelled by man; discharges through pipes, sewers, or other conveyances owned by a State, municipality, or other person which do not lead to a treatment works; and discharges through pipes, sewers, or other conveyances, leading into privately owned treatment works. This term does not include an addition of pollutants by any ``indirect discharger.''

Discharge Monitoring Report (``DMR'') means the EPA uniform national form, including any subsequent additions, revisions, or modifications for the reporting of self-monitoring results by permittees. DMRs must be used by ``approved States'' as well as by EPA. EPA will supply DMRs to any approved State upon request. The EPA national forms may be modified to substitute the State Agency name, address, logo, and other similar information, as appropriate, in place of EPA's.

DMR means ``Discharge Monitoring Report.''

Draft permit means a document prepared under Sec. 124.6 indicating the Director's tentative decision to issue or deny, modify, revoke and reissue, terminate, or reissue a ``permit.'' A notice of intent to terminate a permit, and a notice of intent to deny a permit, as discussed in Sec. 124.5, are types of ``draft permits.'' A denial of a request for modification, revocation and reissu ance, or termination, as discussed in Sec. 124.5, is not a ``draft permit.'' A ``proposed permit'' is not a ``draft permit.''

Effluent limitation means any restriction imposed by the Director on quantities, discharge rates, and concentrations of ``pollutants'' which are ``discharged'' from ``point sources'' into ``waters of the United States,'' the waters of the ``contiguous zone,'' or the ocean.

Effluent limitations guidelines means a regulation published by the Administrator under section 304(b) of CWA to adopt or revise ``effluent limitations.''

Environmental Protection Agency (``EPA'') means the United States Environmental Protection Agency.

EPA means the United States ``Environmental Protection Agency.''

Facility or activity means any NPDES ``point source'' or any other facility or activity (including land or appurtenances thereto) that is subject to regulation under the NPDES program.

Federal Indian reservation means all land within the limits of any Indian reservation under the jurisdiction of the United States Government, notwithstanding the issuance of any patent, and including rights-of-way running through the reservation.

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General permit means an NPDES ``permit'' issued under Sec. 122.28 authorizing a category of discharges under the CWA within a geographical area.

Hazardous substance means any substance designated under 40 CFR part 116 pursuant to section 311 of CWA.

Indian country means:

(1) All land within the limits of any Indian reservation under the jurisdiction of the United States Government, notwithstanding the issuance of any patent, and, including rights-of-way running through the reservation;

(2) All dependent Indian communities with the borders of the United States whether within the originally or subsequently acquired territory thereof, and whether within or without the limits of a state; and

(3) All Indian allotments, the Indian titles to which have not been extinguished, including rights-of-way running through the same.

Indian Tribe means any Indian Tribe, band, group, or community

recognized by the Secretary of the Interior and exercising governmental authority over a Federal Indian reservation.

Indirect discharger means a nondomes tic discharger introducing ``pollutants'' to a ``publicly owned treatment works.''

Individual control strategy is defined at 40 CFR 123.46(c).

Interstate agency means an agency of two or more States established by or under an agreement or compact approved by the Congress, or any other agency of two or more States having substantial powers or duties pertaining to the control of pollution as determined and approved by the Administrator under the CWA and regulations.

Major facility means any NPDES ``facility or activity'' classified as such by the Regional Administrator, or, in the case of ``approved State programs,'' the Regional Administrator in conjunction with the State Director.

Maximum daily discharge limitation means the highest allowable ``daily discharge.''

Municipality means a city, town, borough, county, parish, district, association, or other public body created by or under State law and having jurisdiction over disposal of sewage, industrial wastes, or other wastes, or an Indian tribe or an authorized Indian tribal organization, or a designated and approved management agency under section 208 of CWA.

Municipal separate storm sewer system is defined at Sec. 122.26 (b)(4) and (b)(7).

National Pollutant Discharge Elimination System (NPDES) means the national program for issuing, modifying, revoking and reissuing, terminating, monitoring and enforcing permits, and imposing and enforcing pretreatment requirements, under sections 307, 402, 318, and 405 of CWA. The term includes an ``approved program.''

New discharger means any building, structure, facility, or installation:

(a) From which there is or may be a ``discharge of pollutants;''

(b) That did not commence the ``discharge of pollutants'' at a particular ``site'' prior to August 13, 1979;

(c) Which is not a ``new source;'' and

(d) Which has never received a finally effective NDPES permit for discharges at that ``site.''

This definition includes an ``indirect discharger'' which commences discharging into ``waters of the United States'' after August 13, 1979. It also includes any existing mobile point source (other than an offshore or coastal oil and gas exploratory drilling rig or a coastal oil and gas developmental drilling rig) such as a seafood processing rig, seafood processing vessel, or aggregate plant, that begins discharging at a ``site'' for which it does not have a permit; and any offshore or coastal mobile oil and gas exploratory drilling rig or coastal mobile oil and gas developmental drilling rig that commences the discharge of pollutants after August 13, 1979, at a ``site'' under EPA's permitting jurisdiction for which it is not covered by an individual or general permit and which is located in an area determined by the Regional Administrator in the issuance of a final permit to be an area or biological concern. In determining whether an area is an area of biological concern, the Regional Administrator shall consider the fac tors specified in 40 CFR 125.122(a) (1) through (10).

An offshore or coastal mobile exploratory drilling rig or coastal mobile developmental drilling rig will be considered a ``new discharger'' only for the

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duration of its discharge in an area of biological concern.

New source means any building, struc ture, facility, or installation from which there is or may be a ``discharge of pollutants,'' the construction of which commenced:

(a) After promulgation of standards of performance under section 306 of CWA which are applicable to such source, or

(b) After proposal of standards of performance in accordance with section 306 of CWA which are applicable to such source, but only if the standards are promulgated in accordance with section 306 within 120 days of their proposal.

NPDES means ``National Pollutant Discharge Elimination System.''

Owner or operator means the owner or operator of any ``facility or activity'' subject to regulation under the NPDES program.

Permit means an authorization, license, or equivalent control document issued by EPA or an ``approved State'' to implement the requirements of this part and parts 123 and 124. ``Permit'' includes an NPDES ``general permit'' (Sec. 122.28). Permit does not include any permit which has not yet been the subject of final agency action, such as a ``draft permit'' or a ``proposed permit.''

Person means an individual, association, partnership, corporation, municipality, State or Federal agency, or an agent or employee thereof.

Point source means any discernible, confined, and discrete conveyance, including but not limited to, any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, landfill leachate collection system, vessel or other floating craft from which pollutants are or may be discharged. This term does not include return flows from irrigated agriculture or agricultural storm water runoff. (See Sec. 122.3).

Pollutant means dredged spoil, solid waste, incinerator residue, filter backwash, sewage, garbage, sewage sludge, munitions, chemical wastes, biological materials, radioactive materials (except those regulated under the Atomic Energy Act of 1954, as amended (42 U.S.C. 2011 et seq.)), heat, wrecked or discarded equipment, rock, sand, cellar dirt and industrial, municipal, and agricultural waste discharged into water. It does not mean:

(a) Sewage from vessels; or

(b) Water, gas, or other material which is injected into a well to facilitate production of oil or gas, or water derived in association with oil and gas production and disposed of in a well, if the well used either to facilitate production or for disposal purposes is approved by authority of the State in which the well is located, and if the State determines that the injection or disposal will not result in the degradation of ground or surface water resources.

Note: Radioactive materials covered by the Atomic Energy Act are those encompassed in its definition of source, byproduct, or special nuclear materials. Examples of materials not covered include radium and accelerator-produced isotopes. See Train v. Colorado Public Interest Research Group, Inc., 426 U.S. 1 (1976).

POTW is defined at Sec. 403.3 of this chapter.

Primary industry category means any industry category listed in the NRDC settlement agreement (Natural Resources Defense Council et al. v. Train, 8 E.R.C. 2120 (D.D.C. 1976), modified 12 E.R.C. 1833 (D.D.C. 1979)); also listed in appendix A of part 122.

Privately owned treatment works means any device or system which is (a) used to treat wastes from any facility whose operator is not the operator of the treatment works and (b) not a ``POTW.''

Process wastewater means any water which, during manufacturing or processing, comes into direct contact with or results from the production or use of any raw material, intermediate product, finished product, byproduct, or waste product.

Proposed permit means a State NPDES ``permit'' prepared after the close of the public comment period (and, when applicable, any public hearing and administrative appeals) which is sent to EPA for review before final issuance by the State. A ``proposed permit'' is not a ``draft permit.''

Publicly owned treatment works is defined at 40 CFR 403.3.

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Recommencing discharger means a source which recommences discharge after terminating operations.

Regional Administrator means the Regional Administrator of the appropriate Regional Office of the Environmental Protection Agency or the authorized representative of the Regional Administrator.

Schedule of compliance means a schedule of remedial measures included in a ``permit'', including an enforceable sequence of interim requirements (for example, actions, operations, or milestone events) leading to compliance with the CWA and regulations.

Secondary industry category means any industry category which is not a ``primary industry category.''

Secretary means the Secretary of the Army, acting through the Chief of Engineers.

Septage means the liquid and solid material pumped from a septic tank, cesspool, or similar domestic sewage treatment system, or a holding tank when the system is cleaned or maintained.

Sewage from vessels means human body wastes and the wastes from toilets and other receptacles intended to receive or retain body wastes that are discharged from vessels and regulated under section 312 of CWA, except that with respect to commercial vessels on the Great Lakes this term includes graywater. For the purposes of this definition, ``graywater'' means galley, bath, and shower water.

Sewage Sludge means any solid, semi-solid, or liquid residue removed during the treatment of municipal waste water or domestic sewage. Sewage sludge includes, but is not limited to, solids removed during primary, secondary, or advanced waste water treatment, scum, septage, portable toilet pumpings, type III marine sanitation device pumpings (33 CFR part 159), and sewage sludge products. Sewage sludge does not include grit or screenings, or ash generated during the incineration of sewage sludge.

Sewage sludge use or disposal practice means the collection, storage, treatment, transportation, processing, monitoring, use, or disposal of sewage sludge.

Silvicultural point source is defined at Sec. 122.27.

Site means the land or water area where any ``facility or activity'' is physically located or conducted, including adjacent land used in connection with the facility or activity.

Sludge-only facility means any ``treatment works treating domestic sewage'' whose methods of sewage sludge use or disposal are subject to regulations promulgated pursuant to section 405(d) of the CWA and is required to obtain a permit under Sec. 122.1(b)(**2**).

Standards for sewage sludge use or disposal means the regulations promulgated pursuant to section 405(d) of the CWA which govern minimum requirements for sludge quality, management practices, and monitoring and reporting applicable to sewage sludge or the use or disposal of sewage sludge by any person.

State means any of the 50 States, the District of Columbia, Guam, the Commonwealth of Puerto Rico, the Virgin Islands, American Samoa, the Commonwealth of the Northern Mariana Islands, the Trust Territory of the Pacific Islands, or an Indian Tribe as defined in these regulations which meets the requirements of Sec. 123.31 of this chapter.

State Director means the chief administrative officer of any State

or interstate agency operating an ``approved program,'' or the delegated representative of the State Director. If responsibility is divided among two or more State or interstate agencies, ``State Director'' means the chief administrative officer of the State or interstate agency authorized to perform the particular procedure or function to which reference is made.

State/EPA Agreement means an agreement between the Regional Administrator and the State which coordinates EPA and State activities, responsibilities and programs including those under the CWA programs.

Storm water is defined at Sec. 122.26(b)(13).

Storm water discharge associated with industrial activity is defined at Sec. 122.26(b)(14).

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Total dissolved solids means the total dissolved (filterable) solids as determined by use of the method specified in 40 CFR part 136.

Toxic pollutant means any pollutant listed as toxic under section 307(a)(1) or, in the case of ``sludge use or disposal practices,'' any pollutant identified in regulations implementing section 405(d) of the CWA.

Treatment works treating domestic sewage means a POTW or any other sewage sludge or waste water treatment devices or systems, regardless of ownership (including federal facilities), used in the storage, treatment, recycling, and reclamation of municipal or domestic sewage, including land dedicated for the disposal of sewage sludge. This definition does not include septic tanks or similar devices. For purposes of this definition, ``domestic sewage'' includes waste and waste water from humans or household operations that are discharged to or otherwise enter a treatment works. In States where there is no approved State sludge management program under section 405(f) of the CWA, the Regional Administrator may designate any person subject to the standards for sewage sludge use and disposal in 40 CFR part 503 as a ``treatment works treating domestic sewage,'' where he or she finds that there is a potential for adverse effects on public health and the environment from poor sludge quality or poor sludge handling, use or disposal practices, or where he or she finds that such designation is necessary to ensure that such person is in compliance with 40 CFR part 503.

TWTDS means ``treatment works treating domestic sewage.''

Upset is defined at Sec. 122.41(n).

Variance means any mechanism or provision under section 301 or 316 of CWA or under 40 CFR part 125, or in the applicable ``effluent limitations guidelines'' which allows modification to or waiver of the generally applicable effluent limitation requirements or time deadlines of CWA. This includes provisions which allow the establishment of alternative limitations based on fundamentally different factors or on sections 301(c), 301(g), 301(h), 301(i), or 316(a) of CWA.

Waters of the United States or waters of the U.S. means:

(a) All waters which are currently used, were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the ebb and flow of the tide;

(b) All interstate waters, including interstate ``wetlands;''

(c) All other waters such as intrastate lakes, rivers, streams (including intermittent streams), mudflats, sandflats, ``wetlands,'' sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds the use, degradation, or destruction of which would affect or could affect interstate or foreign commerce including any such waters:

(1) Which are or could be used by interstate or foreign travelers for recreational or other purposes;

(2) From which fish or shellfish are or could be taken and sold in interstate or foreign commerce; or

(3) Which are used or could be used for industrial purposes by industries in interstate commerce;

(d) All impoundments of waters otherwise defined as waters of the United States under this definition;

(e) Tributaries of waters identified in paragraphs (a) through (d) of this definition;

(f) The territorial sea; and

(g) ``Wetlands'' adjacent to waters (other than waters that are themselves wetlands) identified in paragraphs (a) through (f) of this definition.

Waste treatment systems, including treatment ponds or lagoons designed to meet the requirements of CWA (other than cooling ponds as defined in 40 CFR 423.11(m) which also meet the criteria of this definition) are not waters of the United States. This exclusion applies only to manmade bodies of water which neither were originally created in waters of the United States (such as disposal area in wetlands) nor resulted from the impoundment of waters of the United States. [See Note 1 of this section.] Waters of the United States do not include prior converted cropland. Notwithstanding the determination of an area's status as prior converted cropland by any other federal agency, for the purposes of the Clean Water Act, the final authority regarding

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Clean Water Act jurisdiction remains with EPA.

Wetlands means those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.

Whole effluent toxicity means the aggregate toxic effect of an effluent measured directly by a toxicity test.

Note: At 45 FR 48620, July 21, 1980, the Environmental Protection Agency suspended until further notice in Sec. 122.2, the last sentence, beginning ``This exclusion applies . . .'' in the definition of ``Waters of the United States.'' This revision continues that suspension.\1\

\1\ Editorial Note: The words ``This revision'' refer to the document published at 48 FR 14153, Apr. 1, 1983.

(Clean Water Act (33 U.S.C. 1251 et seq.), Safe Drinking Water Act (42 U.S.C. 300f et seq.), Clean Air Act (42 U.S.C. 7401 et seq.), Resource Conservation and Recovery Act (42 U.S.C. 6901 et seq.))

[48 FR 14153, Apr. 1, 1983, as amended at 48 FR 39619, Sept. 1, 1983; 50 FR 6940, 6941, Feb. 19, 1985; 54 FR 254, Jan. 4, 1989; 54 FR 18781, May 2, 1989; 54 FR 23895, June 2, 1989; 58 FR 45039, Aug. 25, 1993; 58 FR 67980, Dec. 22, 1993; 64 FR 42462, Aug. 4, 1999; 65 FR 30905, May 15, 2000]