AUTHORIZATION TO DISCHARGE UNDER THE NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM

In compliance with the provisions of the Federal Clean Water Act as amended, (33 U.S.C. §§1251 et seq.; the "CWA"), and the Massachusetts Clean Waters Act, as amended, (M.G.L. Chap. 21, §§26-53),

General Electric Company

is authorized to discharge from a facility located at

General Electric Aviation
1000 Western Avenue
Lynn, MA 01910

to the receiving water named

Saugus River

in accordance with effluent limitations, monitoring requirements and other conditions set forth herein.

This permit shall become effective on the first day of the calendar month following 60 days after signature.

This permit and the authorization to discharge expire at midnight, five (5) years from the last day of the month preceding the effective date.

This permit supersedes the permit issued on September 29, 1993.

This permit consists of 36 pages in Part I including effluent limitations, monitoring requirements, 10 pages in Attachment 1: Marine Acute Toxicity Test Procedure and Protocol (2012), 12 pages in Attachment 2: Marine Chronic Toxicity Test Procedure and Protocol (2013), 1 page in Attachment 3: Outfalls/Intakes Map, 1 page in Attachment 4: Approved Additives, and 25 pages in Part II: Standard Conditions.

Signed this 30th day of September, 2014

/S/SIGNATURE ON FILE

Ken Moraff, Director
Office of Ecosystem Protection
Environmental Protection Agency
Boston, MA

/S/SIGNATURE ON FILE

David Ferris, Director
Massachusetts Wastewater Management Program
Department of Environmental Protection
Commonwealth of Massachusetts
Boston, MA

PART I
A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

1. During the period beginning on the effective date and lasting through the expiration date, the permittee is authorized to discharge stormwater commingled with dry weather flows during wet weather[1] from the **Drainage System Outfalls (Outfall Serial Numbers 001, 007, 010, 019, 027B, 028, 030, and 031)** to the Saugus River. Such discharges shall be limited and monitored by the permittee as specified below.

Effluent Characteristic	Units	Discharge Limitation		Monitoring Requirements[2,3]	
		Average Monthly	Maximum Daily	Measurement Frequency[4]	Sample Type
Flow	MGD	Report	Report	Daily	Estimate
Gate Openings[5]	-	Report Total Monthly		Continuous	Count
Dry Weather Flow Pumped to CDTS[6]	MGD	Report	Report	Continuous	Estimate
pH	S.U.	-	6.0-8.5	1/Quarter	Grab
Oil and Grease (O&G)	mg/L	10	15	1/Quarter	Grab
Total Suspended Solids (TSS)	mg/L	Report	Report	1/Quarter	Grab
Total BTEX	µg/L	Report	Report	1/Quarter	Grab
Benzene	µg/L	Report	Report	1/Quarter	Grab
Toluene	µg/L	Report	Report	1/Quarter	Grab
Ethylbenzene	µg/L	Report	Report	1/Quarter	Grab
Total Xylenes	µg/L	Report	Report	1/Quarter	Grab
Total Cyanide[7]	µg/L	Report	Report	1/Quarter	Grab
Volatile Organic Compounds (VOCs), Total	µg/L	Report	Report	1/Quarter	Grab
carbon tetrachloride	µg/L	Report	Report	1/Quarter	Grab
1,4 (or p)-dichlorobenzene (p-DCB)	µg/L	Report	Report	1/Quarter	Grab
1,2 (or o)-dichlorobenzene (o-DCB)	µg/L	Report	Report	1/Quarter	Grab
1,3 (or m)-dichlorobenzene (m-DCB)	µg/L	Report	Report	1/Quarter	Grab

Effluent Characteristic	Units	Discharge Limitation		Monitoring Requirements[2,3]	
		Average Monthly	Maximum Daily	Measurement Frequency[4]	Sample Type
1,1 dichloroethane (DCA)	µg/L	Report	Report	1/Quarter	Grab
1,2 dichloroethane (DCA)	µg/L	Report	Report	1/Quarter	Grab
1,1 dichloroethylene (DCE)	µg/L	Report	Report	1/Quarter	Grab
cis-1,2 dichloroethylene (DCE)	µg/L	Report	Report	1/Quarter	Grab
dichloromethan (methylene chloride)	µg/L	Report	Report	1/Quarter	Grab
tetrachlroroethylene (PCE)	µg/L	Report	Report	1/Quarter	Grab
1,1,1 trichloroethane (TCA)	µg/L	Report	Report	1/Quarter	Grab
1,1,2 trichlororethane (TCA)	µg/L	Report	Report	1/Quarter	Grab
trichloroethylene (TCE)	µg/L	Report	Report	1/Quarter	Grab
chloroethylene (vinyl chloride)	µg/L	Report	Report	1/Quarter	Grab
Total Residual Chlorine	µg/L	Report	Report	1/Quarter	Grab
Metals[8]					
Antimony	mg/L	Report	Report	1/Quarter	Grab
Cadmium	mg/L	Report	Report	1/Quarter	Grab
Copper	mg/L	Report	Report	1/Quarter	Grab
Iron	mg/L	Report	Report	1/Quarter	Grab
Lead	mg/L	Report	Report	1/Quarter	Grab
Nickel	mg/L	Report	Report	1/Quarter	Grab
Silver	mg/L	Report	Report	1/Quarter	Grab
Zinc	mg/L	Report	Report	1/Quarter	Grab
Total Polycyclic Aromatic Hydrocarbons (PAHs)[9]	µg/L	Report	Report	1/Quarter	Grab
Group I PAHs	µg/L	Report	Report	1/Quarter	Grab
benzo(a)anthracene	µg/L	Report	Report	1/Quarter	Grab
benzo(a)pyrene	µg/L	Report	Report	1/Quarter	Grab
benzo(b)fluroanthene	µg/L	Report	Report	1/Quarter	Grab

Effluent Characteristic	Units	Discharge Limitation		Monitoring Requirements[2,3]	
		Average Monthly	Maximum Daily	Measurement Frequency[4]	Sample Type
benzo(k)fluroanthene	µg/L	Report	Report	1/Quarter	Grab
chrysene	µg/L	Report	Report	1/Quarter	Grab
dibenzo(a,h)anthracene	µg/L	Report	Report	1/Quarter	Grab
indeno(1,2,3-cd)pyrene	µg/L	Report	Report	1/Quarter	Grab
Total Polychlorinated Biphenyls (PCBs)[10,11]	µg/L	Report	Report	1/Quarter	Grab
Whole Effluent Toxicity (WET)[12,13,14,15]					
LC_{50}[16]	%		Report	2/Year	Grab
Hardness	mg/L		Report	2/Year	Grab
Alkalinity	mg/L		Report	2/Year	Grab
pH	S.U.		Report	2/Year	Grab
Specific Conductance	µmhos/c		Report	2/Year	Grab
Total Solids	m		Report	2/Year	Grab
Ammonia	mg/L		Report	2/Year	Grab
Total Organic Carbon	mg/L		Report	2/Year	Grab
Total Residual Chlorine	mg/L		Report	2/Year	Grab
Dissolved Oxygen	mg/L		Report	2/Year	Grab
Total Cadmium	mg/L		Report	2/Year	Grab
Total Chromium	mg/L		Report	2/Year	Grab
Total Lead	mg/L		Report	2/Year	Grab
Total Copper	mg/L		Report	2/Year	Grab
Total Zinc	mg/L		Report	2/Year	Grab
Total Nickel	mg/L		Report	2/Year	Grab
Total Aluminum	mg/L		Report	2/Year	Grab
Total Magnesium	mg/L		Report	2/Year	Grab
Total Calcium	mg/L		Report	2/Year	Grab

See pages 5-7 for explanation of footnotes.

Footnotes:

1. For the purposes of this permit, weather conditions are considered to be either "wet weather" conditions or "dry weather" conditions. "Wet weather" is defined as any time period that begins with the first opening of any drainage system outfall gate due to the addition of stormwater from a precipitation event to the drainage system and continues until two hours after the last closing of the last drainage system outfall gate with the exception of Outfall 027B. "Wet weather" at Outfall 027B continues until forty-eight (48) hours after the last closing of the last drainage system outfall gate. "Dry weather" is defined as any period of time that does not meet the definition of "wet weather." Dry weather flow is defined as effluent that collects in the drainage system outfall vaults during dry weather, including, but not limited to, infiltrated groundwater, steam heating and air conditioner condensate, steam conduit water, non-contact cooling water, steam condensate, boiler filter backwash, and ion exchange regeneration and backwash.

2. Samples taken in compliance with the monitoring requirements specified above shall be taken from the chamber immediately preceding the outfall gate at each of the Drainage System Outfalls (Outfalls 001, 007, 010, 019, 027B, 028, 030, and 031) the first time each outfall gate is opened (i.e., the first pulse of effluent) prior to mixing with the receiving water (the Saugus River). Samples shall be collected at least seventy-two (72) hours after the last closing of the last outfall gate ending the previous wet weather event (see Footnote 1). The discharge through each such outfall shall be sampled and reported separately on the monthly DMR. All samples shall be tested in accordance with the procedures in 40 CFR Part 136, unless specified otherwise elsewhere in this permit. If collection of grab sample(s) representative of the first pulse of discharge is impracticable, grab sample(s) shall be taken as soon after that as possible, and the permittee shall submit on the DMR cover letter a description of why the collection of the grab sample(s) during the first pulse was impracticable. When a permittee is unable to collect grab sample(s) due to adverse weather conditions, the permittee must submit in lieu of sampling data a description of why the grab sample(s) could not be collected, including available documentation of the event. Adverse weather conditions which may prohibit the collection of sample(s) include weather conditions that pose a danger to personnel (such as local flooding, high winds, hurricane, tornadoes, electrical storms, etc.) or otherwise make the collection of sample(s) impracticable (drought, extended frozen conditions, specified storm event did not occur during sampling period, etc.) A "no discharge" report shall be submitted on the monthly DMR for those sampling periods in which there is no discharge.

3. When reporting sample data at or below the minimum level (ML), see the latest EPA Region 1 NPDES Permit Program Instructions for the Discharge Monitoring Report Forms (DMRs) at http://www.epa.gov/region1/enforcement/water/dmr.html for guidance. The ML is the level at which the entire analytical system gives a recognizable mass spectra and acceptable calibration points. This level corresponds to the lower points at which the calibration curve is determined based on the analysis of the pollutant(s) of concern in reagent water.

4. Sampling frequency of 1/month is defined as the sampling of <u>one</u> (1) discharge event in each calendar month, when discharge occurs. Sampling frequency of 1/quarter is defined as the sampling of <u>four</u> (4) discharge events in each calendar year, when discharge occurs. Quarters are defined as the interval of time between the months of: January through March, inclusive; April through June, inclusive; July through September, inclusive; and October through December, inclusive. Quarterly sampling shall be performed concurrently with the monthly monitoring event. The permittee shall submit the results to EPA of any additional testing done to that required herein, if it is conducted in accordance with EPA approved methods consistent with the provisions of 40 CFR §122.41(l)(4)(ii).

5. The permittee shall report the total number of gate openings each month for each Drainage System Outfall gate. The permittee shall also report the date, times, and duration that each gate is open, along with the corresponding weather conditions at the time of gate opening and during the entire time that the gate is open, the flow during the entire time that the gate is open, and the time at which the gate closes for each instance that a gate was opened, along with the corresponding weather condition at that time. This

information shall be submitted with the DMRs.

6. The permittee shall estimate the total volume of wastewater pumped to the CDTS for treatment prior to a storm event forecasted to generate 0.1 inches or more of precipitation during the period that the permittee begins transferring flow to the CDTS in preparation for the storm until the first time that the outfall gate is triggered releasing commingled dry weather flow and stormwater to the Saugus River. Both the maximum daily and average monthly volume for each outfall shall be reported on the DMR.

7. Total cyanide must be monitored at Outfall 001 only. EPA's water quality criteria is expressed as micrograms of free cyanide per liter (ug/L). There is currently no EPA approved method for free cyanide. Therefore, total cyanide must be reported.

8. The concentration of metals shall be reported as total recoverable.

9. The minimum level (ML) for analysis of Polynuclear Aromatic Hydrocarbons (PAHs) shall be no greater than 10 µg/L. Analysis must be completed using an EPA approved method in 40 CFR Part 136, Table IC – List of Approved Test Procedures for Non-Pesticide Organic Compounds or, alternatively, using EPA approved method 8270D. Total Group I PAHs and Total Group II PAHs shall be reported as the sum of detectable concentrations of individual PAH compounds.

10. In the November 2002 Water Quality Criteria (WQC), EPA revised the definition of Total PCBs for aquatic life as the "sum of all homologue, all isomer, all congener, or all Aroclor analyses." The minimum level for analysis of total PCB shall be no greater than 0.065 ug/L, which is the ML of Modified Method 8082. The permittee shall provide the result of total PCBs as the sum of all Aroclors. Numeric results of individual aroclors for all quarters shall be submitted as an attachment to the December discharge monitoring report.

11. GE may request a reduction in PCB sampling after one (1) year and a minimum of four (4) consecutive samples of non-detection for PCBs. GE must receive written approval from EPA to reduce the frequency of sampling. The permittee is required to continue testing at the frequency specified in this permit until notice is received by certified mail from EPA that the PCB testing requirement has been changed.

12. The permittee shall conduct acute toxicity tests at a frequency of two (2) per year. The permittee shall test the inland silverside, *Menidia beryllina*, and mysid shrimp, *Americamysis bahia*. Toxicity test samples shall be collected and tests completed during the time periods of October 1st - March 31st and April 1st - September 30th, each year. Toxicity test results are to be submitted by the 15th day of the month following the end of the month sampled. The tests must be performed in accordance with test procedures and protocols specified in Attachment 1 of the permit.

13. After submitting WET test results for at least two (2) years, and a minimum of four (4) consecutive sets of WET test results demonstrating no toxicity, the permittee may request a reduction in the WET testing requirements. The permittee is required to continue testing at the frequency specified in the permit until notice is received by certified mail from EPA that the WET testing requirement has been changed.

14. If toxicity test(s) using receiving water as diluent show the receiving water to be toxic or unreliable, the permittee shall either follow procedures outlined in Attachment 1 (Toxicity Test Procedure and Protocol) Section IV., DILUTION WATER in order to obtain an individual approval for use of an alternate dilution water, or the permittee shall follow the *Self-Implementing Alternative Dilution Water Guidance* which may be used to obtain automatic approval of an alternate dilution water, including the appropriate species for use with that water. This guidance is found in Attachment G of *NPDES Program Instructions for the Discharge Monitoring Report Forms (DMRs),* which may be found on the EPA, Region I web site at http://www.epa.gov/Region1/enforcementandassistance/dmr.html. If this guidance is revoked, the permittee shall revert to obtaining individual approval as outlined in Attachment 1. Any modification or revocation to this guidance will be transmitted to the permittee as part of the annual DMR instruction package. However, at any time, the permittee may choose to contact EPA-New England directly using the approach outlined in

Attachment 1 of the permit.

15. For each Whole Effluent Toxicity (WET) test the permittee shall report on the appropriate Discharge Monitoring Report (DMR), the concentrations of the Hardness, Total Ammonia Nitrogen as Nitrogen, Alkalinity, pH, Specific Conductance, Total Solids, Total Organic Carbon, Total Residual Chlorine, Dissolved Oxygen, Total Recoverable Aluminum, Total Recoverable Cadmium, Total Recoverable Chromium, Total Recoverable Copper, Total Recoverable Lead, Total Recoverable Nickel, Total Recoverable Zinc, Total Recoverable Magnesium, and Total Recoverable Calcium found in the 100 percent effluent sample. The permittee should note that all chemical parameter results must still be reported in the appropriate toxicity report. Analyses conducted for WET testing may also be used to satisfy the monthly or quarterly sampling requirements as long as the timing of sampling for the parameters coincides with WET testing for selected pollutants.

16. The LC_{50} is the concentration of effluent which causes mortality to 50% of the test organisms.

2. During the period beginning on the effective date and lasting through the expiration date, the permittee is authorized to discharge treated effluent from the Consolidated Drains Treatment System through **Outfall Serial Number 027A** to the Saugus River. Such discharge shall be limited and monitored by the permittee as specified below.

Effluent Characteristic	Units	Discharge Limitation		Monitoring Requirements[1,3]	
		Average Monthly	Maximum Daily	Measurement Frequency[2]	Sample Type
Flow[4]	MGD	Report	Report	Daily	Estimate
pH	S.U.	-	6.5-8.5	1/Month	Grab
Oil and Grease (O&G)	mg/L	10	15	1/Month	Grab
Total Suspended Solids (TSS)	mg/L	30	100	1/Month	Grab
Temperature	°F	Report	85	1/Month	Grab
Total Polychlorinated Biphenyls (PCBs)[5,6]	µg/L	Report	Report	1/Month	Grab
Total Residual Oxidants (TRO)	µg/L	Report	Report	1/Month	Grab
Total Petroleum Hydrocarbons (TPH)	mg/L	Report	5	1/Month	Grab
Total BTEX	µg/L	Report	100	1/Month	Grab
Benzene	µg/L	Report	5	1/Month	Grab
Toluene	µg/L	Report	Report	1/Month	Grab
Ethylbenzene	µg/L	Report	Report	1/Month	Grab
Total Xylenes	µg/L	Report	Report	1/Month	Grab
Total Cyanide[7]	µg/L	Report	Report	1/Quarter	Grab
Volatile Organic Compounds (VOCs), Total	µg/L	Report	Report	1/Month	Grab
carbon tetrachloride	µg/L	Report	4.4	1/Month	Grab
1,4 (or p)-dichlorobenzene (p-DCB)	µg/L	Report	5.0	1/Month	Grab
1,2 (or o)-dichlorobenzene (o-DCB)	µg/L	Report	600	1/Month	Grab
1,3 (or m)-dichlorobenzene (m-DCB)	µg/L	Report	320	1/Month	Grab
1,1 dichloroethane (DCA)	µg/L	Report	70	1/Month	Grab

Effluent Characteristic	Units	Discharge Limitation		Monitoring Requirements[1,3]	
		Average Monthly	Maximum Daily	Measurement Frequency[2]	Sample Type
1,2 dichloroethane (DCA)	µg/L	Report	5.0	1/Month	Grab
1,1 dichloroethylene (DCE)	µg/L	Report	3.2	1/Month	Grab
cis-1,2 dichloroethylene (DCE)	µg/L	Report	70	1/Month	Grab
dichloromethan (methylene chloride)	µg/L	Report	4.6	1/Month	Grab
tetrachlroroethylene (PCE)	µg/L	Report	5.0	1/Month	Grab
1,1,1 trichloroethane (TCA)	µg/L	Report	200	1/Month	Grab
1,1,2 trichlororethane (TCA)	µg/L	Report	5.0	1/Month	Grab
trichloroethylene (TCE)	µg/L	Report	5.0	1/Month	Grab
chloroethylene (vinyl chloride)	µg/L	Report	2.0	1/Month	Grab
Metals[8]					
Antimony	mg/L	Report	Report	1/Quarter	Grab
Arsenic	mg/L	Report	Report	1/Quarter	Grab
Beryllium	mg/L	Report	Report	1/Quarter	Grab
Cadmium	mg/L	Report	Report	1/Quarter	Grab
Calcium	mg/L	Report	Report	1/Quarter	Grab
Chromium	mg/L	Report	Report	1/Quarter	Grab
Copper	mg/L	Report	Report	1/Quarter	Grab
Iron	mg/L	Report	Report	1/Quarter	Grab
Ferrous Iron	mg/L	Report	Report	1/Quarter	Grab
Lead	mg/L	Report	Report	1/Quarter	Grab
Magnesium	mg/L	Report	Report	1/Quarter	Grab
Manganese	mg/L	Report	Report	1/Quarter	Grab
Mercury	mg/L	Report	Report	1/Quarter	Grab
Nickel	mg/L	Report	Report	1/Quarter	Grab
Selenium	mg/L	Report	Report	1/Quarter	Grab
Silver	mg/L	Report	Report	1/Quarter	Grab

Effluent Characteristic	Units	Discharge Limitation		Monitoring Requirements[1,3]	
		Average Monthly	Maximum Daily	Measurement Frequency[2]	Sample Type
Sodium	mg/L	Report	Report	1/Quarter	Grab
Thallium	mg/L	Report	Report	1/Quarter	Grab
Zinc	mg/L	Report	Report	1/Quarter	Grab
Polycyclic Aromatic Hydrocarbons (PAHs)[9]					
Total Group I PAHs	μg/L	Report	10	1/Month	Grab
Total Group II PAHs	μg/L	Report	100	1/Month	Grab
benzo(a)anthracene	μg/L	Report	Report	1/Month	Grab
benzo(a)pyrene	μg/L	Report	Report	1/Month	Grab
benzo(b)fluroanthene	μg/L	Report	Report	1/Month	Grab
benzo(k)fluroanthene	μg/L	Report	Report	1/Month	Grab
chrysene	μg/L	Report	Report	1/Month	Grab
dibenzo(a,h)anthracene	μg/L	Report	Report	1/Month	Grab
indeno(1,2,3-cd)pyrene	μg/L	Report	Report	1/Month	Grab
Whole Effluent Toxicity (WET)[10,11,13]					
LC_{50}[14]	%		Report	2/Year	Composite[12]
C-NOEC[15]	%		Report	2/Year	Composite[12]
Hardness	mg/L		Report	2/Year	Composite[12]
Alkalinity	mg/L		Report	2/Year	Composite[12]
pH	S.U.		Report	2/Year	Composite[12]
Specific Conductance	μmhos/c		Report	2/Year	Composite[12]
Total Solids	m		Report	2/Year	Composite[12]
Ammonia	mg/L		Report	2/Year	Composite[12]
Total Organic Carbon	mg/L		Report	2/Year	Composite[12]
Total Residual Chlorine	mg/L		Report	2/Year	Composite[12]
Dissolved Oxygen	mg/L		Report	2/Year	Composite[12]

Effluent Characteristic	Units	Discharge Limitation		Monitoring Requirements[1,3]	
		Average Monthly	Maximum Daily	Measurement Frequency[2]	Sample Type
Total Cadmium	mg/L		Report	2/Year	Composite[12]
Total Chromium	mg/L		Report	2/Year	Composite[12]
Total Lead	mg/L		Report	2/Year	Composite[12]
Total Copper	mg/L		Report	2/Year	Composite[12]
Total Zinc	mg/L		Report	2/Year	Composite[12]
Total Nickel	mg/L		Report	2/Year	Composite[12]
Total Aluminum	mg/L		Report	2/Year	Composite[12]
Total Magnesium	mg/L		Report	2/Year	Composite[12]
Total Calcium	mg/L		Report	2/Year	Composite[12]

See pages 12-13 for explanation of footnotes.

Footnotes:

1. Samples taken in compliance with the monitoring requirements specified above shall be taken at a point representative of all the discharge from the CDTS at Outfall 027A, prior to mixing with the receiving waters (the Saugus River). All samples shall be tested in accordance with the procedures in 40 CFR §136, unless specified elsewhere in the permit.

2. Sampling frequency of 1/month is defined as the sampling of <u>one</u> (1) discharge event in each calendar month, when discharge occurs. Sampling frequency of 1/quarter is defined as the sampling of <u>four</u> (4) discharge events in each calendar year, when discharge occurs. Quarters are defined as the interval of time between the months of: January through March, inclusive; April through June, inclusive; July through September, inclusive; and October through December, inclusive. Quarterly sampling shall be performed concurrently with the monthly monitoring event. The permittee shall submit the results to EPA of any additional testing done to that required herein, if it is conducted in accordance with EPA approved methods consistent with the provisions of 40 CFR §122.41(l)(4)(ii).

3. When reporting sample data at or below the minimum level (ML), see the latest EPA Region 1 NPDES Permit Program Instructions for the Discharge Monitoring Report Forms (DMRs) at http://www.epa.gov/region1/enforcement/water/dmr.html for guidance. The ML is the level at which the entire analytical system gives a recognizable mass spectra and acceptable calibration points. This level corresponds to the lower points at which the calibration curve is determined based on the analysis of the pollutant(s) of concern in reagent water.

4. Flow through Outfall 027A shall not exceed the design capacity of the treatment system.

5. In the November 2002 WQC, EPA revised the definition of Total PCBs for aquatic life as the "sum of all homologue, all isomer, all congener, or all Aroclor analyses." The minimum level for analysis of total PCB shall be no greater than 0.065 ug/L, which is the ML of Modified Method 8082. The permittee shall provide the result of total PCBs as the sum of all Aroclors. Numeric results of individual aroclors for all quarters shall be submitted as an attachment to the December discharge monitoring report.

6. GE may request a reduction in the frequency of PCB sampling, to not less than quarterly, after one (1) year, and a minimum of twelve (12) consecutive samples, of non-detection for PCBs. GE must receive written approval from EPA to reduce the frequency of sampling. The permittee is required to continue testing at the frequency specified in this permit until notice is received by certified mail from EPA that the PCB testing requirement has been changed.

7. EPA's water quality criteria is expressed as micrograms of free cyanide per liter (ug/L). There is currently no EPA approved method for free cyanide. Therefore, total cyanide must be reported.

8. Concentration of metals shall be reported as total recoverable.

9. The minimum level (ML) for analysis of Group I Polynuclear Aromatic Hydrocarbons (PAHs) shall be no greater than 1 µg/L. The ML for analysis of Group II Polynuclear Aromatic Hydrocarbons (PAHs) shall be no greater than 10 µg/L. Analysis must be completed using an EPA approved method in 40 CFR Part 136, Table IC – List of Approved Test Procedures for Non-Pesticide Organic Compounds or, alternatively, using EPA approved method 8270D. Total Group I PAHs and Total Group II PAHs shall be reported as the sum of detectable concentrations of individual PAH compounds.

10. The permittee shall conduct chronic and acute toxicity tests at a frequency of 2/year. The permittee shall test the inland silverside, *Menidia beryllina*, and sea urchin, *Arbacia punctulata,* for chronic toxicity and the inland silverside and mysid shrimp, *Americamysis bahia,* for acute toxicity. Toxicity test samples shall

be collected and tests completed during the time periods of October 1st - March 31st and April 1st-September 30th, each year. Toxicity test results are to be submitted by the 15th day of the month following the end of the month sampled. The tests must be performed in accordance with test procedures and protocols specified in Attachments 1 and 2 of the permit.

After submitting WET test results for at least two (2) years, and a minimum of four (4) consecutive sets of WET test results demonstrating no toxicity, the permittee may request a reduction in the WET testing requirements. The permittee is required to continue testing at the frequency specified in the permit until notice is received by certified mail from EPA that the WET testing requirement has been changed.

11. If toxicity test(s) using receiving water as diluent show the receiving water to be toxic or unreliable, the permittee shall either follow procedures outlined in Attachment 1 (Toxicity Test Procedure and Protocol) Section IV., DILUTION WATER in order to obtain an individual approval for use of an alternate dilution water, or the permittee shall follow the *Self-Implementing Alternative Dilution Water Guidance* which may be used to obtain automatic approval of an alternate dilution water, including the appropriate species for use with that water. This guidance is found in Attachment G of *NPDES Program Instructions for the Discharge Monitoring Report Forms (DMRs),* which may be found on the EPA, Region I web site at http://www.epa.gov/Region1/enforcementandassistance/dmr.html. If this guidance is revoked, the permittee shall revert to obtaining individual approval as outlined in Attachment 1. Any modification or revocation to this guidance will be transmitted to the permittee as part of the annual DMR instruction package. However, at any time, the permittee may choose to contact EPA-New England directly using the approach outlined in Attachments 1 and 2 of the permit.

12. A composite sample shall consist of a minimum of eight (8) grab samples of equal volume collected at equal intervals during a 24-hour period and combined proportional to flow, or a sample consisting of the same number of grab samples, or greater, collected proportionally to flow over that same time period. In the event that the discharge does not last 24 hours, sample at hourly intervals for the length of time of the discharge, not to be less than 4 hours (i.e., no less than four samples).

13. For each Whole Effluent Toxicity (WET) test the permittee shall report on the appropriate Discharge Monitoring Report (DMR), the concentrations of the Hardness, Total Ammonia Nitrogen as Nitrogen, Alkalinity, pH, Specific Conductance, Total Solids, Total Organic Carbon, Total Residual Chlorine, Dissolved Oxygen, Total Recoverable Aluminum, Total Recoverable Cadmium, Total Recoverable Chromium, Total Recoverable Copper, Total Recoverable Lead, Total Recoverable Nickel, Total Recoverable Zinc, Total Recoverable Magnesium, and Total Recoverable Calcium found in the 100 percent effluent sample. The permittee should note that all chemical parameter results must still be reported in the appropriate toxicity report. Analyses conducted for WET testing may also be used to satisfy monthly or quarterly sampling requirements under Part I.A.2 as long as the timing of sampling for the parameters coincides with WET testing for selected pollutants.

14. The LC_{50} is the concentration of effluent which causes mortality to 50% of the test organisms.

15. The C-NOEC (chronic no observed effect concentration) is defined as the highest concentration of toxicant or effluent to which organisms are exposed in a life cycle or partial life cycle test which causes no adverse effect on growth, survival, or reproduction, based on a statistically significant difference from dilution control, at a specific time of observation as determined from hypothesis testing. As described in EPA WET Method Manual EPA 821-R-02-013, Section 10.2.6.2, all test results are to be reviewed and reported in accordance with EPA guidance on the evaluation of the concentration-response relationship.

3. During the period beginning on the effective date and lasting through the expiration date, the permittee is authorized to discharge non-contact cooling water (NCCW) from aircraft engine test facility heat exchangers and NCCW from the engine and compressor test facility through **Outfall Serial Number 014 (Engine Testing Facility)** to the Saugus River. Such discharges shall be limited and monitored by the permittee as specified below.

Effluent Characteristic	Units	Discharge Limitation		Monitoring Requirements[1]	
		Average Monthly	Maximum Daily	Measurement Frequency[2]	Sample Type
Flow (March 1 – July 31)	MGD	18	45	1/Month	Estimate
Flow (August 1 – February 28)	MGD	27	45	1/Month	Estimate
pH	S.U.	-	6.5-8.5	1/Month	Grab
Temperature	°F	90	95	Continuous	Recorder
Oil and Grease (O&G)	mg/L	Report	15	1/Month	Grab
Total Suspended Solids (TSS)	mg/L	Report	Report	1/Month	Grab
Whole Effluent Toxicity (WET)[3,4,6]					
LC_{50}	%		Report	2/Year	Composite[5]
Hardness	mg/L		Report	2/Year	Composite[5]
Alkalinity	mg/L		Report	2/Year	Composite[5]
pH	S.U.		Report	2/Year	Composite[5]
Specific Conductance	µmhos/c		Report	2/Year	Composite[5]
Total Solids	m		Report	2/Year	Composite[5]
Ammonia	mg/L		Report	2/Year	Composite[5]
Total Organic Carbon	mg/L		Report	2/Year	Composite[5]
Total Residual Chlorine	mg/L		Report	2/Year	Composite[5]
Dissolved Oxygen	mg/L		Report	2/Year	Composite[5]
Total Cadmium	mg/L		Report	2/Year	Composite[5]
Total Chromium	mg/L		Report	2/Year	Composite[5]

Effluent Characteristic	Units	Discharge Limitation		Monitoring Requirements[1]	
		Average Monthly	Maximum Daily	Measurement Frequency[2]	Sample Type
Total Lead	mg/L		Report	2/Year	Composite[5]
Total Copper	mg/L		Report	2/Year	Composite[5]
Total Zinc	mg/L		Report	2/Year	Composite[5]
Total Nickel	mg/L		Report	2/Year	Composite[5]
Total Aluminum	mg/L		Report	2/Year	Composite[5]
Total Magnesium	mg/L		Report	2/Year	Composite[5]
Total Calcium	mg/L		Report	2/Year	Composite[5]

See pages 16 for explanation of footnotes.

Footnotes:

1. Samples taken in compliance with the monitoring requirements specified above shall be taken at a point representative of all the discharge through the outfall, prior to mixing with the receiving waters (Saugus River). All samples shall be tested in accordance with the procedures in 40 CFR Part 136, unless specified otherwise elsewhere in this permit.

2. Sampling frequency of 1/month is defined as the sampling of one (1) discharge event in each calendar month, when discharge occurs. Sampling frequency of 2/Year is defined as the sampling of two (2) discharge events in each calendar year, when discharge occurs. 2/Year samples shall be collected and tests completed during the time periods of October 1st - March 31st and April 1st- September 30th. The permittee shall submit the results to EPA of any additional testing done to that required herein, if it is conducted in accordance with EPA approved methods consistent with the provisions of 40 CFR §122.41(l)(4)(ii).

3. The permittee shall conduct acute toxicity tests at a frequency of 2/year. The permittee shall test the inland silverside, *Menidia beryllina*, and mysid shrimp, *Americamysis bahia*. The LC_{50} is the concentration of effluent which causes mortality to 50% of the organisms. Toxicity test results are to be submitted by the 15th day of the month following the end of the month sampled. The tests must be performed in accordance with test procedures and protocols specified in Attachment 1 of the permit.

   After submitting WET test results for at least two (2) years, and a minimum of four (4) consecutive sets of WET test results demonstrating no toxicity, the permittee may request a reduction in the WET testing requirements. The permittee is required to continue testing at the frequency specified in the permit until notice is received by certified mail from EPA that the WET testing requirement has been changed.

4. If toxicity test(s) using receiving water as diluent show the receiving water to be toxic or unreliable, the permittee shall either follow procedures outlined in Attachment 1 (Toxicity Test Procedure and Protocol) Section IV., DILUTION WATER in order to obtain an individual approval for use of an alternate dilution water, or the permittee shall follow the *Self-Implementing Alternative Dilution Water Guidance* which may be used to obtain automatic approval of an alternate dilution water, including the appropriate species for use with that water. This guidance is found in Attachment G of *NPDES Program Instructions for the Discharge Monitoring Report Forms (DMRs),* which may be found on the EPA, Region I web site at http://www.epa.gov/Region1/enforcementandassistance/dmr.html. If this guidance is revoked, the permittee shall revert to obtaining individual approval as outlined in Attachment 1. Any modification or revocation to this guidance will be transmitted to the permittees as part of the annual DMR instruction package. However, at any time, the permittee may choose to contact EPA-New England directly using the approach outlined in Attachment 1.

5. A composite sample shall consist of a minimum of eight (8) grab samples of equal volume collected at equal intervals during a 24-hour period and combined proportional to flow, or a sample consisting of the same number of grab samples, or greater, collected proportionally to flow over that same time period. In the event that the discharge does not last 24 hours, sample at hourly intervals for the length of time of the discharge, not to be less than 4hours (i.e., no less than four samples).

6. For each Whole Effluent Toxicity (WET) test the permittee shall report on the appropriate Discharge Monitoring Report (DMR), the concentrations of the Hardness, Total Ammonia Nitrogen as Nitrogen, Alkalinity, pH, Specific Conductance, Total Solids, Total Organic Carbon, Total Residual Chlorine, Dissolved Oxygen, Total Recoverable Aluminum, Total Recoverable Cadmium, Total Recoverable Chromium, Total Recoverable Copper, Total Recoverable Lead, Total Recoverable Nickel, Total Recoverable Zinc, Total Recoverable Magnesium, and Total Recoverable Calcium found in the 100 percent effluent sample. The permittee should note that all chemical parameter results must still be reported in the appropriate toxicity report.

4. During the period beginning on the effective date and lasting through the expiration date, the permittee is authorized to discharge flows consisting of NCCW from power plant generating equipment, turbine condensate, steam condensate, boiler startup/soot blower drains/boiler draining for maintenance, de-aerator storage tanks, boiler blowdown, and flows from internal Outfall 018C through **Outfall Serial Number 018A (Power Plant)** to the Saugus River. Such discharge shall be limited and monitored by the permittee as specified below.

Effluent Characteristic	Units	Discharge Limitation		Monitoring Requirements[1]	
		Average Monthly	Maximum Daily	Measurement Frequency[2]	Sample Type
Flow	MGD	28.7	35.6	1/Month	Estimate
pH	S.U.	-	6.5-8.5	1/Month	Grab
Temperature	°F	90	95	Continuous	Recorder
Oil and Grease (O&G)	mg/L	Report	15	1/Month	Grab
Total Suspended Solids (TSS)	mg/L	Report	Report	1/Month	Grab
Whole Effluent Toxicity (WET)[3,4,6]					
LC_{50}[7]	%		Report	2/Year	Composite[5]
C-NOEC[8]	%		Report	2/Year	Composite[5]
Hardness	mg/L		Report	2/Year	Composite[5]
Alkalinity	mg/L		Report	2/Year	Composite[5]
pH	S.U.		Report	2/Year	Composite[5]
Specific Conductance	µmhos/c		Report	2/Year	Composite[5]
Total Solids	m		Report	2/Year	Composite[5]
Ammonia	mg/L		Report	2/Year	Composite[5]
Total Organic Carbon	mg/L		Report	2/Year	Composite[5]
Total Residual Chlorine	mg/L		Report	2/Year	Composite[5]
Dissolved Oxygen	mg/L		Report	2/Year	Composite[5]
Total Cadmium	mg/L		Report	2/Year	Composite[5]

Effluent Characteristic	Units	Discharge Limitation		Monitoring Requirements[1]	
		Average Monthly	Maximum Daily	Measurement Frequency[2]	Sample Type
Total Chromium	mg/L		Report	2/Year	Composite[5]
Total Lead	mg/L		Report	2/Year	Composite[5]
Total Copper	mg/L		Report	2/Year	Composite[5]
Total Zinc	mg/L		Report	2/Year	Composite[5]
Total Nickel	mg/L		Report	2/Year	Composite[5]
Total Aluminum	mg/L		Report	2/Year	Composite[5]
Total Magnesium	mg/L		Report	2/Year	Composite[5]
Total Calcium	mg/L		Report	2/Year	Composite[5]

See pages 19-20 for explanation of footnotes.

Footnotes:

1. Samples taken in compliance with the monitoring requirements specified above shall be taken at a point representative of all the discharge from the site through the outfall, prior to mixing with the receiving waters. All samples shall be tested in accordance with the procedures in 40 CFR §136, unless specified elsewhere in the permit.

2. Sampling frequency of 1/month is defined as the sampling of one (1) discharge event in each calendar month, when discharge occurs. Sampling frequency of 2/Year is defined as the sampling of two (2) discharge events in each calendar year during the time periods of October 1st - March 31st and April 1st- September 30th. 2/Year sampling shall be performed concurrently with the monthly monitoring event. The permittee shall submit the results to EPA of any additional testing done to that required herein, if it is conducted in accordance with EPA approved methods consistent with the provisions of 40 CFR §122.41(l)(4)(ii).

3. The permittee shall conduct chronic and acute toxicity tests at a frequency of 2/year. The permittee shall test the inland silverside, *Menidia beryllina*, and sea urchin, *Arbacia punctulata*, for chronic toxicity and the inland silverside and mysid shrimp, *Americamysis bahia*, for acute toxicity. Toxicity test samples shall be collected and tests completed Toxicity test results are to be submitted by the 15th day of the month following the end of the month sampled. The tests must be performed in accordance with test procedures and protocols specified in Attachments 1 and 2 of the permit.

   After submitting WET test results for at least two (2) years, and a minimum of four (4) consecutive sets of WET test results demonstrating no toxicity, the permittee may request a reduction in the WET testing requirements. The permittee is required to continue testing at the frequency specified in the permit until notice is received by certified mail from EPA that the WET testing requirement has been changed.

4. If toxicity test(s) using receiving water as diluent show the receiving water to be toxic or unreliable, the permittee shall either follow procedures outlined in Attachment 1 (Toxicity Test Procedure and Protocol) Section IV., DILUTION WATER in order to obtain an individual approval for use of an alternate dilution water, or the permittee shall follow the *Self-Implementing Alternative Dilution Water Guidance* which may be used to obtain automatic approval of an alternate dilution water, including the appropriate species for use with that water. This guidance is found in Attachment G of *NPDES Program Instructions for the Discharge Monitoring Report Forms (DMRs),* which may be found on the EPA, Region I web site at http://www.epa.gov/Region1/enforcementandassistance/dmr.html. If this guidance is revoked, the permittee shall revert to obtaining individual approval as outlined in Attachment 1. Any modification or revocation to this guidance will be transmitted to the permittees as part of the annual DMR instruction package. However, at any time, the permittee may choose to contact EPA-New England directly using the approach outlined in Attachments 1 and 2 of the permit.

5. A composite sample shall consist of a minimum of eight (8) grab samples of equal volume collected at equal intervals during a 24-hour period and combined proportional to flow, or a sample consisting of the same number of grab samples, or greater, collected proportionally to flow over that same time period. In the event that the discharge does not last 24 hours, sample at hourly intervals for the length of time of the discharge, not to be less than 4 hours (i.e., no less than four samples).

6. For each Whole Effluent Toxicity (WET) test the permittee shall report on the appropriate Discharge Monitoring Report (DMR), the concentrations of the Hardness, Total Ammonia Nitrogen as Nitrogen, Alkalinity, pH, Specific Conductance, Total Solids, Total Organic Carbon, Total Residual Chlorine, Dissolved Oxygen, Total Recoverable Aluminum, Total Recoverable Cadmium, Total Recoverable Chromium, Total Recoverable Copper, Total Recoverable Lead, Total Recoverable Nickel, Total Recoverable Zinc, Total Recoverable Magnesium, and Total Recoverable Calcium found in the 100 percent

effluent sample. The permittee should note that all chemical parameter results must still be reported in the appropriate toxicity report.

7. The LC_{50} is the concentration of effluent which causes mortality to 50% of the test organisms.

8. The C-NOEC (chronic no observed effect concentration) is defined as the highest concentration of toxicant or effluent to which organisms are exposed in a life cycle or partial life cycle test which causes no adverse effect on growth, survival, or reproduction, based on a statistically significant difference from dilution control, at a specific time of observation as determined from hypothesis testing. As described in EPA WET Method Manual EPA 821-R-02-013, Section 10.2.6.2, all test results are to be reviewed and reported in accordance with EPA guidance on the evaluation of the concentration-response relationship.

5. During the period beginning on the effective date and lasting through the expiration date, the permittee is authorized to discharge flows consisting of boiler startup/soot blower drains/boiler draining for maintenance, boiler filter backwash and ion exchange regeneration and backwash, de-aerator storage tanks, and boiler blowdown through **Internal Outfall Serial Number 018C (Power Plant)** to the Saugus River. Such discharge shall be limited and monitored by the permittee as specified below.

Effluent Characteristic	Units	Discharge Limitation		Monitoring Requirements[1]	
		Average Monthly	Maximum Daily	Measurement Frequency[2]	Sample Type
Flow	MGD	Report	Report	1/Month	Estimate
pH	S.U.	6.0 – 9.0		1/Month	Grab
Oil and Grease (O&G)	mg/L	15	20	1/Month	Grab
Total Suspended Solids (TSS)	mg/L	30	100	1/Month	Grab

Footnotes:

1. Samples taken in compliance with the monitoring requirements specified above shall be taken at a point representative of all the flow through the internal outfall, prior to mixing with any other discharge through Outfall 018A. All samples shall be tested in accordance with the procedures in 40 CFR §136, unless specified elsewhere in the permit. If collection of a single representative sample of the flows through Outfall 018C is impracticable, collect the samples independently and report the results separately on the DMR.

2. Sampling frequency of 1/month is defined as the sampling of one (1) discharge event in each calendar month. The permittee shall submit the results to EPA of any additional testing done to that required herein, if it is conducted in accordance with EPA approved methods consistent with the provisions of 40 CFR §122.41(l)(4)(ii).

6. During the period beginning on the effective date and lasting through the expiration date, the permittee is authorized to discharge unused intake water through **Outfall Serial Number 020** to the Saugus River. Such discharge shall be limited and monitored by the permittee as specified below.

Effluent Characteristic	Units	Discharge Limitation		Monitoring Requirements[1]	
		Average Monthly	Maximum Daily	Measurement Frequency[2]	Sample Type
Flow	MGD	16.9	Report	1/Quarter	Estimate
pH	S.U.	-	6.5-8.5	1/Quarter	Grab
Oil and Grease (O&G)	mg/L	Report	15	1/Quarter	Grab
Total Suspended Solids (TSS)	mg/L	Report	Report	1/Quarter	Grab

Footnotes:

1. Samples taken in compliance with the monitoring requirements specified above shall be taken at a point representative of all the discharge from the site through the outfall, prior to mixing with the receiving waters.

2. Sampling frequency of 1/quarter is defined as the sampling of four (4) discharge events in each calendar year, when discharge occurs. Quarters are defined as the interval of time between the months of: January through March, inclusive; April through June, inclusive; July through September, inclusive; and October through December, inclusive. The permittee shall submit the results to EPA of any additional testing done to that required herein, if it is conducted in accordance with EPA approved methods consistent with the provisions of 40 CFR §122.41(l)(4)(ii).

Part I.A (continued)

7. Discharges from Internal Outfall 032 directly to the receiving water (Saugus River) are prohibited.

8. Discharges through Outfalls 003 and 005 are prohibited.

9. Discharges through Outfall 029 (Gear Plant) are prohibited.

10. The permittee is authorized to use non-toxic, biodegradable dyes during dry weather, in minimal amounts, in accordance with good engineering practice, with prior notification to EPA and MassDEP.

11. Building 64-A sump water and test cell washdown water shall be discharged to the LWSC municipal sewer system.

12. Discharge of wash water containing detergents is prohibited.

13. The use of detergents and/or solvents in Drainage System Cleaning process is prohibited.

14. Unless otherwise authorized, the pH shall be in the range of 6.5 through 8.5 standard units and not more than 0.2 units outside of the natural background range. There shall be no change from natural background conditions that would impair any use assigned to Class SB waters.

15. These waters shall be free from floating, suspended, and settleable solids in concentrations or combinations that would impair any use assigned to this class, that would cause aesthetically objectionable conditions, or that would impair the benthic biota or degrade the chemical composition of the bottom.

16. These waters shall be free from oil, grease and petrochemicals that produce a visible film on the surface of the water, impart an oily taste to the water or an oily or other undesirable taste to the edible portions of aquatic life, coat the banks or bottom of the water course, or are deleterious or become toxic to aquatic life.

17. The use of oil-based anti-foam agents, such as Foamtrol AF2290, is prohibited.

18. The discharge shall not contain materials in concentrations or combinations which are hazardous or toxic to human health, aquatic life of the receiving surface waters or which would impair the uses designated by its classification.

19. EPA may modify and/or revoke and reissue this permit in accordance with EPA regulations at 40 C.F.R. §122.62 and §122.63.

20. All existing manufacturing, commercial, mining and silvicultural dischargers must notify the Director as soon as they know or have reason to believe:

a. That any activity has occurred or will occur which would result in the discharge, on a routine basis, of any toxic pollutant which is not limited in the permit, if that discharge will exceed the highest of the following "notification levels":

   i. One hundred micrograms per liter (100 µg/l);

   ii. Two hundred micrograms per liter (200 µg/l) for acrolein and acrylonitrite; five hundred micrograms per liter (500 µg/l) for 2,4-dinitrophenol; and one milligram per liter (1 mg/l) for antimony;

   iii. Five (5) times the maximum concentration value reported for that pollutant in the permit application in accordance with 40 C.F.R.i 122.21(g)(7); or

   iv. Any other notification level established by the Director in accordance with 40 C.F.R.§122.44(f).

b. That any activity has occurred or will occur which would result in the discharge, on a non-routine or infrequent basis, of any toxic pollutant which is not limited in the permit, if that discharge will exceed the highest of the following "notification levels":

   i. Five hundred micrograms per liter (500 µg/l);

   ii. One milligram per liter (1 mg/l) for antimony;

   iii. Ten (10) times the maximum concentration value reported for that pollutant in the permit application in accordance with 40 C.F.R.i 122.21(g)(7).

   iv. Any other notification level established by the Director in accordance with 40 C.F.R.i 122.44(f).

c. That they have begun or expect to begin to use or manufacture as an intermediate or final product or byproduct any toxic pollutant which was not reported in the permit application.

21. Toxics Control

a. The permittee shall not discharge any pollutant or combination of pollutants in toxic amounts.

b. Any toxic components of the effluent shall not result in any demonstrable harm to aquatic life or violate any state or federal water quality standard which has been or may be promulgated. Upon promulgation of any such standard, this permit may be revised or amended in accordance with such standards.

B. BEST MANAGEMENT PRACTICES (BMPs)

1. Dry Weather Flows from Drainage System Outfalls (Outfall Serial Numbers 001, 007, 010, 019, 027B, 028, 030, 031)

   a. The Drainage System Outfall gates shall remain closed without leaks, except for minor weeping around the bottom edge of the gate due to hydrostatic pressure, during all periods of dry weather.

   b. Prior to any storm event forecasted to generate 0.1 inches or more of precipitation over twenty-four (24) hours, operate the transfer pumps to lower the elevation of dry weather flows contained in the drainage system outfall vaults to no more than the "low alarm" level prior to the start of wet weather (see Part I.A.1 Footnote 1). The permittee shall use the National Weather Service's Precipitation Forecast for the Boston area to determine when to operate the vaults at the "low alarm" level. The average monthly and maximum daily volume of dry weather flow pumped to the CDTS prior to a storm event from each drainage system outfall during each month shall be reported on the discharge monitoring report (see Part I.A.1).

   c. Ensure the sonic sensor in each outfall vault is operated normally so that the water level in the skimming chamber is never lower than the baffle designed to retain floating material for skimming except when required to operate at the "low alarm" level to minimize dry weather flow in the vault prior to a forecasted storm event consistent with Part I.B.1.b, above.

   d. Develop and implement a written schedule for inspection and cleaning of all oil/water separators at each Drainage System Outfall vault on a regular basis.

2. Storm Water Pollution Prevention Plan (SWPPP)

   The permittee shall develop, implement, and maintain a Stormwater Pollution Prevention Plan (SWPPP) designed to reduce, or prevent, the discharge of pollutants in stormwater to the receiving waters identified in this permit. The SWPPP shall be a written document that is consistent with the terms of this permit. Additionally, the SWPPP shall serve as a tool to document the permittee's compliance with the terms of the permit. The recommended format for the SWPPP is available on the EPA website for the Multi-Sector General Permit (MSGP) for Stormwater Discharges Associated with Industrial Activities (http://cfpub.epa.gov/npdes/stormwater/msgp.cfm).

   The SWPPP shall be completed or updated and certified by the permittee within 90 days after the effective date of this permit. The permittee shall certify that the SWPPP has been completed or updated, that it meets the requirements of the permit, and that it reduces the pollutants discharged in stormwater to the extent practicable. The certification shall be signed in accordance with the requirements identified in 40 CFR

§122.22. A copy of this initial certification shall be sent to EPA and MassDEP within one hundred and twenty (120) days of the effective date of the Permit.

a. The SWPPP shall be prepared in accordance with good engineering practices and shall be consistent with the general provisions for SWPPPs included in the most current version of the MSGP. In the current MSGP (effective May 27, 2009), the general SWPPP provisions are included in Part 5. Specifically, the SWPPP shall document the selection, design, and installation of control measures and contain the elements listed below:

   i. A pollution prevention team comprised of qualified facility personnel with collective and individual responsibilities for developing, implementing, maintaining, revising and ensuring compliance with the SWPPP.

   ii. A site description which includes the activities at the facility; a general location map showing the facility, receiving waters, and outfall locations; and a site map showing the extent of significant structures and impervious surfaces, directions of stormwater flows, and locations of all existing structural control measures, stormwater conveyances, pollutant sources (identified in Part 3.c. below), stormwater monitoring points, stormwater inlets and outlets, and industrial activities exposed to precipitation such as, storage, disposal, material handling.

   iii. A summary of all pollutant sources which includes a list of activities exposed to stormwater, the pollutants associated with these activities, a description of where spills have occurred or could occur, a description of non-stormwater discharges, and a summary of any existing stormwater discharge sampling data.

   iv. A description of all stormwater controls, both structural and non-structural.

   v. A schedule and procedure for implementation and maintenance of the control measures described above and for the quarterly inspections and best management practices (BMPs) described below.

b. The SWPPP shall include best management practices (BMPs) appropriate for the facility that will minimize the discharge of pollutants in stormwater to waters of the United States. At a minimum, these BMPs shall be consistent with the control measures described in the most current version of the MSGP. In the current MSGP (effective May 27, 2009), these control measures, which are non-numeric technology-based effluent limitations, are described in Part 2. Specifically, BMPs must include the following elements:

   i. Minimizing exposure of manufacturing, processing, and material storage areas to stormwater discharges.

ii. Good housekeeping measures designed to maintain areas that are potential sources of pollutants.

iii. Preventative maintenance programs to avoid leaks, spills, and other releases of pollutants in stormwater discharged to receiving waters.

iv. Spill prevention and response procedures to ensure effective response to spills and leaks if or when they occur.

v. Erosion and sediment controls designed to stabilize exposed areas and contain runoff using structural and/or non-structural control measures to minimize onsite erosion and sedimentation, and the resulting discharge of pollutants.

vi. Runoff management practices to divert, infiltrate, reuse, contain, or otherwise reduce stormwater runoff.

vii. Proper handling procedures for salt or materials containing salt that are used for deicing activities.

c. In addition, the permittee shall perform the following site-specific BMPs for the facility to minimize the discharge of pollutants in stormwater:

i. Inspect all stormwater collected within the secondary containment areas at the jet fuel farm, around tanks, in the truck unloading ramps, in the Outfall 032 drainage area, and from other areas for evidence of an oil sheen or other contamination prior to such water being discharged to the drainage system. In the event that a sheen is observed, the permittee shall eliminate the sheen prior to discharging the water from the containment area to the drainage system. Otherwise, water containing a sheen shall be discharged to the CDTS for treatment, or disposed of offsite.

ii. Perform regular cleaning of the Drainage System pipelines. The term “regular cleaning” shall be defined based on site-specific factors and described in the facility’s SWPPP, which shall include requirements for the disposal of all solids offsite which are accumulated as a result of the cleaning, the minimization of the amount of solids left behind in the storm drains, the disposal of all collected solids off-site in a manner that complies with federal, state and local laws, regulations and ordinances, and ensuring that all drainage system cleaning water is disposed of offsite or goes directly to the CDTS for treatment.

iii. Prior to washing roof mounted air conditioner (AC) units, inspect each AC unit for the presence of any visible oil and grease spots or spills. If any such oil and grease is found, manually remove according to normal spill clean-up protocol before any spray washing begins.

iv. Containerize any wash water containing detergent and remove offsite for subsequent treatment or disposal.

v. Discharge of any water containing non-approved additives directly to the receiving water is prohibited. Approved additives are listed in Attachment 4.

vi. Minimize contamination of precipitation or surface runoff from fuel oil unloading areas. Consider using containment curbs in unloading areas, having personnel familiar with spill prevention and response procedures present during deliveries to ensure that any leaks or spills are immediately contained and cleaned up, and using spill and overflow protection devices (e.g., drip pans, drip diapers, or other containment devices placed beneath fuel oil connectors to contain potential spillage during deliveries or from leaks at the connectors).

vii. Minimize contamination of surface runoff from large bulk fuel storage tanks. Consider containment berms (or their equivalent). You must also comply with applicable State and Federal laws, including Spill Prevention, Control and Countermeasure (SPCC) Plan requirements.

viii. Minimize the potential for an oil or chemical spill, or reference the appropriate part of your SPCC plan. Visually inspect as part of your routine facility inspection the structural integrity of all above-ground tanks, pipelines, pumps, and related equipment that may be exposed to stormwater, and make any necessary repairs immediately.

ix. Continue to test water generated from the dewatering of excavations. Based on the test results, the flow shall be either 1) discharged to the CDTS equalization tanks for treatment; 2) discharged to the LWSC municipal sewer system with permission; or 3) shipped offsite for disposal.

d. All areas identified in the SWPPP shall be inspected at a minimum on a quarterly basis. Inspections shall begin during the 1st full quarter after the effective date of the permit. EPA considers quarters as follows: January to March; April to June; July to September; and October to December.

e. The permittee shall amend and update the SWPPP within 14 days of any changes at the facility that result in a significant effect on the potential for the discharge of pollutants to the waters of the United States. Such changes may include, but are not limited to: a change in design, construction, operation, or maintenance, materials storage, or activities at the facility; a release of a reportable quantity of pollutants as described in 40 CFR Part 302; or a determination by the permittee or EPA that the SWPPP appears to be ineffective in achieving the general objectives of controlling pollutants in stormwater discharges associated with industrial activity. Any amended or new versions of the SWPPP shall be re-certified and signed by the permittee in accordance with the requirements identified in 40 CFR §122.22

f. The permittee shall certify at least annually that the previous year's inspections and maintenance activities were conducted, results were recorded, records were maintained, and that the facility is in compliance with the SWPPP. If the facility is not in compliance with any aspect of the SWPPP, the annual certification shall state the non-compliance and the remedies which are being undertaken. Such annual certifications also shall be signed in accordance with the requirements identified in 40 CFR §122.22. The permittee shall keep a copy of the current SWPPP and all SWPPP certifications (the initial certification, re-certifications, and annual certifications) signed during the effective period of this permit at the facility and shall make it available for inspection by EPA and MassDEP. In addition, the permittee shall document in the SWPPP any violation of numerical or non-numerical wet weather effluent limits with a description of the corrective actions taken.

C. COOLING WATER INTAKE STRUCTURE REQUIREMENTS TO MINIMIZE ADVERSE IMPACTS FROM IMPINGEMENT AND ENTRAINMENT

The design, location, construction, and capacity of the permittee's CWISs shall reflect the best technology available (BTA) for minimizing adverse environmental impacts from the entrainment and impingement of various life stages of fish (e.g., eggs, larvae, juveniles, adults) by the CWISs. The following requirements have been determined by the EPA to represent the BTA for minimizing impingement and entrainment impacts at this facility:

1. Test Cell CWIS

   a. To minimize impingement mortality, the permittee shall improve the existing fish return trough by installing a new fish return trough that avoids high elevation drops and 90-degree turns, and returns fish to a location that minimizes potential for re-impingement and is submerged at all tidal stages.

   b. To minimize entrainment, the permittee shall operate the CWIS with an average monthly flow limit of 18 MGD from March 1 to July 31 and an average monthly flow limit of 27 MGD from August 1 to February 28.

2. Power Plant CWIS

   a. To minimize impingement mortality, the permittee shall reduce the through-screen velocity at any new or existing screening system to a level no greater than 0.5 fps.

   b. To minimize entrainment, the permittee shall:

      i. Maintain a year-round monthly average intake flow of 28.7 MGD, commensurate with a 20% reduction in average monthly flow from the permittee's 1993 NPDES permit; *and*

ii. Install and operate a fine mesh wedgewire screen intake system with a pressurized system to clear debris from the screens. For this permit, "fine mesh" is defined as a screen with a slot or mesh size no greater than 0.5 mm, unless the permittee can demonstrate through a site-specific study that a larger slot size is equally or more effective for reducing entrainment as a 0.5 mm slot or mesh size.

3. As an alternative to the requirements in Part I.C.2, the permittee may at its option minimize entrainment and impingement at the Power Plant CWIS by maintaining a year-round maximum daily intake flow commensurate with the operation of a closed-cycle cooling system by no later than the final compliance schedule dates specified in Part I.C.5 of this permit.

4. Any change in the location, design, or capacity of any CWIS must be approved in advance and in writing by the EPA and MassDEP.

5. *Compliance Schedule.* In order to comply with Parts I.C.1 and I.C.2 of this permit, the permittee will need to install and operate new equipment. This Part of the permit provides a schedule by which the permittee shall attain compliance with Parts I.C.1 and I.C.2 of the permit. Specifically, steps for the installation and operation of equipment required to comply with Parts I.C.1 and I.C.2 of this permit shall be completed as soon as practicable, but no later than the schedule of milestones set forth below. The permittee shall notify EPA and MassDEP in writing of compliance or non-compliance with the requirements for each milestone no later than fourteen (14) days following each specified deadline.

   a. Data collection, including facility dewatering, topographic and bathymetric surveys, and geotechnical exploration, shall be completed no later than six (6) months from the effective date of the permit.

   b. A preliminary design for the fish return trough at the Test Cell CWIS shall be submitted to EPA and MassDEP no later than eight (8) months from the effective date of the permit.

   c. A preliminary design for the wedgewire screens at the Power Plant CWIS shall be submitted to EPA and MassDEP no later than eight (8) months from the effective date of the permit. This preliminary design will specify the slot or mesh proposed for the wedgewire screens (specifically, whether they will have a slot or mesh size of 0.5 mm or less, or whether they will have a larger slot or mesh size based on a site-specific study by the permittee demonstrating that a larger slot size will be as effective as, or more effective than, a 0.5 mm slot or mesh size for reducing entrainment).

   d. The permittee shall complete installation and commence operation of variable frequency drives for the Power Plant CWIS condenser pumps, and comply with the flow requirement in Part I.C.2.b, as soon as practicable after the effective date of the permit.

e. A final design for the fish return trough at the Test Cell CWIS shall be submitted to EPA and MassDEP no later than fourteen (14) months from the effective date of the permit.

f. A final design for the wedgewire screens at the Power Plant CWIS shall be submitted to EPA and MassDEP no later than fourteen (14) months from the effective date of the permit. This final design will specify the slot or mesh to be used for the wedgewire screens.

g. The permittee shall obtain all necessary permits for installation and construction of the fish return trough and wedgewire screens, including U.S. Army Corps of Engineers, MassDEP, Massachusetts Division of Coastal Zone Management, local conservation commissions, and others as necessary no later than twenty-six (26) months from the effective date of the permit.

h. The permittee shall obtain and select a construction bid for the construction of the new fish return trough at the Test Cell CWIS no later than twenty-eight (28) months from the effective date of the permit.

i. The permittee shall obtain and select a construction bid for the construction of wedgewire screens at the Power Plant CWIS no later than twenty-eight (28) months from the effective date of the permit.

j. The permittee shall complete site preparation for the construction of a fish return trough at the Test Cell CWIS no later than thirty-two (32) months from the effective date of the permit.

k. The permittee shall complete site preparation for the construction of wedgewire screens at the Power Plant CWIS no later than thirty-two (32) months from the effective date of the permit.

l. The permittee shall complete installation, operational modifications, test, startup and commissioning of the fish return trough at the Test Cell CWIS no later than forty-three (43) months from the effective date of the permit.

m. The permittee shall complete installation, operational modifications, test, startup and commissioning of the wedgewire screens at the Power Plant CWIS no later than forty-three (43) months from the effective date of the permit.

D. BIOLOGICAL MONITORING PROGRAM

1. Entrainment monitoring at the Power Plant CWIS shall commence no later than thirty (30) days from the date upon which both the wedgewire screens and variable frequency drives are fully operable and continue for two (2) years.

   a. Entrainment monitoring shall be conducted twice per month during the months of March through September, and once per month from October through February. Two non-consecutive entrainment samples shall be collected during each event representing day and night samples (e.g. once on Monday morning at 8:00 am, and once on Wednesday night at 8:00 pm).

      i. Entrainment samples shall be collected from the intake pipe(s) if feasible, or from a representative location within the intake structure.

      ii. Sampling shall be conducted using a 0.5-mm mesh, 60-cm diameter collection net with a flow meter mounted in the mouth of the net. Filtration volume shall be recorded for each event and each sample shall represent approximately 100 m^3 of water. After each sample, the collection nets shall be washed down and the sample transferred from the net to a jar containing sufficient formalin to produce a 5 to 10% solution.

      iii. In the laboratory, all fish eggs and larvae shall be identified to the lowest distinguishable taxonomic category and counted.

      iv. Ichthyoplankton counts shall be converted to densities per 100 m^3 based on the flow through the sampling net and the data shall be presented in the annual CWIS Biological Monitoring Report (BMR) detailed in Part I.D.3 below. Estimates of total numbers based on intake flow rates shall also be provided. Entrainment losses shall be converted from weekly estimates of density per unit volume, to monthly and yearly loss estimates based on the permitted flow at Outfall 018. In addition, loss estimates should be converted to adult equivalents for species for which regionally specific larval survival rates are available.

   b. The permittee shall demonstrate once per month that the through-screen velocity at each wedgewire screen at the maximum daily flow is no more than 0.5 fps. The permittee shall also conduct visual inspections of the wedgewire screens and routine cleaning at a schedule that ensures that the screen performance is consistent with the requirements of Part I.C.2 of this permit. Visual inspections, routine cleaning, and demonstration of the through-screen velocity shall continue for the duration of this permit unless authorization to discontinue or modify portions of the sampling program is granted by EPA and MassDEP.

2. Impingement monitoring at the Test Cell CWIS shall commence no later than thirty (30) days from the date upon which the new fish return trough is fully operable and continue for two (2) years.

a. To the maximum extent practicable, a sampling event shall consist of three, non-consecutive four (4) hour collections that represent morning, afternoon, and night (e.g. once on Monday morning at 8:00 am, once on Wednesday afternoon at 2:00 pm, and once on Friday night at 8:00 pm). The permittee may conduct fewer than three samples and/or consecutive 4-hour collections if the Test Cell CWIS does not operate long enough for three, non-consecutive collections to be sampled. In the event that fewer than three samples or in the event that consecutive samples are conducted, the permittee shall provide an explanation in the CWIS Biological Monitoring Report.

i. Sampling shall be conducted using 3/8-inch (9.5 mm) mesh. Each collection shall cover a period of at least four hours following an initial cleansing screenwash and the exact time period shall be recorded. To the extent practicable, the trash racks shall also be cleaned during each sampling period and its contents examined for any fish, mammals, reptiles or invertebrates.

ii. All fish will be immediately examined for initial condition (live, dead, injured). Three times per year during spring, fall, and winter, latent survival shall be determined after 48 hours.

iii. All fish shall be identified to the lowest distinguishable taxonomic category, counted, and measured (to the nearest mm total length) and the data shall be presented in the annual CWIS BMR. In the event of a large impingement event of school of equivalently sized forage fish, a subsample of 50 fish can be taken for length measurements. Twenty-four hour and monthly totals shall be extrapolated and reported.

iv. Annual impingement rates shall be extrapolated from the sampling events.

3. A CWIS Monitoring Report shall be submitted annually by March 31st. Each annual report shall provide a summary of the previous year's information in a narrative format. The report shall also include graphical representations, where appropriate, and all quality control procedures employed.

a. The annual report conclusions will indicate the trends of the various parameters analyzed and identify any anomalies that appear in the annual historical data comparison. These differences will be explained, if possible. The permittee will make recommendations for any remediation considered necessary or for any programs to better understand such anomalies.

b. The annual report will provide the status of the present monitoring programs, the expected effort in the ensuing six months, and an alert to EPA and MassDEP of any anomalies or patterns that may be evident in the data collection.

4. The permittee is required to submit a written explanation if any aspect of the CWIS monitoring program is not conducted. The report shall be submitted as part of the

Discharge Monitoring Report for the month the sampling was not conducted. The explanation for not monitoring must include all specific sampling activities that did not take place, along with the justification for suspending the identified sampling. This information also must be included in the annual BMR.

E. REOPENER CLAUSES

1. This permit shall be modified, or alternately, revoked and reissued, to comply with any applicable standard or limitation promulgated or approved under sections 301(b)(2)(C) and (D), 304(b)(2), and 307(a)(2) of the Clean Water Act, if the effluent standard or limitation so issued or approved:

   a. Contains different conditions or is otherwise more stringent than any effluent limitation in the permit; or

   b. Controls any pollutants not limited in the permit.

F. MONITORING AND REPORTING

1. **For a period of one year from the effective date of the permit**, the permittee may either submit monitoring data and other reports to EPA in hard copy form or report electronically using NetDMR, a web-based tool that allows permittees to electronically submit discharge monitoring reports (DMRs) and other required reports via a secure internet connection. **Beginning no later than one year after the effective date of the permit**, the permittee shall begin reporting using NetDMR, unless the facility is able to demonstrate a reasonable basis that precludes the use of NetDMR for submitting DMRs and reports. Specific requirements regarding submittal of data and reports in hard copy form and for submittal using NetDMR are described below:

   a. Submittal of Reports Using NetDMR

   NetDMR is accessed from: http://www.epa.gov/netdmr. **Within one year of the effective date of this permit**, the permittee shall begin submitting DMRs and reports required under this permit electronically to EPA using NetDMR, unless the facility is able to demonstrate a reasonable basis, such as technical or administrative infeasibility, that precludes the use of NetDMR for submitting DMRs and reports ("opt out request").

   DMRs shall be submitted electronically to EPA no later than the 15th day of the month following the completed reporting period. All reports required under the permit shall be submitted to EPA, including the MassDEP Monthly Operations and Maintenance Report, as an electronic attachment to the DMR. Once a permittee begins submitting reports using NetDMR, it will no longer be required to submit hard copies of DMRs or other reports to EPA and will no longer be required to submit hard copies of DMRs to MassDEP. However, permittees shall continue to send hard copies of reports other than

DMRs (including Monthly Operation and Maintenance Reports) to MassDEP until further notice from MassDEP.

b. Submittal of NetDMR Opt Out Requests

Opt out requests must be submitted in writing to EPA for written approval at least sixty (60) days prior to the date a facility would be required under this permit to begin using NetDMR. This demonstration shall be valid for twelve (12) months from the date of EPA approval and shall thereupon expire. At such time, DMRs and reports shall be submitted electronically to EPA unless the permittee submits a renewed opt out request and such request is approved by EPA. All opt out requests should be sent to the following addresses:

Attn: NetDMR Coordinator
U.S. Environmental Protection Agency, Water Technical Unit
5 Post Office Square, Suite 100 (OES04-4)
Boston, MA 02109-3912

and

Massachusetts Department of Environmental Protection
Surface Water Discharge Permit Program
1Winter Street, 5^{th} Floor
Boston, Massachusetts 02108

c. Submittal of Reports in Hard Copy Form

Monitoring results shall be summarized for each calendar month and reported on separate hard copy Discharge Monitoring Report Form(s) (DMRs) postmarked no later than the 15^{th} day of the month following the completed reporting period. MassDEP Monthly Operation and Maintenance Reports shall be submitted as an attachment to the DMRs. Signed and dated originals of the DMRs, and all other reports or notifications required herein or in Part II shall be submitted to the Director at the following address:

U.S. Environmental Protection Agency
Water Technical Unit (OES04-SMR)
5 Post Office Square - Suite 100
Boston, MA 02109-3912

Duplicate signed copies of all reports or notifications required above shall be submitted to the State at the following addresses:

Massachusetts Department of Environmental Protection - NERO
Bureau of Waste Prevention
205B Lowell Street
Wilmington, MA 01887

Any verbal reports, if required in **Parts I** and/or **II** of this permit, shall be made to both EPA and to MassDEP.

G. STATE PERMIT CONDITIONS

1. This authorization to discharge includes two separate and independent permit authorizations. The two permit authorizations are (i) a federal National Pollutant Discharge Elimination System permit issued by the U.S. Environmental Protection Agency (EPA) pursuant to the Federal Clean Water Act, 33 U.S.C. §§1251 et seq.; and (ii) an identical state surface water discharge permit issued by the Commissioner of MassDEP pursuant to the Massachusetts Clean Waters Act, MGL c. 21, §§ 26-53, and 314 CMR 3.00. All of the requirements contained in this authorization, as well as the standard conditions contained in 314 CMR 3.19, are hereby incorporated by reference into this state surface water discharge permit.

2. This authorization also incorporates the state water quality certification issued by MassDEP under § 401(a) of the Federal Clean Water Act, 40 CFR 124.53, MGL c. 21, § 27 and 314 CMR 3.07. All of the requirements (if any) contained in MassDEP's water quality certification for the permit are hereby incorporated by reference into this state surface water discharge permit as special conditions pursuant to 314 CMR 3.11.

3. Each agency shall have the independent right to enforce the terms and conditions of this permit. Any modification, suspension or revocation of this permit shall be effective only with respect to the agency taking such action, and shall not affect the validity or status of this permit as issued by the other agency, unless and until each agency has concurred in writing with such modification, suspension or revocation. In the event any portion of this permit is declared invalid, illegal or otherwise issued in violation of state law such permit shall remain in full force and effect under federal law as a NPDES Permit issued by the U.S. Environmental Protection Agency. In the event this permit is declared invalid, illegal or otherwise issued in violation of federal law, this permit shall remain in full force and effect under state law as a permit issued by the Commonwealth of Massachusetts.

ATTACHMENT 1

MARINE ACUTE
TOXICITY TEST PROCEDURE AND PROTOCOL

I. GENERAL REQUIREMENTS

The permittee shall conduct acceptable acute toxicity tests in accordance with the appropriate test protocols described below:

- **2007.0 - Mysid Shrimp (Americamysis bahia) definitive 48 hour test.**
- **2006.0 - Inland Silverside (Menidia beryllina) definitive 48 hour test.**

Acute toxicity data shall be reported as outlined in Section VIII.

II. METHODS

The permittee shall use the most recent 40 CFR Part 136 methods. Whole Effluent Toxicity (WET) Test Methods and guidance may be found at:

http://water.epa.gov/scitech/methods/cwa/wet/index.cfm#methods

The permittee shall also meet the sampling, analysis and reporting requirements included in this protocol. This protocol defines more specific requirements while still being consistent with the Part 136 methods. If, due to modifications of Part 136, there are conflicting requirements between the Part 136 method and this protocol, the permittee shall comply with the requirements of the Part 136 method.

III. SAMPLE COLLECTION

A discharge and receiving water sample shall be collected. The receiving water control sample must be collected immediately upstream of the permitted discharge's zone of influence. The acceptable holding times until initial use of a sample are 24 and 36 hours for on-site and off-site testing, respectively. A written waiver is required from the regulating authority for any holding time extension. Sampling guidance dictates that, where appropriate, aliquots for the analysis required in this protocol shall be split from the samples, containerized and immediately preserved, or analyzed as per 40 CFR Part 136. EPA approved test methods require that samples collected for metals analyses be preserved immediately after collection. Testing for the presence of total residual chlorine[1] (TRC) must be analyzed immediately or as soon as possible, for all effluent samples, prior to WET testing. TRC analysis may be performed on-site or by the toxicity testing laboratory and the samples must be dechlorinated, as necessary, using sodium thiosulfate

[1] For this protocol, total residual chlorine is synonymous with total residual oxidants.

prior to sample use for toxicity testing. If performed on site the results should be included on the chain of custody (COC) presented to WET laboratory.

Standard Methods for the Examination of Water and Wastewater describes dechlorination of samples (APHA, 1992). Dechlorination can be achieved using a ratio of 6.7 mg/L anhydrous sodium thiosulfate to reduce 1 mg/L chlorine. If dechlorination is necessary, a thiosulfate control consisting of the maximum concentration of thiosulfate used to dechlorinate the sample in the toxicity test control water must also be run in the WET test.

All samples submitted for chemical and physical analyses will be analyzed according to Section VI of this protocol. Grab samples must be used for pH, temperature, and total residual chlorine (as per 40 CFR Part 122.21).

All samples held for use beyond the day of sampling shall be refrigerated and maintained at a temperature range of 0-6^{o} C.

IV. DILUTION WATER

Samples of receiving water must be collected from a reasonably accessible location in the receiving water body immediately upstream of the permitted discharge's zone of influence. Avoid collection near areas of obvious road or agricultural runoff, storm sewers or other point source discharges and areas where stagnant conditions exist. EPA strongly urges that screening for toxicity be performed prior to the set up of a full, definitive toxicity test any time there is a question about the test dilution water's ability to achieve test acceptability criteria (TAC) as indicated in Section V of this protocol. The test dilution water control response will be used in the statistical analysis of the toxicity test data. All other control(s) required to be run in the test will be reported as specified in the Discharge Monitoring Report (DMR) Instructions, Attachment F, page 2,Test Results & Permit Limits.

The test dilution water must be used to determine whether the test met the applicable TAC. When receiving water is used for test dilution, an additional control made up of standard laboratory water (0% effluent) is required. This control will be used to verify the health of the test organisms and evaluate to what extent, if any, the receiving water itself is responsible for any toxic response observed.

If dechlorination of a sample by the toxicity testing laboratory is necessary a "sodium thiosulfate" control, representing the concentration of sodium thiosulfate used to adequately dechlorinate the sample prior to toxicity testing, must be included in the test.

If the use of alternate dilution water (ADW) is authorized, in addition to the ADW test control, the testing laboratory must, for the purpose of monitoring the receiving water, also run a receiving water control.

If the receiving water is found to be, or suspected to be toxic or unreliable, ADW of known quality with hardness similar to that of the receiving water may be substituted. Substitution is species specific meaning that the decision to use ADW is made for each species and is based on the toxic response of that particular species. Substitution to an ADW is authorized in two cases. The first case is when repeating a test due to toxicity in the site dilution water requires an **immediate decision** for ADW use by the permittee and toxicity testing laboratory. The second is when two of the most recent documented incidents of unacceptable site dilution water toxicity require ADW use in future WET testing.

For the second case, written notification from the permittee requesting ADW use **and** written authorization from the permit issuing agency(s) is required **prior to** switching to a long-term use of ADW for the duration of the permit.

Written requests for use of ADW must be mailed with supporting documentation to the following addresses:

Director
Office of Ecosystem Protection (CAA)
U.S. Environmental Protection Agency, Region 1
Five Post Office Square, Suite 100
Mail Code OEP06-5
Boston, MA 02109-3912

and

Manager
Water Technical Unit (SEW)
U.S. Environmental Protection Agency
Five Post Office Square, Suite 100
Mail Code OES04-4
Boston, MA 02109-3912

Note: USEPA Region 1 retains the right to modify any part of the alternate dilution water policy stated in this protocol at any time. Any changes to this policy will be documented in the annual DMR posting.

See the most current annual DMR instructions which can be found on the EPA Region 1 website at http://www.epa.gov/region1/enforcementandassistance/dmr.html for further important details on alternate dilution water substitution requests.

V. TEST CONDITIONS AND TEST ACCEPTABILITY CRITERIA

EPA Region 1 requires tests be performed using four replicates of each control and effluent concentration because the non-parametric statistical tests cannot be used with data from fewer replicates. The following tables summarize the accepted Americamysis and Menidia toxicity test conditions and test acceptability criteria:

EPA NEW ENGLAND EFFLUENT TOXICITY TEST CONDITIONS FOR THE MYSID, AMERICAMYSIS BAHIA 48 HOUR TEST[1]

1. Test type	48hr Static, non-renewal
2. Salinity	25ppt ± 10 percent for all dilutions by adding dry ocean salts
3. Temperature (^oC)	$20^oC \pm 1^oC$ or $25^oC \pm 1^oC$, temperature must not deviate by more than 3^oC during test
4. Light quality	Ambient laboratory illumination
5. Photoperiod	16 hour light, 8 hour dark
6. Test chamber size	250 ml (minimum)
7. Test solution volume	200 ml/replicate (minimum)
8. Age of test organisms	1-5 days, ≤ 24 hours age range
9. No. Mysids per test chamber	10
10. No. of replicate test chambers per treatment	4
11. Total no. Mysids per test concentration	40
12. Feeding regime	Light feeding using concentrated Artemia naupli while holding prior to initiating the test
13. Aeration [2]	None
14. Dilution water	5-30 ppt, +/- 10%; Natural seawater, or deionized water mixed with artificial sea salts
15. Dilution factor	≥ 0.5
16. Number of dilutions [3]	5 plus a control. An additional dilution at the permitted effluent concentration (%

	effluent) is required if it is not included in the dilution series.
17. Effect measured	Mortality - no movement of body appendages on gentle prodding
18. Test acceptability	90% or greater survival of test organisms in control solution
19. Sampling requirements	For on-site tests, samples are used within 24 hours of the time that they are removed from the sampling device. For off-site tests, samples must be first used within 36 hours of collection.
20. Sample volume required	Minimum 1 liter for effluents and 2 liters for receiving waters

Footnotes:

[1] Adapted from EPA 821-R-02-012.

[2] If dissolved oxygen falls below 4.0 mg/L, aerate at rate of less than 100 bubbles/min. Routine D.O. checks are recommended.

[3] When receiving water is used for dilution, an additional control made up of standard laboratory dilution water (0% effluent) is required.

EPA NEW ENGLAND TOXICITY TEST CONDITIONS FOR THE INLAND SILVERSIDE, MENIDIA BERYLLINA 48 HOUR TEST[1]

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1. Test Type	48 hr Static, non-renewal
2. Salinity	25 ppt ± 10 % by adding dry ocean salts
3. Temperature	20°C ± 1°C or 25°C ± 1°C, temperature must not deviate by more than 3°C during test
4. Light Quality	Ambient laboratory illumination
5. Photoperiod	16 hr light, 8 hr dark
6. Size of test vessel	250 mL (minimum)
7. Volume of test solution	200 mL/replicate (minimum)
8. Age of fish	9-14 days; 24 hr age range
9. No. fish per chamber	10 (not to exceed loading limits)
10. No. of replicate test vessels per treatment	4
11. Total no. organisms per concentration	40
12. Feeding regime	Light feeding using concentrated Artemia nauplii while holding prior to initiating the test
13. Aeration[2]	None
14. Dilution water	5-32 ppt, +/- 10% ; Natural seawater, or deionized water mixed with artificial sea salts.
15. Dilution factor	≥ 0.5
16. Number of dilutions[3]	5 plus a control. An additional dilution at the permitted concentration (% effluent) is required if it is not included in the dilution series.
17. Effect measured	Mortality-no movement on gentle prodding.

18. Test acceptability	90% or greater survival of test organisms in control solution.
19. Sampling requirements	For on-site tests, samples must be used within 24 hours of the time they are removed from the sampling device. Off-site test samples must be used within 36 hours of collection.
20. Sample volume required	Minimum 1 liter for effluents and 2 liters for receiving waters.

Footnotes:

[1] Adapted from EPA 821-R-02-012.

[2] If dissolved oxygen falls below 4.0 mg/L, aerate at rate of less than 100 bubbles/min. Routine D.O. checks recommended.

[3] When receiving water is used for dilution, an additional control made up of standard laboratory dilution water (0% effluent) is required.

V.1. Test Acceptability Criteria

If a test does not meet TAC the test must be repeated with fresh samples within 30 days of the initial test completion date.

V.2. Use of Reference Toxicity Testing

Reference toxicity test results and applicable control charts must be included in the toxicity testing report.

In general, if reference toxicity test results fall outside the control limits established by the laboratory for a specific test endpoint, a reason or reasons for this excursion must be evaluated, correction made and reference toxicity tests rerun as necessary as prescribed below.

If a test endpoint value exceeds the control limits at a frequency of more than one out of twenty then causes for the reference toxicity test failure must be examined and if problems are identified corrective action taken. The reference toxicity test must be repeated during the same month in which the exceedance occurred.

If two consecutive reference toxicity tests fall outside control limits, the possible cause(s) for the exceedance must be examined, corrective actions taken and a repeat of the reference toxicity test must take place immediately. Actions taken to resolve the problem must be reported.

V.2.a. Use of Concurrent Reference Toxicity Testing

In the case where concurrent reference toxicity testing is required due to a low frequency of testing with a particular method, if the reference toxicity test results fall slightly outside of laboratory established control limits, but the primary test met the TAC, the results of the primary test will be considered acceptable. However, if the results of the concurrent test fall well outside the established **upper** control limits i.e. ≥3 standard deviations for IC25s and LC50 values and ≥ two concentration intervals for NOECs or NOAECs, and even though the primary test meets TAC, the primary test will be considered unacceptable and must be repeated.

VI. CHEMICAL ANALYSIS

At the beginning of the static acute test, pH, salinity, and temperature must be measured at the beginning and end of each 24 hour period in each dilution and in the controls. The following chemical analyses shall be performed for each sampling event.

Parameter	Effluent	Diluent	Minimum Level for effluent[*1] (mg/L)
pH	x	x	---
Salinity	x	x	ppt(o/oo)
Total Residual Chlorine [*2]	x	x	0.02
Total Solids and Suspended Solids	x	x	---
Ammonia	x	x	0.1
Total Organic Carbon	x	x	0.5
Total Metals			
Cd	x	x	0.0005
Pb	x	x	0.0005
Cu	x	x	0.003
Zn	x	x	0.005
Ni	x	x	0.005

Superscript:

[*1] These are the minimum levels for effluent (fresh water) samples. Tests on diluents (marine waters) shall be conducted using the Part 136 methods that yield the lowest MLs.

[*2] Either of the following methods from the 18th Edition of the APHA Standard Methods for the Examination of Water and Wastewater must be used for these analyses:

-Method 4500-Cl E Low Level Amperometric Titration (the preferred method);
-Method 4500-CL G DPD Photometric Method.

VII. TOXICITY TEST DATA ANALYSIS

LC50 Median Lethal Concentration

An estimate of the concentration of effluent or toxicant that is lethal to 50% of the test organisms during the time prescribed by the test method.

Methods of Estimation:

- Probit Method
- Spearman-Karber
- Trimmed Spearman-Karber
- Graphical

See flow chart in Figure 6 on page 73 of EPA 821-R-02-012 for appropriate method to use on a given data set.

No Observed Acute Effect Level (NOAEL)

See flow chart in Figure 13 on page 87 of EPA 821-R-02-012.

VIII. TOXICITY TEST REPORTING

A report of results must include the following:

- Toxicity Test summary sheet(s) (Attachment F to the DMR Instructions) which includes:
    - Facility name
    - NPDES permit number
    - Outfall number
    - Sample type
    - Sampling method
    - Effluent TRC concentration
    - Dilution water used
    - Receiving water name and sampling location
    - Test type and species
    - Test start date
    - Effluent concentrations tested (%) and permit limit concentration
    - Applicable reference toxicity test date and whether acceptable or not
    - Age, age range and source of test organisms used for testing
    - Results of TAC review for all applicable controls
    - Permit limit and toxicity test results
    - Summary of any test sensitivity and concentration response evaluation that was conducted

Please note: The NPDES Permit Program Instructions for the Discharge Monitoring Report Forms (DMRs) are available on EPA's website at
http://www.epa.gov/NE/enforcementandassistance/dmr.html

In addition to the summary sheets the report must include:

- A brief description of sample collection procedures;
- Chain of custody documentation including names of individuals collecting samples, times and dates of sample collection, sample locations, requested analysis and lab receipt with time and date received, lab receipt personnel and condition of samples upon receipt at the lab(s);
- Reference toxicity test control charts;
- All sample chemical/physical data generated, including minimum levels (MLs) and analytical methods used;
- All toxicity test raw data including daily ambient test conditions, toxicity test chemistry, sample dechlorination details as necessary, bench sheets and statistical analysis;
- A discussion of any deviations from test conditions; and
- Any further discussion of reported test results, statistical analysis and concentration-response relationship and test sensitivity review per species per endpoint.

ATTACHMENT 2

MARINE CHRONIC
TOXICITY TEST PROCEDURE AND PROTOCOL

I. GENERAL REQUIREMENTS

The permittee shall be responsible for the conduct of acceptable silverside chronic and sea urchin chronic toxicity tests in accordance with the appropriate test protocols described below:

- Inland Silverside (Menidia beryllina) Larval Growth and Survival Test

- Sea Urchin (Arbacia punctulata) 1 Hour Fertilization Test

Chronic toxicity data shall be reported as outlined in Section VIII.

II. METHODS

The permittee shall use 40 CFR Part 136 methods. Methods and guidance may be found at:

http://water.epa.gov/scitech/swguidance/methods/wet/index.cfm#methods

The permittee shall also meet the sampling, analysis and reporting requirements included in this protocol. Where there are conflicting requirements between the Part 136 method and this protocol, the permittee shall comply with the requirements of the Part 136 method.

III. SAMPLE COLLECTION AND USE

A total of three fresh samples of effluent and receiving water are required for initiation and subsequent renewals of a marine, chronic, toxicity test. The receiving water control sample must be collected immediately upstream of the permitted discharge's zone of influence. Fresh samples are recommended for use on test days 1, 3, and 5. However, provided a total of three samples are used for testing over the test period, an alternate sampling schedule is acceptable. The acceptable holding times until initial use of a fresh sample are 24 and 36 hours for on-site and off-site testing, respectively. A written waiver is required from the regulating authority for any hold time extension. All fresh test samples collected may be used for 24, 48 and 72 hour renewals after initial use. All samples held for use beyond the day of sampling shall be refrigerated and maintained at a temperature range of 0-6^{o} C.

If any of the renewal samples are of sufficient potency to cause lethality to 50 percent or more of the test organisms in any of the test treatments for either species or, if the test fails to meet its permit limits, then chemical analysis for total metals (originally required for the initial sample only in Section VI) will be required on the renewal sample(s) as well.

Sampling guidance dictates that, where appropriate, aliquots for the analysis required in this protocol shall be split from the samples, containerized and immediately preserved, or analyzed as per 40 CFR Part 136. EPA approved test methods require that samples collected for metals analyses be preserved immediately after collection. Testing for the presence of total residual chlorine (TRC) must be analyzed immediately or as soon as possible, for all effluent samples, prior to WET testing. For TRC analysis performed on site the results must be included on the chain of custody (COC) presented to WET laboratory. For the purpose of sample preparation, i.e. eliminating chlorine prior to toxicity testing, if called for by the permit, TRC analysis may also be performed by the toxicity testing laboratory and the samples must be dechlorinated, as necessary, using sodium thiosulfate prior to sample use for toxicity testing. According to Standard Methods for the Examination of Water and Wastewater describes dechlorination of samples (APHA, 1992) dechlorination can be achieved using a ratio of 6.7 mg/L anhydrous sodium thiosulfate to reduce 1 mg/L chlorine.

If dechlorination of a sample by the toxicity testing laboratory is necessary a “sodium thiosulfate” control, representing the concentration of sodium thiosulfate used to adequately dechlorinate the sample prior to toxicity testing, must be included in the test.

All samples submitted for chemical and physical analyses will be analyzed according to Section VI of this protocol. Grab samples must be used for pH, temperature, and total residual oxidants (as per 40 CFR Part 122.21).

IV. DILUTION WATER

Samples of receiving water must be collected from a location in the receiving water body immediately upstream of the permitted discharge’s zone of influence at a reasonably accessible location. Avoid collection near areas of obvious road or agricultural runoff, storm sewers or other point source discharges and areas where stagnant conditions exist. EPA strongly urges that screening for toxicity be performed prior to the set up of a full, definitive toxicity test any time there is a question about the test dilution water's ability to achieve test acceptability criteria (TAC) as indicated in Section V of this protocol. The test dilution water control response will be used in the statistical analysis of the toxicity test data. All other control(s) required to be run in the test will be reported as specified in the Discharge Monitoring Report (DMR) Instructions, Attachment F, page 2,Test Results & Permit Limits.

The test dilution water must be used to determine whether the test met the applicable test acceptability criteria (TAC). When receiving water is used for test dilution, an additional control made up of standard laboratory water (0% effluent) is required. This control will be used to verify the health of the test organisms and evaluate to what extent, if any, the receiving water itself is responsible for any toxic response observed.
If the receiving water diluent is found to be, or suspected to be toxic or unreliable, an alternatedilution water (ADW) of known quality with hardness similar to that of the receiving water may be substituted. Substitution is species specific meaning that the decision to use ADW is made for each species and is based on the toxic response of that particular species.

Substitution to an ADW is authorized in two cases. The first is the case where repeating a test due to toxicity in the site dilution water requires an immediate decision for ADW use be made by the permittee and toxicity testing laboratory. The second is in the case where two of the most recent documented incidents of unacceptable site dilution water toxicity requires ADW use in future WET testing. For the second case, written notification from the permittee requesting ADW use and written authorization from the permit issuing agency(s) is required **prior to** switching to a long-term use of ADW for the duration of the permit.

Written requests for use of ADW must be mailed with supporting documentation to the following addresses:

Director
Office of Ecosystem Protection
U.S. Environmental Protection Agency, Region 1
Five Post Office Square, Suite 100
Mail Code OEP06-5
Boston, MA 02109-3912

and

Manager
Water Technical Unit (SEW)
U.S. Environmental Protection Agency
Five Post Office Square, Suite 100
Mail Code OES04-4
Boston, MA 02109-3912

Note: USEPA Region 1 retains the right to modify any part of the alternate dilution water policy stated in this protocol at any time. Any changes to this policy will be documented in the annual DMR posting.

See the most current annual DMR instructions, which can be found on the EPA Region 1 website at http://www.epa.gov/region1/enforcementandassistance/dmr.html for further important details on alternate dilution water substitution requests.

If the use of an alternate dilution water (ADW) is authorized, in addition to the ADW test control, the testing laboratory must, for the purpose of monitoring the receiving water, also run a receiving water control.

V. TEST CONDITIONS AND TEST ACCEPTABILITY CRITERIA

EPA New England requires that if a reference toxicant test was being performed concurrently with an effluent or receiving water test and fails, both tests must be repeated.

The following tables summarize the accepted Menidia and Arbacia toxicity test conditions and test acceptability criteria:

EPA NEW ENGLAND RECOMMENDED TEST CONDITIONS FOR THE SEA URCHIN, ARBACIA PUNCTULATA, FERTILIZATION TEST[1]

---

1. Test type	Static, non-renewal
2. Salinity	30 o/oo ± 2 o/oo by adding dry ocean salts
3. Temperature	20 ± 1°C temperature must not deviate by more than 3°C during test
4. Light quality	Ambient laboratory illumination
5. Light intensity	10-20 uE/m^2/s, or 50-100 ft-c (Ambient Laboratory Levels)
6. Test vessel size	Disposal (glass) liquid scintillation vials (20 ml capacity), presoaked in control water
7. Test solution volume	5 ml
8. Number of sea urchins	Pooled sperm from four males and pooled eggs from four females are used per test
9. Number of egg and sperm cells	About 2000 eggs per chamber and 5,000,000 sperm cells per vial
10. Number of replicate chambers	4 per treatment
11. Dilution water	Uncontaminated source of natural seawater or deionized water mixed with artificial sea salts
12. Dilution factor	Approximately 0.5, must bracket the permitted RWC
13. Test duration	1 hour and 20 minutes
14. Effects measured	Fertilization of sea urchin eggs
15. Number of treatments per test[2]	5 and a control. (receiving water and laboratory water control) An additional dilution at the permitted effluent concentration (% effluent) is required.

16. Acceptability of test	70% - 90% egg fertilization in all controls. Minimum of 70% fertilization in dilution water control. Effluent concentrations exhibiting greater than 70% fertilization, flagged as statistically significantly different from the controls, will not be considered statistically different from the controls for NOEC reporting.
17. Sampling requirements	For on-site tests, samples are to be used within 24 hours of the time that they are removed from the sampling device. For off-site tests, samples must be first used within 36 hours of collection.
18. Sample volume required	Minimum 1 liter

Footnotes:

[1] Adapted from EPA 821-R-02-014

EPA NEW ENGLAND RECOMMENDED TEST CONDITIONS FOR THE INLAND SILVERSIDE, MENIDIA BERYLLINA, GROWTH AND SURVIVAL TEST[1]

1. Test type	Static, renewal
2. Salinity	5 o/oo to 32 o/oo +/- 2 o/oo of the selected salinity by adding artificial sea salts
3. Temperature	25 ± 1°C, temperature must not deviate by more than 3°C during test
4. Light quality	Ambient laboratory light
5. Light intensity	10-20 uE/m^2/s, or 50-100 ft-C (Ambient Laboratory Levels)
6. Photoperiod	16 hr light, 8 hr darkness
7. Test vessel size	600 - 1000 mL beakers or equivalent (glass test chambers should be used)
8. Test solution volume	500-750 mL/replicate loading and DO restrictions must be met)
9. Renewal of test solutions	Daily using most recently collected sample
10. Age of test organisms	Seven to eleven days post hatch; 24 hr range in age
11. Larvae/test chamber	15 (minimum of 10)
12. Number of replicate chambers	4 per treatment
13. Source of food	Newly hatched and rinsed Artemia nauplii less than 24 hr old
14. Feeding regime	Feed once a day 0.10 g wet wt Artemia nauplii per replicate on days 0 – 2 feed 0.15 g wet wt Artemia nauplii per replicate on days 3-6
15. Cleaning	Siphon daily, immediately before test solution renewal and feeding
16. Aeration[2]	None
17. Dilution water	Uncontaminated source of natural seawater; or deionized water mixed with artificial sea salts

18. Effluent concentrations	5 and a control (receiving water and laboratory water control) An additional dilution at the permitted effluent concentration (% effluent) is required
19. Dilution factor	≥ 0.5, must bracket the permitted RWC
20. Test duration	7 days
21. Effects measured	Survival and growth (weight)
22. Acceptability of test	The average survival of dilution water control larvae is a minimum of 80%, and the average dry wt of unpreserved control larvae is a minimum of 0.5 mg, or the average dry wt of preserved control larvae is a minimum of 0.43 mg if preserved not more than 7 days in 4% formalin or 70% ethanol
23. Sampling requirements	For on-site tests, samples are collected daily and used within 24 hours of the time they are removed from the sampling device. For off-site tests, samples must be first used within 36 hours of collection.
24. Sample Volume Required	Minimum of 6 liters/day.

Footnotes:

[1] Adapted from EPA 821-R-02-014

[2] If dissolved oxygen (D.O.) falls below 4.0 mg/L, aerate all chambers at a rate of less than 100 bubbles/min. Routine D.O. checks are recommended.

V.1. Test Acceptability Criteria

If a test does not meet TAC the test must be repeated with fresh samples within 30 days of the initial test completion date.

V.2. Use of Reference Toxicity Testing

Reference toxicity test results and applicable control charts must be included in the toxicity testing report.

In general, if reference toxicity test results fall outside the control limits established by the laboratory for a specific test endpoint, a reason or reasons for this excursion must be evaluated, correction made and reference toxicity tests rerun as necessary as prescribed below.

If a test endpoint value exceeds the control limits at a frequency of more than one out of twenty then causes for the reference toxicity test failure must be examined and if problems are identified corrective action taken. The reference toxicity test must be repeated during the same month in which the exceedance occurred.

If two consecutive reference toxicity tests fall outside control limits, the possible cause(s) for the exceedance must be examined, corrective actions taken and a repeat of the reference toxicity test must take place immediately. Actions taken to resolve the problem must be reported.

V.2.a. Use of Concurrent Reference Toxicity Testing

In the case where concurrent reference toxicity testing is required due to a low frequency of testing with a particular method, if the reference toxicity test results fall slightly outside of laboratory established control limits, but the primary test met the TAC, the results of the primary test will be considered acceptable. However, if the results of the concurrent test fall well outside the established upper control limits i.e. $\geq$3 standard deviations for IC25s values and $\geq$ two concentration intervals for NOECs, and even though the primary test meets TAC, the primary test will be considered unacceptable and must be repeated.

VI. CHEMICAL ANALYSIS

The toxicity test requires measurement of pH, salinity, and temperature at the beginning and end of each 24 hour period in each dilution and controls for both daily test renewal and waste. The following chemical analyses shall be performed for each initial sample as well as any renewal samples, if necessary pursuant to the requirement of Part III above.

Parameter	Effluent	Diluent	Minimum Level for effluent[*1] (mg/L)
pH	x	x	---
Salinity	x	x	ppt(o/oo)
Total Residual Chlorine [*2]	x	x	0.02
Total Solids and Suspended Solids	x	x	---
Ammonia	x	x	0.1
Total Organic Carbon	x	x	0.5
Total Metals			
Cd	x	x	0.0005
Pb	x	x	0.0005
Cu	x	x	0.003
Zn	x	x	0.005
Ni	x	x	0.005

Superscript:

[*1] These are the minimum levels for effluent (fresh water) samples. Tests on diluents (marine waters) shall be conducted using the Part 136 methods that yield the lowest MLs.

[*2] Either of the following methods from the 18th Edition of the APHA Standard Methods for the Examination of Water and Wastewater must be used for these analyses:

-Method 4500-Cl E Low Level Amperometric Titration (the preferred method);
-Method 4500-CL G DPD Photometric Method.

VII. TOXICITY TEST DATA ANALYSIS AND REVIEW

A. Test Review

1. Concentration / Response Relationship

A concentration/response relationship evaluation is required for test endpoint determinations from both Hypothesis Testing and Point Estimate techniques. The test report is to include documentation of this evaluation in support of the endpoint values reported.

The dose-response review must be performed as required in Section 10.2.6 of EPA-821-R-02-014. Guidance for this review can be found at http://water.epa.gov/scitech/methods/cwa/wet/upload/2007_07_10_methods_wet_disk1_ctm.pdf.

In most cases, the review will result in one of the following three conclusions: (1) Results are reliable and reportable; (2) Results are anomalous and require explanation; or (3) Results are inconclusive and a retest with fresh samples is required.

2. Test Variability (Test Sensitivity)

This review step is separate from the determination of whether a test meets or does not meet TAC. Within test variability is to be examined for the purpose of evaluating test sensitivity. This evaluation is to be performed for the sub-lethal hypothesis testing endpoint growth for *Menidia beryllina* as required by the permit. The test report is to include documentation of this evaluation to support that the endpoint values reported resulted from a toxicity test of adequate sensitivity. This evaluation must be performed as required in Section 10.2.8 of EPA-821-R-02-014.

To determine the adequacy of test sensitivity, USEPA requires the calculation of test percent minimum significant difference (PMSD) values. In cases where NOEC determinations are made based on a non-parametric technique, calculation of a test PMSD value, for the sole purpose of assessing test sensitivity, shall be calculated using a comparable parametric statistical analysis technique. The calculated test PMSD is then compared to the upper and lower PMSD bounds shown for marine tests in Section 10.2.8.3, p. 54, Table 6 of EPA-821-R-02-014. The comparison will yield one of the following determinations.

- The test PMSD exceeds the PMSD upper bound test variability criterion in Table 6, the test results are considered highly variable and the test may not be sensitive enough to determine the presence of toxicity at the permit limit concentration (PLC). If the test results indicate that the discharge is not toxic at the PLC, then the test is considered insufficiently sensitive and must be repeated within 30 days of the initial test completion using fresh samples. If the test results indicate that the discharge is toxic at the PLC, the test is considered acceptable and does not have to be repeated.

- The test PMSD falls below the PMSD lower bound test variability criterion in Table 6, the test is determined to be very sensitive. In order to determine which treatment(s) are statistically significant and which are not, for the purpose of reporting a NOEC, the relative percent difference (RPD) between the control and each treatment must be calculated and compared to the lower PMSD boundary. See *Understanding and Accounting for Method Variability in Whole Effluent Toxicity Applications Under the NPDES Program*, EPA 833-R-00-003, June 2002, Section 6.4.2. The document can be located under Guidance Documents at the following website location http://water.epa.gov/scitech/methods/cwa/wet/index.cfm#guidance. If the RPD for a treatment falls below the PMSD lower bound, the difference is considered statistically insignificant. If the RPD for a treatment is greater that the PMSD lower bound, then the treatment is considered statistically significant.

- The test PMSD falls within the PMSD upper and lower bounds in Table 6, the sub-lethal test endpoint values shall be reported as is.

B. Statistical Analysis

1. General - Recommended Statistical Analysis Method

Refer to general data analysis flowchart, EPA 821-R-02-014, page 45

For discussion on Hypothesis Testing, refer to EPA 821-R-02-014, Section 9.6

For discussion on Point Estimation Techniques, refer to EPA 821-R-02-014, Section 9.7

2. *Menidia beryllina*

Refer to survival hypothesis testing analysis flowchart, EPA 821-R-02-014, page 181

Refer to survival point estimate techniques flowchart, EPA 821-R-02-013, page 182

Refer to growth data statistical analysis flowchart, EPA 821-R-02-014, page 193

3. *Arbacia punctulata*

Refer to fertilization data testing flowchart, EPA 821-R-02-014, page 312

VIII. TOXICITY TEST REPORTING

A report of results must include the following:

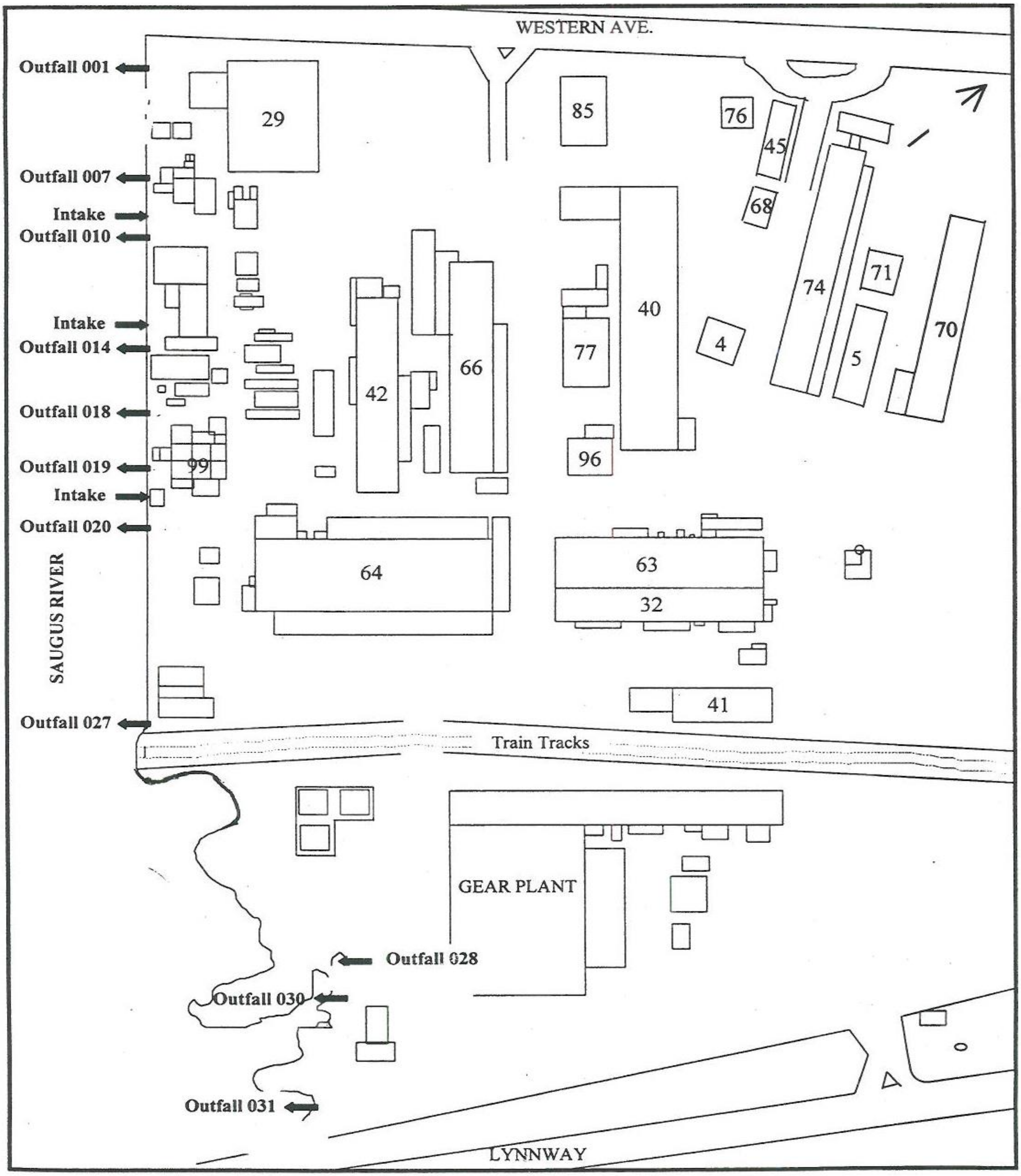
- Toxicity Test summary sheet(s) (Attachment F to the DMR Instructions) which includes:
    - Facility name
    - NPDES permit number
    - Outfall number
    - Sample type
    - Sampling method
    - Effluent TRC concentration
    - Dilution water used
    - Receiving water name and sampling location
    - Test type and species
    - Test start date
    - Effluent concentrations tested (%) and permit limit concentration
    - Applicable reference toxicity test date and whether acceptable or not
    - Age, age range and source of test organisms used for testing
    - Results of TAC review for all applicable controls
    - Test sensitivity evaluation results (test PMSD for growth)
    - Permit limit and toxicity test results
    - Summary of test sensitivity and concentration response evaluation

Please note: The NPDES Permit Program Instructions for the Discharge Monitoring Report Forms (DMRs) are available on EPA's website at http://www.epa.gov/NE/enforcementandassistance/dmr.html

In addition to the summary sheets the report must include:

- A brief description of sample collection procedures;
- Chain of custody documentation including names of individuals collecting samples, times and dates of sample collection, sample locations, requested analysis and lab receipt with time and date received, lab receipt personnel and condition of samples upon receipt at the lab(s);
- Reference toxicity test control charts;
- All sample chemical/physical data generated, including minimum limits (MLs) and analytical methods used;
- All toxicity test raw data including daily ambient test conditions, toxicity test chemistry, sample dechlorination details as necessary, bench sheets and statistical analysis;
- A discussion of any deviations from test conditions; and
- Any further discussion of reported test results, statistical analysis and concentration-response relationship and test sensitivity review.

Attachment 3
GE Aviation Final NPDES Permit No. MA0003905
River Works NPDES Outfall/Intake Map



Attachment 4
Final Permit for GE Aviation NPDES Permit No. MA0003905
List of Approved Chemical Additives

Name of Additive	Equipment	Application
CORTROL IS3000	Boilers	Inorganic oxygen scavenger
OPTISPERSE ADJ560	Boilers	Alkalinity builder/caustic
OPTISPERSE ADJ050	Boilers	General dispersant polymer
OPTISPERSE CL361	Boilers	Chelant
OPTISPERSE HP78626	Boilers	Iron dispersant polymer
STEAMATE NA0540	Boilers	Steam treatment
OPTISPERSE ADJ575	Boilers	Boiler antifoam
FOAMTROL AF2290	Boilers	River antifoam
CORTROL IS104	Boilers	Inorganic oxygen scavenger
KLARAID IC1172	WWTP	Coagulant
POLYFLOC AE1138	WWTP	Flocculent
POLYFLOC AP1138	WWTP	Flocculent
DIANODIC DN310	Cooling Towers	Inhibitor Package
SPECTRUS OX909	Cooling Towers	Oxidizing biocide
SPECTRUS NX114	Cooling Towers	Non-oxidizing biocide
GENGUARD GN7112	Cooling Towers	Inhibitor package
INHIBITOR VCS2000	Cooling Towers	Lay-up inhibitor
SPECTRUS OX103	Sumps	Oxidizing biocide pucks
CORRSHIELD NT402	Closed Loops	Inhibitor package
INHIBITOR AZ660	Closed Loops	Yellow metal inhibitor
CORRSHIELD NT4201	Closed Loops	Inhibitor package
CORRSHIELD MD4103	Closed Loops	Inhibitor package
INHIBITOR AZ8104	Closed Loops	Yellow metal inhibitor

NPDES PART II STANDARD CONDITIONS
(January, 2007)

TABLE OF CONTENTS

PART II. A. GENERAL REQUIREMENTS

1. Duty to Comply

The permittee must comply with all conditions of this permit. Any permit noncompliance constitutes a violation of the Clean Water Act (CWA) and is grounds for enforcement action; for permit termination, revocation and reissuance, or modification; or for denial of a permit renewal application.

a. The permittee shall comply with effluent standards or prohibitions established under Section 307(a) of the sludge use or disposal established under Section 405(d) of the CWA within the time provided in the regulations that establish these standards or prohibitions, even if the permit has not yet been modified to incorporate the requirements.

b. The CWA provides that any person who violates Section 301, 302, 306, 307, 308, 318, or 405 of the CWA or any permit condition or limitation implementing any of such sections in a permit issued under Section 402, or any requirement imposed in a pretreatment program approved under Section 402 (a)(3) or 402 (b)(8) of the CWA is subject to a civil penalty not to exceed $25,000 per day for each violation. Any person who negligently violates such requirements is subject to a fine of not less than $2,500 nor more than $25,000 per day of violation, or by imprisonment for not more than 1 year, or both. Any person who knowingly violates such requirements is subject to a fine of not less than $5,000 nor more than $50,000 per day of violation, or by imprisonment for not more than 3 years, or both.

c. Any person may be assessed an administrative penalty by the Administrator for violating Section 301, 302, 306, 307, 308, 318, or 405 of the CWA, or any permit condition or limitation implementing any of such sections in a permit issued under Section 402 of the CWA. Administrative penalties for Class I violations are not to exceed $10,000 per violation, with the maximum amount of any Class I penalty assessed not to exceed $25,000. Penalties for Class II violations are not to exceed $10,000 per day for each day during which the violation continues, with the maximum amount of any Class II penalty not to exceed $125,000.

Note: See 40 CFR §122.41(a)(2) for complete "Duty to Comply" regulations.

2. Permit Actions

This permit may be modified, revoked and reissued, or terminated for cause. The filing of a request by the permittee for a permit modification, revocation and reissuance, or termination, or notifications of planned changes or anticipated noncompliance does not stay any permit condition.

3. Duty to Provide Information

The permittee shall furnish to the Regional Administrator, within a reasonable time, any information which the Regional Administrator may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit, or to determine compliance with this permit. The permittee shall also furnish to the Regional Administrator, upon request, copies of records required to be kept by this permit.

4. Reopener Clause

The Regional Administrator reserves the right to make appropriate revisions to this permit in order to establish any appropriate effluent limitations, schedules of compliance, or other provisions which may be authorized under the CWA in order to bring all discharges into compliance with the CWA.

For any permit issued to a treatment works treating domestic sewage (including "sludge-only facilities"), the Regional Administrator or Director shall include a reopener clause to incorporate any applicable standard for sewage sludge use or disposal promulgated under Section 405 (d) of the CWA. The Regional Administrator or Director may promptly modify or revoke and reissue any permit containing the reopener clause required by this paragraph if the standard for sewage sludge use or disposal is more stringent than any requirements for sludge use or disposal in the permit, or contains a pollutant or practice not limited in the permit.

Federal regulations pertaining to permit modification, revocation and reissuance, and termination are found at 40 CFR §122.62, 122.63, 122.64, and 124.5.

5. Oil and Hazardous Substance Liability

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from responsibilities, liabilities or penalties to which the permittee is or may be subject under Section 311 of the CWA, or Section 106 of the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA).

6. Property Rights

The issuance of this permit does not convey any property rights of any sort, nor any exclusive privileges.

7. Confidentiality of Information

a. In accordance with 40 CFR Part 2, any information submitted to EPA pursuant to these regulations may be claimed as confidential by the submitter. Any such claim must be asserted at the time of submission in the manner prescribed on the application form or instructions or, in the case of other submissions, by stamping the words "confidential business information" on each page containing such information. If no claim is made at the time of submission, EPA may make the information available to the public without further notice. If a claim is asserted, the information will be treated in accordance with the procedures in 40 CFR Part 2 (Public Information).

b. Claims of confidentiality for the following information will be denied:

(1) The name and address of any permit applicant or permittee;
(2) Permit applications, permits, and effluent data as defined in 40 CFR §2.302(a)(2).

c. Information required by NPDES application forms provided by the Regional Administrator under 40 CFR §122.21 may not be claimed confidential. This includes information submitted on the forms themselves and any attachments used to supply information required by the forms.

8. Duty to Reapply

If the permittee wishes to continue an activity regulated by this permit after its expiration date, the permittee must apply for and obtain a new permit. The permittee shall submit a new application at least 180 days before the expiration date of the existing permit, unless permission for a later date has been granted by the Regional Administrator. (The Regional Administrator shall not grant permission for applications to be submitted later than the expiration date of the existing permit.)

9. State Authorities

Nothing in Part 122, 123, or 124 precludes more stringent State regulation of any activity covered by these regulations, whether or not under an approved State program.

10. Other Laws

The issuance of a permit does not authorize any injury to persons or property or invasion of other private rights, nor does it relieve the permittee of its obligation to comply with any other applicable Federal, State, or local laws and regulations.

PART II. B. OPERATION AND MAINTENANCE OF POLLUTION CONTROLS

1. Proper Operation and Maintenance

The permittee shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the permittee to achieve compliance with the conditions of this permit and with the requirements of storm water pollution prevention plans. Proper operation and maintenance also includes adequate laboratory controls and appropriate quality assurance procedures. This provision requires the operation of back-up or auxiliary facilities or similar systems only when the operation is necessary to achieve compliance with the conditions of the permit.

2. Need to Halt or Reduce Not a Defense

It shall not be a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

3. Duty to Mitigate

The permittee shall take all reasonable steps to minimize or prevent any discharge or sludge use or disposal in violation of this permit which has a reasonable likelihood of adversely affecting human health or the environment.

4. Bypass

a. Definitions

(1) *Bypass* means the intentional diversion of waste streams from any portion of a treatment facility.

(2) *Severe property damage* means substantial physical damage to property, damage to the treatment facilities which causes them to become inoperable, or substantial and permanent loss of natural resources which can be reasonably expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production.

b. Bypass not exceeding limitations

The permittee may allow any bypass to occur which does not cause effluent limitations to be exceeded, but only if it also is for essential maintenance to assure efficient operation. These bypasses are not subject to the provision of Paragraphs B.4.c. and 4.d. of this section.

c. Notice

(1) Anticipated bypass. If the permittee knows in advance of the need for a bypass, it shall submit prior notice, if possible at least ten days before the date of the bypass.

(2) Unanticipated bypass. The permittee shall submit notice of an unanticipated bypass as required in paragraph D.1.e. of this part (Twenty-four hour reporting).

d. Prohibition of bypass

Bypass is prohibited, and the Regional Administrator may take enforcement action against a permittee for bypass, unless:

(1) Bypass was unavoidable to prevent loss of life, personal injury, or severe property damage;

(2) There were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate back-up equipment should have been installed in the exercise of reasonable engineering judgment to prevent a bypass which occurred during normal periods of equipment downtime or preventative maintenance; and

(3) i) The permittee submitted notices as required under Paragraph 4.c. of this section.
ii) The Regional Administrator may approve an anticipated bypass, after considering its adverse effects, if the Regional Administrator determines that it will meet the three conditions listed above in paragraph 4.d. of this section.

5. <u>Upset</u>

a. Definition. *Upset* means an exceptional incident in which there is an unintentional and temporary noncompliance with technology-based permit effluent limitations because of factors beyond the reasonable control of the permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventive maintenance, or careless or improper operation.

b. Effect of an upset. An upset constitutes an affirmative defense to an action brought for noncompliance with such technology-based permit effluent limitations if the requirements of paragraph B.5.c. of this section are met. No determination made during administrative review of claims that noncompliance was caused by upset, and before an action for noncompliance, is final administrative action subject to judicial review.

c. Conditions necessary for a demonstration of upset. A permittee who wishes to establish the affirmative defense of upset shall demonstrate, through properly signed, contemporaneous operating logs, or other relevant evidence that:

(1) An upset occurred and that the permittee can identify the cause(s) of the upset;
(2) The permitted facility was at the time being properly operated;
(3) The permittee submitted notice of the upset as required in paragraphs D.1.a. and 1.e. (Twenty-four hour notice); and
(4) The permittee complied with any remedial measures required under B.3. above.

d. Burden of proof. In any enforcement proceeding the permittee seeking to establish the occurrence of an upset has the burden of proof.

PART II. C. MONITORING REQUIREMENTS

1. Monitoring and Records

a. Samples and measurements taken for the purpose of monitoring shall be representative of the monitored activity.

b. Except for records for monitoring information required by this permit related to the permittee's sewage sludge use and disposal activities, which shall be retained for a period of at least five years (or longer as required by 40 CFR Part 503), the permittee shall retain records of all monitoring information, including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation, copies of all reports required by this permit, and records of all data used to complete the application for this permit, for a period of at least 3 years from the date of the sample, measurement, report or application except for the information concerning storm water discharges which must be retained for a total of 6 years. This retention period may be extended by request of the Regional Administrator at any time.

c. Records of monitoring information shall include:

(1) The date, exact place, and time of sampling or measurements;
(2) The individual(s) who performed the sampling or measurements;
(3) The date(s) analyses were performed;
(4) The individual(s) who performed the analyses;
(5) The analytical techniques or methods used; and
(6) The results of such analyses.

d. Monitoring results must be conducted according to test procedures approved under 40 CFR Part 136 or, in the case of sludge use or disposal, approved under 40 CFR Part 136 unless otherwise specified in 40 CFR Part 503, unless other test procedures have been specified in the permit.

e. The CWA provides that any person who falsifies, tampers with, or knowingly renders inaccurate any monitoring device or method required to be maintained under this permit shall, upon conviction, be punished by a fine of not more than $10,000, or by imprisonment for not more than 2 years, or both. If a conviction of a person is for a violation committed after a first conviction of such person under this paragraph, punishment is a fine of not more than $20,000 per day of violation, or by imprisonment of not more than 4 years, or both.

2. Inspection and Entry

The permittee shall allow the Regional Administrator or an authorized representative (including an authorized contractor acting as a representative of the Administrator), upon presentation of credentials and other documents as may be required by law, to:

a. Enter upon the permittee's premises where a regulated facility or activity is located or conducted, or where records must be kept under the conditions of this permit;

b. Have access to and copy, at reasonable times, any records that must be kept under the conditions of this permit;

c. Inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this permit; and

d. Sample or monitor at reasonable times, for the purposes of assuring permit compliance or as otherwise authorized by the CWA, any substances or parameters at any location.

PART II. D. REPORTING REQUIREMENTS

1. Reporting Requirements

a. Planned Changes. The permittee shall give notice to the Regional Administrator as soon as possible of any planned physical alterations or additions to the permitted facility. Notice is only required when:

(1) The alteration or addition to a permitted facility may meet one of the criteria for determining whether a facility is a new source in 40 CFR§122.29(b); or
(2) The alteration or addition could significantly change the nature or increase the quantities of the pollutants discharged. This notification applies to pollutants which are subject neither to the effluent limitations in the permit, nor to the notification requirements at 40 CFR§122.42(a)(1).
(3) The alteration or addition results in a significant change in the permittee's sludge use or disposal practices, and such alteration, addition or change may justify the application of permit conditions different from or absent in the existing permit, including notification of additional use or disposal sites not reported during the permit application process or not reported pursuant to an approved land application plan.

b. Anticipated noncompliance. The permittee shall give advance notice to the Regional Administrator of any planned changes in the permitted facility or activity which may result in noncompliance with permit requirements.

c. Transfers. This permit is not transferable to any person except after notice to the Regional Administrator. The Regional Administrator may require modification or revocation and reissuance of the permit to change the name of the permittee and incorporate such other requirements as may be necessary under the CWA. (See 40 CFR Part 122.61; in some cases, modification or revocation and reissuance is mandatory.)

d. Monitoring reports. Monitoring results shall be reported at the intervals specified elsewhere in this permit.

(1) Monitoring results must be reported on a Discharge Monitoring Report (DMR) or forms provided or specified by the Director for reporting results of monitoring of sludge use or disposal practices.

(2) If the permittee monitors any pollutant more frequently than required by the permit using test procedures approved under 40 CFR Part 136 or, in the case of sludge use or disposal, approved under 40 CFR Part 136 unless otherwise specified in 40 CFR Part 503, or as specified in the permit, the results of the monitoring shall be included in the calculation and reporting of the data submitted in the DMR or sludge reporting form specified by the Director.

(3) Calculations for all limitations which require averaging or measurements shall utilize an arithmetic mean unless otherwise specified by the Director in the permit.

e. Twenty-four hour reporting.

(1) The permittee shall report any noncompliance which may endanger health or the environment. Any information shall be provided orally within 24 hours from the time the permittee becomes aware of the circumstances.

A written submission shall also be provided within 5 days of the time the permittee becomes aware of the circumstances. The written submission shall contain a description of the noncompliance and its cause; the period of noncompliance, including exact dates and times, and if the noncompliance has not been corrected, the anticipated time it is expected to continue; and steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance.

(2) The following shall be included as information which must be reported within 24 hours under this paragraph.

(a) Any unanticipated bypass which exceeds any effluent limitation in the permit. (See 40 CFR §122.41(g).)
(b) Any upset which exceeds any effluent limitation in the permit.
(c) Violation of a maximum daily discharge limitation for any of the pollutants listed by the Regional Administrator in the permit to be reported within 24 hours. (See 40 CFR §122.44(g).)

(3) The Regional Administrator may waive the written report on a case-by-case basis for reports under Paragraph D.1.e. if the oral report has been received within 24 hours.

f. Compliance Schedules. Reports of compliance or noncompliance with, any progress reports on, interim and final requirements contained in any compliance schedule of this permit shall be submitted no later than 14 days following each schedule date.

g. Other noncompliance. The permittee shall report all instances of noncompliance not reported under Paragraphs D.1.d., D.1.e., and D.1.f. of this section, at the time monitoring reports are submitted. The reports shall contain the information listed in Paragraph D.1.e. of this section.

h. Other information. Where the permittee becomes aware that it failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application or in any report to the Regional Administrator, it shall promptly submit such facts or information.

2. Signatory Requirement

a. All applications, reports, or information submitted to the Regional Administrator shall be signed and certified. (See 40 CFR §122.22)

b. The CWA provides that any person who knowingly makes any false statement, representation, or certification in any record or other document submitted or required to be maintained under this permit, including monitoring reports or reports of compliance or noncompliance shall, upon conviction, be punished by a fine of not more than $10,000 per violation, or by imprisonment for not more than 2 years per violation, or by both.

3. Availability of Reports.

Except for data determined to be confidential under Paragraph A.8. above, all reports prepared in accordance with the terms of this permit shall be available for public inspection at the offices of the State water pollution control agency and the Regional Administrator. As required by the CWA, effluent data shall not be considered confidential. Knowingly making any false statements on any such report may result in the imposition of criminal penalties as provided for in Section 309 of the CWA.

PART II. E. DEFINITIONS AND ABBREVIATIONS

1. Definitions for Individual NPDES Permits including Storm Water Requirements

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

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 to, 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 and disposal” under Sections 301, 302, 303, 304, 306, 307, 308, 403, and 405 of the 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.

Average means the arithmetic mean of values taken at the frequency required for each parameter over the specified period. For total and/or fecal coliforms and Escherichia coli, the average shall be the geometric mean.

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" measured during the calendar week divided by the number of "daily discharges" measured during the 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.

Best Professional Judgment (BPJ) means a case-by-case determination of Best Practicable Treatment (BPT), Best Available Treatment (BAT), or other appropriate technology-based standard based on an evaluation of the available technology to achieve a particular pollutant reduction and other factors set forth in 40 CFR §125.3 (d).

Coal Pile Runoff means the rainfall runoff from or through any coal storage pile.

Composite Sample means a sample consisting of a minimum of eight grab samples of equal volume collected at equal intervals during a 24-hour period (or lesser period as specified in the section on Monitoring and Reporting) and combined proportional to flow, or a sample consisting of the same number of grab samples, or greater, collected proportionally to flow over that same time period.

Construction Activities - The following definitions apply to construction activities:

(a) Commencement of Construction is the initial disturbance of soils associated with clearing, grading, or excavating activities or other construction activities.

(b) Dedicated portable asphalt plant is a portable asphalt plant located on or contiguous to a construction site and that provides asphalt only to the construction site that the plant is located on or adjacent to. The term dedicated portable asphalt plant does not include facilities that are subject to the asphalt emulsion effluent limitation guideline at 40 CFR Part 443.

(c) Dedicated portable concrete plant is a portable concrete plant located on or contiguous to a construction site and that provides concrete only to the construction site that the plant is located on or adjacent to.

(d) Final Stabilization means that all soil disturbing activities at the site have been complete, and that a uniform perennial vegetative cover with a density of 70% of the cover for unpaved areas and areas not covered by permanent structures has been established or equivalent permanent stabilization measures (such as the use of riprap, gabions, or geotextiles) have been employed.

(e) Runoff coefficient means the fraction of total rainfall that will appear at the conveyance as runoff.

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 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) Pub. L. 92-500, as amended by Pub. L. 95-217, Pub. L. 95-576, Pub. L. 96-483, and Pub. L. 97-117; 33 USC §§1251 et seq.

Daily Discharge means the discharge of a pollutant measured during the calendar day or any other 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 calculated as the total mass of the pollutant discharged over the day. For pollutants with limitations expressed in other units of measurements, the "daily discharge" is calculated as the average measurement of the pollutant over the day.

Director normally means the person authorized to sign NPDES permits by EPA or the State or an authorized representative. Conversely, it also could mean the Regional Administrator or the State Director as the context requires.

Discharge Monitoring Report Form (DMR) means the EPA standard 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.

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 (See "Point Source" definition).

This definition includes additions of pollutants into waters of the United States from: surface runoff which is collected or channeled 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."

Effluent limitation means any restriction imposed by the Regional Administrator 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 limitation guidelines means a regulation published by the Administrator under Section 304(b) of CWA to adopt or revise "effluent limitations".

EPA means the United States "Environmental Protection Agency".

Flow-weighted composite sample means a composite sample consisting of a mixture of aliquots where the volume of each aliquot is proportional to the flow rate of the discharge.

Grab Sample – An individual sample collected in a period of less than 15 minutes.

Hazardous Substance means any substance designated under 40 CFR Part 116 pursuant to Section 311 of the CWA.

Indirect Discharger means a non-domestic discharger introducing pollutants to a publicly owned treatment works.

Interference means a discharge which, alone or in conjunction with a discharge or discharges from other sources, both:

(a) Inhibits or disrupts the POTW, its treatment processes or operations, or its sludge processes, use or disposal; and

(b) Therefore is a cause of a violation of any requirement of the POTW's NPDES permit (including an increase in the magnitude or duration of a violation) or of the prevention of sewage sludge use or disposal in compliance with the following statutory provisions and regulations or permits issued thereunder (or more stringent State or local regulations): Section 405 of the Clean Water Act (CWA), the Solid Waste Disposal Act (SWDA) (including Title II, more commonly referred to as the Resources Conservation and Recovery Act (RCRA), and including State regulations contained in any State sludge management plan prepared pursuant to Subtitle D of the SDWA), the Clean Air Act, the Toxic Substances Control Act, and the Marine Protection Research and Sanctuaries Act.

Landfill means an area of land or an excavation in which wastes are placed for permanent disposal, and which is not a land application unit, surface impoundment, injection well, or waste pile.

Land application unit means an area where wastes are applied onto or incorporated into the soil surface (excluding manure spreading operations) for treatment or disposal.

Large and Medium municipal separate storm sewer system means all municipal separate storm sewers that are either: (i) located in an incorporated place (city) with a population of 100,000 or more as determined by the latest Decennial Census by the Bureau of Census (these cities are listed in Appendices F and 40 CFR Part 122); or (ii) located in the counties with unincorporated urbanized populations of 100,000 or more, except municipal separate storm sewers that are located in the incorporated places, townships, or towns within such counties (these counties are listed in Appendices H and I of 40 CFR 122); or (iii) owned or operated by a municipality other than those described in Paragraph (i) or (ii) and that are designated by the Regional Administrator as part of the large or medium municipal separate storm sewer system.

Maximum daily discharge limitation means the highest allowable "daily discharge" concentration that occurs only during a normal day (24-hour duration).

Maximum daily discharge limitation (as defined for the Steam Electric Power Plants only) when applied to Total Residual Chlorine (TRC) or Total Residual Oxidant (TRO) is defined as "maximum concentration" or "Instantaneous Maximum Concentration" during the two hours of a chlorination cycle (or fraction thereof) prescribed in the Steam Electric Guidelines, 40 CFR Part 423. These three synonymous terms all mean "a value that shall not be exceeded" during the two-hour chlorination cycle. This interpretation differs from the specified NPDES Permit requirement, 40 CFR § 122.2, where the two terms of "Maximum Daily Discharge" and "Average Daily Discharge" concentrations are specifically limited to the daily (24-hour duration) values.

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 tribe organization, or a designated and approved management agency under Section 208 of the CWA.

National Pollutant Discharge Elimination System 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 the 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 NPDES 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 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 rig 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 in an area of biological concern. In determining whether an area is an area of biological concern, the Regional Administrator shall consider the factors 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 duration of its discharge in an area of biological concern.

New source means any building, structure, 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 programs.

Pass through means a Discharge which exits the POTW into waters of the United States in quantities or concentrations which, alone or in conjunction with a discharge or discharges from other sources, is a cause of a violation of any requirement of the POTW's NPDES permit (including an increase in the magnitude or duration of a violation).

Permit means an authorization, license, or equivalent control document issued by EPA or an "approved" State.

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 40 CFR §122.2).

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 is used either to facilitate production or for disposal purposes is approved by the 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.

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 40 CFR Part 122.

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

Publicly Owned Treatment Works (POTW) means any facility or system used in the treatment (including recycling and reclamation) of municipal sewage or industrial wastes of a liquid nature which is owned by a "State" or "municipality".

This definition includes sewers, pipes, or other conveyances only if they convey wastewater to a POTW providing treatment.

Regional Administrator means the Regional Administrator, EPA, Region I, Boston, Massachusetts.

Secondary Industry Category means any industry which is not a "primary industry category".

Section 313 water priority chemical means a chemical or chemical category which:

(1) is listed at 40 CFR §372.65 pursuant to Section 313 of the Emergency Planning and Community Right-To-Know Act (EPCRA) (also known as Title III of the Superfund Amendments and Reauthorization Act (SARA) of 1986);

(2) is present at or above threshold levels at a facility subject to EPCRA Section 313 reporting requirements; and

(3) satisfies at least one of the following criteria:

- (i) are listed in Appendix D of 40 CFR Part 122 on either Table II (organic priority pollutants), Table III (certain metals, cyanides, and phenols), or Table V (certain toxic pollutants and hazardous substances);
- (ii) are listed as a hazardous substance pursuant to Section 311(b)(2)(A) of the CWA at 40 CFR §116.4; or
- (iii) are pollutants for which EPA has published acute or chronic water quality criteria.

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 Sludge means any solid, semisolid, or liquid residue removed during the treatment of municipal wastewater or domestic sewage. Sewage sludge includes, but is not limited to, solids removed during primary, secondary, or advanced wastewater 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.

Significant materials includes, but is not limited to: raw materials, fuels, materials such as solvents, detergents, and plastic pellets, raw materials used in food processing or production, hazardous substance designated under section 101(14) of CERCLA, any chemical the facility is required to report pursuant to EPCRA Section 313, fertilizers, pesticides, and waste products such as ashes, slag, and sludge that have the potential to be released with storm water discharges.

Significant spills includes, but is not limited to, releases of oil or hazardous substances in excess of reportable quantities under Section 311 of the CWA (see 40 CFR §110.10 and §117.21) or Section 102 of CERCLA (see 40 CFR § 302.4).

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 40 CFR §122.1(b)(3).

State means any of the 50 States, the District of Columbia, Guam, the Commonwealth of Puerto Rico, the Virgin Islands, American Samoa, the Trust Territory of the Pacific Islands.

Storm Water means storm water runoff, snow melt runoff, and surface runoff and drainage.

Storm water discharge associated with industrial activity means the discharge from any conveyance which is used for collecting and conveying storm water and which is directly related to manufacturing, processing, or raw materials storage areas at an industrial plant. (See 40 CFR §122.26 (b)(14) for specifics of this definition.

Time-weighted composite means a composite sample consisting of a mixture of equal volume aliquots collected at a constant time interval.

Toxic pollutants 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 wastewater 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 wastewater 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.

Waste Pile means any non-containerized accumulation of solid, non-flowing waste that is used for treatment or storage.

Waters of the United States 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 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 purpose;

(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 the 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.

Wetlands means those areas that are inundated or saturated by surface or ground water at a frequency and duration 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 (WET) means the aggregate toxic effect of an effluent measured directly by a toxicity test. (See Abbreviations Section, following, for additional information.)

2. Definitions for NPDES Permit Sludge Use and Disposal Requirements.

Active sewage sludge unit is a sewage sludge unit that has not closed.

Aerobic Digestion is the biochemical decomposition of organic matter in sewage sludge into carbon dioxide and water by microorganisms in the presence of air.

Agricultural Land is land on which a food crop, a feed crop, or a fiber crop is grown. This includes range land and land used as pasture.

Agronomic rate is the whole sludge application rate (dry weight basis) designed:

(1) To provide the amount of nitrogen needed by the food crop, feed crop, fiber crop, cover crop, or vegetation grown on the land; and

(2) To minimize the amount of nitrogen in the sewage sludge that passes below the root zone of the crop or vegetation grown on the land to the ground water.

Air pollution control device is one or more processes used to treat the exit gas from a sewage sludge incinerator stack.

Anaerobic digestion is the biochemical decomposition of organic matter in sewage sludge into methane gas and carbon dioxide by microorganisms in the absence of air.

Annual pollutant loading rate is the maximum amount of a pollutant that can be applied to a unit area of land during a 365 day period.

Annual whole sludge application rate is the maximum amount of sewage sludge (dry weight basis) that can be applied to a unit area of land during a 365 day period.

Apply sewage sludge or sewage sludge applied to the land means land application of sewage sludge.

Aquifer is a geologic formation, group of geologic formations, or a portion of a geologic formation capable of yielding ground water to wells or springs.

Auxiliary fuel is fuel used to augment the fuel value of sewage sludge. This includes, but is not limited to, natural gas, fuel oil, coal, gas generated during anaerobic digestion of sewage sludge, and municipal solid waste (not to exceed 30 percent of the dry weight of the sewage sludge and auxiliary fuel together). Hazardous wastes are not auxiliary fuel.

Base flood is a flood that has a one percent chance of occurring in any given year (i.e. a flood with a magnitude equaled once in 100 years).

Bulk sewage sludge is sewage sludge that is not sold or given away in a bag or other container for application to the land.

Contaminate an aquifer means to introduce a substance that causes the maximum contaminant level for nitrate in 40 CFR §141.11 to be exceeded in ground water or that causes the existing concentration of nitrate in the ground water to increase when the existing concentration of nitrate in the ground water exceeds the maximum contaminant level for nitrate in 40 CFR §141.11.

Class I sludge management facility is any publicly owned treatment works (POTW), as defined in 40 CFR §501.2, required to have an approved pretreatment program under 40 CFR §403.8 (a) (including any POTW located in a state that has elected to assume local program responsibilities pursuant to 40 CFR §403.10 (e) and any treatment works treating domestic sewage, as defined in 40 CFR § 122.2, classified as a Class I sludge management facility by the EPA Regional Administrator, or, in the case of approved state programs, the Regional Administrator in conjunction with the State Director, because of the potential for sewage sludge use or disposal practice to affect public health and the environment adversely.

Control efficiency is the mass of a pollutant in the sewage sludge fed to an incinerator minus the mass of that pollutant in the exit gas from the incinerator stack divided by the mass of the pollutant in the sewage sludge fed to the incinerator.

Cover is soil or other material used to cover sewage sludge placed on an active sewage sludge unit.

Cover crop is a small grain crop, such as oats, wheat, or barley, not grown for harvest.

Cumulative pollutant loading rate is the maximum amount of inorganic pollutant that can be applied to an area of land.

Density of microorganisms is the number of microorganisms per unit mass of total solids (dry weight) in the sewage sludge.

Dispersion factor is the ratio of the increase in the ground level ambient air concentration for a pollutant at or beyond the property line of the site where the sewage sludge incinerator is located to the mass emission rate for the pollutant from the incinerator stack.

Displacement is the relative movement of any two sides of a fault measured in any direction.

Domestic septage is either liquid or solid material removed from a septic tank, cesspool, portable toilet, Type III marine sanitation device, or similar treatment works that receives only domestic sewage. Domestic septage does not include liquid or solid material removed from a septic tank, cesspool, or similar treatment works that receives either commercial wastewater or industrial wastewater and does not include grease removed from a grease trap at a restaurant.

Domestic sewage is waste and wastewater from humans or household operations that is discharged to or otherwise enters a treatment works.

Dry weight basis means calculated on the basis of having been dried at 105 degrees Celsius (°C) until reaching a constant mass (i.e. essentially 100 percent solids content).

Fault is a fracture or zone of fractures in any materials along which strata on one side are displaced with respect to the strata on the other side.

Feed crops are crops produced primarily for consumption by animals.

Fiber crops are crops such as flax and cotton.

Final cover is the last layer of soil or other material placed on a sewage sludge unit at closure.

Fluidized bed incinerator is an enclosed device in which organic matter and inorganic matter in sewage sludge are combusted in a bed of particles suspended in the combustion chamber gas.

Food crops are crops consumed by humans. These include, but are not limited to, fruits, vegetables, and tobacco.

Forest is a tract of land thick with trees and underbrush.

Ground water is water below the land surface in the saturated zone.

Holocene time is the most recent epoch of the Quaternary period, extending from the end of the Pleistocene epoch to the present.

Hourly average is the arithmetic mean of all the measurements taken during an hour. At least two measurements must be taken during the hour.

Incineration is the combustion of organic matter and inorganic matter in sewage sludge by high temperatures in an enclosed device.

Industrial wastewater is wastewater generated in a commercial or industrial process.

Land application is the spraying or spreading of sewage sludge onto the land surface; the injection of sewage sludge below the land surface; or the incorporation of sewage sludge into the soil so that the sewage sludge can either condition the soil or fertilize crops or vegetation grown in the soil.

Land with a high potential for public exposure is land that the public uses frequently. This includes, but is not limited to, a public contact site and reclamation site located in a populated area (e.g., a construction site located in a city).

Land with low potential for public exposure is land that the public uses infrequently. This includes, but is not limited to, agricultural land, forest and a reclamation site located in an unpopulated area (e.g., a strip mine located in a rural area).

Leachate collection system is a system or device installed immediately above a liner that is designed, constructed, maintained, and operated to collect and remove leachate from a sewage sludge unit.

Liner is soil or synthetic material that has a hydraulic conductivity of 1×10^{-7} centimeters per second or less.

Lower explosive limit for methane gas is the lowest percentage of methane gas in air, by volume, that propagates a flame at 25 degrees Celsius and atmospheric pressure.

Monthly average (Incineration) is the arithmetic mean of the hourly averages for the hours a sewage sludge incinerator operates during the month.

Monthly average (Land Application) is the arithmetic mean of all measurements taken during the month.

Municipality means a city, town, borough, county, parish, district, association, or other public body (including an intermunicipal agency of two or more of the foregoing entities) created by or under State law; an Indian tribe or an authorized Indian tribal organization having jurisdiction over sewage sludge management; or a designated and approved management agency under section 208 of the CWA, as amended. The definition includes a special district created under state law, such as a water district, sewer district, sanitary district, utility district, drainage district, or similar entity, or an integrated waste management facility as defined in section 201 (e) of the CWA, as amended, that has as one of its principal responsibilities the treatment, transport, use or disposal of sewage sludge.

Other container is either an open or closed receptacle. This includes, but is not limited to, a bucket, a box, a carton, and a vehicle or trailer with a load capacity of one metric ton or less.

Pasture is land on which animals feed directly on feed crops such as legumes, grasses, grain stubble, or stover.

Pathogenic organisms are disease-causing organisms. These include, but are not limited to, certain bacteria, protozoa, viruses, and viable helminth ova.

Permitting authority is either EPA or a State with an EPA-approved sludge management program.

Person is an individual, association, partnership, corporation, municipality, State or Federal Agency, or an agent or employee thereof.

Person who prepares sewage sludge is either the person who generates sewage sludge during the treatment of domestic sewage in a treatment works or the person who derives a material from sewage sludge.

pH means the logarithm of the reciprocal of the hydrogen ion concentration; a measure of the acidity or alkalinity of a liquid or solid material.

Place sewage sludge or sewage sludge placed means disposal of sewage sludge on a surface disposal site.

Pollutant (as defined in sludge disposal requirements) is an organic substance, an inorganic substance, a combination or organic and inorganic substances, or pathogenic organism that, after discharge and upon exposure, ingestion, inhalation, or assimilation into an organism either directly from the environment or indirectly by ingestion through the food chain, could on the basis on information available to the Administrator of EPA, cause death, disease, behavioral abnormalities, cancer, genetic mutations, physiological malfunctions (including malfunction in reproduction) or physical deformations in either organisms or offspring of the organisms.

Pollutant limit (for sludge disposal requirements) is a numerical value that describes the amount of a pollutant allowed per unit amount of sewage sludge (e.g., milligrams per kilogram of total solids); the amount of pollutant that can be applied to a unit of land (e.g., kilograms per hectare); or the volume of the material that can be applied to the land (e.g., gallons per acre).

Public contact site is a land with a high potential for contact by the public. This includes, but is not limited to, public parks, ball fields, cemeteries, plant nurseries, turf farms, and golf courses.

Qualified ground water scientist is an individual with a baccalaureate or post-graduate degree in the natural sciences or engineering who has sufficient training and experience in ground water hydrology and related fields, as may be demonstrated by State registration, professional certification, or completion of accredited university programs, to make sound professional judgments regarding ground water monitoring, pollutant fate and transport, and corrective action.

Range land is open land with indigenous vegetation.

Reclamation site is drastically disturbed land that is reclaimed using sewage sludge. This includes, but is not limited to, strip mines and construction sites.

Risk specific concentration is the allowable increase in the average daily ground level ambient air concentration for a pollutant from the incineration of sewage sludge at or beyond the property line of a site where the sewage sludge incinerator is located.

Runoff is rainwater, leachate, or other liquid that drains overland on any part of a land surface and runs off the land surface.

Seismic impact zone is an area that has 10 percent or greater probability that the horizontal ground level acceleration to the rock in the area exceeds 0.10 gravity once in 250 years.

Sewage sludge is a solid, semi-solid, or liquid residue generated during the treatment of domestic sewage in a treatment works. Sewage sludge includes, but is not limited to:, domestic septage; scum or solids removed in primary, secondary, or advanced wastewater treatment processes; and a material derived from sewage sludge. Sewage sludge does not include ash generated during the firing of sewage sludge in a sewage sludge incinerator or grit and screening generated during preliminary treatment of domestic sewage in treatment works.

Sewage sludge feed rate is either the average daily amount of sewage sludge fired in all sewage sludge incinerators within the property line of the site where the sewage sludge incinerators are located for the number of days in a 365 day period that each sewage sludge incinerator operates, or the average daily design capacity for all sewage sludge incinerators within the property line of the site where the sewage sludge incinerators are located.

Sewage sludge incinerator is an enclosed device in which only sewage sludge and auxiliary fuel are fired.

Sewage sludge unit is land on which only sewage sludge is placed for final disposal. This does not include land on which sewage sludge is either stored or treated. Land does not include waters of the United States, as defined in 40 CFR §122.2.

Sewage sludge unit boundary is the outermost perimeter of an active sewage sludge unit.

Specific oxygen uptake rate (SOUR) is the mass of oxygen consumed per unit time per unit mass of total solids (dry weight basis) in sewage sludge.

Stack height is the difference between the elevation of the top of a sewage sludge incinerator stack and the elevation of the ground at the base of the stack when the difference is equal to or less than 65 meters. When the difference is greater than 65 meters, stack height is the creditable stack height determined in accordance with 40 CFR §51.100 (ii).

State is one of the United States of America, the District of Columbia, the Commonwealth of Puerto Rico, the Virgin Islands, Guam, American Samoa, the Trust Territory of the Pacific Islands, the Commonwealth of the Northern Mariana Islands, and an Indian tribe eligible for treatment as a State pursuant to regulations promulgated under the authority of section 518(e) of the CWA.

Store or storage of sewage sludge is the placement of sewage sludge on land on which the sewage sludge remains for two years or less. This does not include the placement of sewage sludge on land for treatment.

Surface disposal site is an area of land that contains one or more active sewage sludge units.

Total hydrocarbons means the organic compounds in the exit gas from a sewage sludge incinerator stack measured using a flame ionization detection instrument referenced to propane.

Total solids are the materials in sewage sludge that remain as residue when the sewage sludge is dried at 103 to 105 degrees Celsius.

Treat or treatment of sewage sludge is the preparation of sewage sludge for final use or disposal. This includes, but is not limited to, thickening, stabilization, and dewatering of sewage sludge. This does not include storage of sewage sludge.

Treatment works is either a federally owned, publicly owned, or privately owned device or system used to treat (including recycle and reclaim) either domestic sewage or a combination of domestic sewage and industrial waste of a liquid nature.

Unstable area is land subject to natural or human-induced forces that may damage the structural components of an active sewage sludge unit. This includes, but is not limited to, land on which the soils are subject to mass movement.

Unstabilized solids are organic materials in sewage sludge that have not been treated in either an aerobic or anaerobic treatment process.

Vector attraction is the characteristic of sewage sludge that attracts rodents, flies, mosquitoes, or other organisms capable of transporting infectious agents.

Volatile solids is the amount of the total solids in sewage sludge lost when the sewage sludge is combusted at 550 degrees Celsius in the presence of excess air.

Wet electrostatic precipitator is an air pollution control device that uses both electrical forces and water to remove pollutants in the exit gas from a sewage sludge incinerator stack.

Wet scrubber is an air pollution control device that uses water to remove pollutants in the exit gas from a sewage sludge incinerator stack.

3. Commonly Used Abbreviations

BOD	Five-day biochemical oxygen demand unless otherwise specified
CBOD	Carbonaceous BOD
CFS	Cubic feet per second
COD	Chemical oxygen demand
Chlorine	
Cl_2	Total residual chlorine
TRC	Total residual chlorine which is a combination of free available chlorine (FAC, see below) and combined chlorine (chloramines, etc.)

TRO	Total residual chlorine in marine waters where halogen compounds are present
FAC	Free available chlorine (aqueous molecular chlorine, hypochlorous acid, and hypochlorite ion)
Coliform	
Coliform, Fecal	Total fecal coliform bacteria
Coliform, Total	Total coliform bacteria
Cont. (Continuous)	Continuous recording of the parameter being monitored, i.e. flow, temperature, pH, etc.
Cu. M/day or M^3/day	Cubic meters per day
DO	Dissolved oxygen
kg/day	Kilograms per day
lbs/day	Pounds per day
mg/l	Milligram(s) per liter
ml/l	Milliliters per liter
MGD	Million gallons per day
Nitrogen	
Total N	Total nitrogen
NH_3-N	Ammonia nitrogen as nitrogen
NO_3-N	Nitrate as nitrogen
NO_2-N	Nitrite as nitrogen
NO_3-NO_2	Combined nitrate and nitrite nitrogen as nitrogen
TKN	Total Kjeldahl nitrogen as nitrogen
Oil & Grease	Freon extractable material
PCB	Polychlorinated biphenyl
pH	A measure of the hydrogen ion concentration. A measure of the acidity or alkalinity of a liquid or material
Surfactant	Surface-active agent

Temp. °C	Temperature in degrees Centigrade
Temp. °F	Temperature in degrees Fahrenheit
TOC	Total organic carbon
Total P	Total phosphorus
TSS or NFR	Total suspended solids or total nonfilterable residue
Turb. or Turbidity	Turbidity measured by the Nephelometric Method (NTU)
ug/l	Microgram(s) per liter
WET	"Whole effluent toxicity" is the total effect of an effluent measured directly with a toxicity test.
C-NOEC	"Chronic (Long-term Exposure Test) – No Observed Effect Concentration". The highest tested concentration of an effluent or a toxicant at which no adverse effects are observed on the aquatic test organisms at a specified time of observation.
A-NOEC	"Acute (Short-term Exposure Test) – No Observed Effect Concentration" (see C-NOEC definition).
LC_{50}	LC_{50} is the concentration of a sample that causes mortality of 50% of the test population at a specific time of observation. The LC_{50} = 100% is defined as a sample of undiluted effluent.
ZID	Zone of Initial Dilution means the region of initial mixing surrounding or adjacent to the end of the outfall pipe or diffuser ports.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
NEW ENGLAND - REGION I
5 POST OFFICE SQUARE, SUITE 100 (OEP06-4)
BOSTON, MASSACHUSETTS 02109-3912

FACT SHEET

DRAFT NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) PERMIT TO DISCHARGE TO WATERS OF THE UNITED STATES PURSUANT TO THE CLEAN WATER ACT (CWA).

NPDES PERMIT NUMBER: MA0003905

PUBLIC NOTICE START AND END DATES: FEB - 2 2011 — MAR - 3 2011

NAME AND MAILING ADDRESS OF APPLICANT:

General Electric Company
1000 Western Avenue
Lynn, MA 01910

NAME AND ADDRESS OF FACILITY WHERE DISCHARGE OCCURS:

General Electric Aviation
1000 Western Avenue
Lynn, MA 01910

RECEIVING WATER(S): Saugus River
(USGS Hydrologic Code #01070002 – North Coastal River Basin)

RECEIVING WATER CLASSIFICATION(S): Class SB - warm water fishery

SIC CODES: 3724, 3566

TABLE OF CONTENTS

I. PROPOSED ACTION, TYPE OF FACILITY, AND DISCHARGE LOCATION

General Electric Aviation (GE Aviation), the permittee, owns and operates a facility in Lynn, Massachusetts, at which GE Aviation manufactures, tests, and assembles jet turbine engines and associated components. The facility site is comprised of approximately 223 acres and includes 45 building complexes with associated storage areas, parking areas, and traffic ways. *See* Attachment B for a site map.

In 1993, the U.S. Environmental Protection Agency (EPA) and the Massachusetts Department of Environmental Protection (MassDEP) last issued GE Aviation a National Pollutant Discharge Elimination System (NPDES) permit under the federal Clean Water Act (CWA) and the Massachusetts Clean Waters Act, respectively, to govern the facility's withdrawal of water *from* the Saugus River for cooling uses and its discharges of pollutants *to* the Saugus River as part of a variety of wastewater streams. These wastewater streams include non-contact cooling water (NCCW), contact cooling water, steam condensate, boiler blowdown, hydrant testing water, wash waters, stormwater, contaminated groundwater, and other miscellaneous wastewaters described herein. These wastewaters are discharged from Outfalls 001, 007, 010, 014, 018, 019, 020, 027, 028, 030, and 031. *See* Attachment A, *Outfall Flow History and Detail* (updated 1/28/09) for a listing of outfalls and flows contributing to them. *See also* Attachment C for outfall and intake locations.

The facility's current NPDES permit expired on September 29, 1998, but was administratively continued because the facility's permit renewal application was deemed timely and complete by EPA. The permittee submitted its permit renewal application on June 29, 1998, and submitted revisions to this application in May of 2000 and September of 2003. The permittee also submitted additional information on July 10, 2009, in Response to a Request for Information under Section 308(a) of the CWA.

The GE Aviation facility is a large, complex industrial site with a complicated array of wastewater discharges to the Saugus River involving numerous outfalls and a wide range of contaminants. As a result, a variety of CWA standards apply to the facility and numerous analyses have been needed to determine the appropriate permit limits.

II. SITE HISTORY

General Electric traces its roots to Thomas Edison, who established the Edison Electric Light Company in 1878. GE Aviation was the result of the merger in 1892 of Edison's company and the Thomson-Houston Electric Company of Lynn.[1] GE Aviation began manufacturing on the site in the late 1800's. The facility started using and storing petroleum products before 1900. The No. 6 Fuel Oil and jet fuel in use today have been used at the facility since the 1940's and 1950's. The Aircraft Engines Division began operating at the current location during World War II.

[1] MassMoments GE Jet Engine Tests in Lynn: http://www.massmoments.org/moment.cfm?mid=117

Industrial activities conducted during the early stages of the plant included the operation of an iron foundry, a steel foundry, and a machinery shop. Operations included the manufacture, assembly, and testing of electricity management and utilization components such as electric motors, switches and transformers.

Since the 1940's, the GE Aviation facility has focused on the manufacture and testing of aircraft engines, the manufacture of turbine engines, generators, gear parts, and marine propulsion units, and steam generation. Currently, the plant focuses on the manufacture and testing of small aircraft engines and engine parts, and the manufacture of ship propulsion machinery. Principal processes in aircraft engine manufacturing include machining, cleaning, fabricating, assembly, and testing. Metal machining and fabricating involves the cutting, grinding, drilling, welding, brazing, and shaping of metal fee stock into aircraft engine components. Alloys used in engine parts include titanium, aluminum, chromium, cobalt and nickel. No surface treatment, coating, or etching is done onsite.

III. DESCRIPTION OF TREATMENT SYSTEM AND DISCHARGES

As part of its process for manufacturing jet engines and components for commercial and military applications, GE Aviation conducts machining, cleaning, descaling, coating, assembly and testing of various components at the Lynn facility. The plant runs 24 hours/day, 365 days/year. GE Aviation also operates an oil-fired steam electric power plant onsite (12 – 45 MW) for the production of steam, electricity, and compressed air. This electricity is primarily for GE Aviation's onsite needs, but at times the facility sells excess electricity to the local power grid.

Approximately 19 miles of underground drain lines ("Drainage System") collect dry weather flows (non-stormwater flows) and/or wet weather flows (stormwater runoff) throughout the site. The Drainage System accumulates, transfers, and discharges the flows to various outfalls along the Saugus River. The facility currently discharges directly to the river through 11 discharge pipes. These discharges pipes and the outfall designations are listed below:[2]

- 2 NCCW flows (over 95% river water) combined with non-stormwater flows, including infiltrated groundwater
  - Outfall 014 (test cell)
  - Outfall 018 (power plant)
- 1 river water overflow from the power plant intake and potentially infiltrated groundwater
  - Outfall 020 ("bathtub")
- 8 stormwater flows (including infiltrated groundwater)
  - Outfall 001
  - Outfall 007
  - Outfall 010
  - Outfall 019
  - Outfall 027B
  - Outfall 028

[2] Note: Outfalls 027A and 027B are the same pipe, but discharge under different flow conditions.

  - Outfall 030
  - Outfall 031
- 1 discharge from the Consolidated Drains Treatment System (CDTS)
  - Outfall 027A

The CDTS treats dry weather flows (non-stormwater flows) collected in the Drainage System. Individual outfall vaults throughout the Drainage System collect non-stormwater flows for transfer to, and treatment by, the CDTS. Additionally, stormwater collects in the fuel farm containment area for transfer to, and treatment by, the CDTS. The flows to the CDTS are as follows:

- Flows from 6 individual outfall vaults which collect non-stormwater flows, including infiltrated groundwater
  - Outfall 007 (which collects Outfall 001 non-stormwater flows in addition to Outfall 007 non-stormwater flows)
  - Outfall 010
  - Outfall 019
  - Outfall 027B
  - Outfall 030 (which collects Outfall 028 non-stormwater flows in addition to Outfall 030 non-stormwater flows)
  - Outfall 031
- Outfall 032 (closed in early 2002) (previously discharged stormwater from fuel farm containment areas directly to the receiving water; the area is now visually inspected before the collected water is discharged to either the CDTS or trucks for disposal offsite.)

GE Aviation also previously discharged through several other outfalls currently not in use, which are listed below:

- Outfall 029 (NCCW and non-stormwater flows, including groundwater, from the gear plant; the permittee plans to demolish the gear plant, which has not been used for more than 10 years)
- Outfalls 003 and 005 (emergency discharge outfalls from test cells consisting of once-through NCCW; these outfalls have not been used for more than 10 years and are capped)

See Attachment C for a schematic of the outfall locations and Attachment A for a list of flows contributing to each outfall.

The draft permit regulates, among other things, the possible discharge of (a) purely non-stormwater flow, (b) purely stormwater flow, and (c) non-stormwater flow commingled with stormwater. These three possible types of discharges each raise different issues and are handled differently by the draft permit.

Both the Lynn Water and Sewer Commission (LWSC) and the Massachusetts Water Resources Authority (MWRA) provide potable water to the facility. Process wastewater is combined with sanitary waste at the facility and discharged, via three outfalls, to the

LWSC's POTW in Lynn. This discharge is regulated by an Industrial Discharge Permit issued by the LWSC.

A. Dry Weather (Non-stormwater) Flows and the Consolidated Drains Treatment System (CDTS)

In 2000, GE Aviation initiated discharges from the CDTS, which was installed to handle groundwater seepage, in accordance with the requirements of an administrative consent order issued by MassDEP.[3] The CDTS was designed as a collection and treatment system to "substantially eliminate" the discharge of untreated non-stormwater flows from the GE Aviation facility, including groundwater infiltration, and to reduce the discharge during wet weather of untreated groundwater from the Drainage System (Outfalls 001, 007, 010, 019, 027, 028, 030 and 031). The groundwater infiltration flows to the Drainage System are generally steady, but reportedly low in volume and velocity (relative to the stormwater volumes).

1. Individual Outfall Vaults – Dry Weather (Non-stormwater) Flow

The eight (8) outfalls in the Drainage System have individual underground vaults which collect the non-stormwater flows from their respective parts of the Drainage System. Two of the outfalls, Outfalls 001 and 028, pump non-stormwater flows from their vaults to the vaults at Outfalls 007 and 030, respectively. This is due to the low flows associated with Outfalls 001 and 028, and the cost-effectiveness of installing a small section of piping to an adjacent outfall, rather than a larger section of piping to the CDTS. The dimensions of the outfall vaults and chambers vary based on outfall-specific characteristics such as pipe size, invert elevation, retention time, depth of baffle wall, and skimmer and pump rates.

The non-stormwater flows collect in the eight (8) individual outfall vaults, where they are trapped behind a closed discharge gate. The vaults are composed of concrete and are divided by a rigid cross-flow under-weir. This creates two chambers: the "skimming" chamber lies upstream and the "sampling" chamber lies downstream. The skimming chamber is equipped with a floating skimmer pump, which constantly skims the surface of that chamber, removing the top-most half-inch or so of the water column. Skimmed water and any light phase hydrocarbons that are present are transferred (at a maximum pump rate of about 5 gallons per minute) to a dedicated oil/water separator. The treated aqueous portion of that stream is returned to the skimming chamber.

The skimming chamber is also fitted with 2 transfer pumps and a sonic sensor, which electronically determines the level of the water in the vault and responds accordingly, either turning on the transfer pump during dry weather to transfer flow to the CDTS, or during a storm event turning it off and opening the slide gate at the high-high/gate-open level. As non-stormwater flows collect in the vault, the level of water in the skimmer chamber will increase to the high level, triggering the sonic sensor to turn on the transfer

[3] MassDEP Administrative Consent Order with General Electric Company, File No. ACO-NE-99-1004, dated February 10, 1999.

pump that transfers non-stormwater flows to the CDTS for treatment. GE Aviation states that one transfer pump in each vault is designed to handle the entire non-stormwater flow in the vault, while the second pump is designed to handle flow fluctuations of up to 125 percent (particularly, the "first-flush" of wet weather flows). Design maximum pumping capacities for each vault range from 64 to 90 gallons per minute (gpm).

When the transfer process drops the elevation of the surface within the skimming chamber to the low level, the pumps shut down. Surface skimming continues while the process repeats the cycle. In this way, the system is intended to continually segregate non-stormwater flows and send them to the CDTS for treatment, except to the extent that any non-stormwater flows are discharged to the river mixed with stormwater flow. *See* Attachment D for a diagram of the outfall vaults.

The draft permit includes conditions prohibiting the discharge of non-allowable non-stormwater flows from the Drainage System vault outfalls during dry weather conditions. Any such non-allowable non-stormwater flow that is to be discharged to the Saugus River must first be treated in the CDTS prior to discharge from Outfall 027A. The draft permit also includes appropriate limits on CDTS discharges through Outfall 027A.

2. <u>Consolidated Drains Treatment System (CDTS)</u>

The individual outfall vaults pump the non-stormwater flows to the CDTS for treatment. The CDTS was not designed to capture, convey, or treat stormwater flows under wet weather conditions. The CDTS was constructed to minimize the risk of discharging to the river the contaminants typically associated with non-stormwater flows. Non-stormwater flows to the CDTS consist of cooling water, steam condensate, steam conduit water discharge, condensate blowdown, turbine condensate, boiler startup/soot blower drains/boiler draining for maintenance (intermittent), boiler filter backwash, ion exchange regeneration and backwash, de-aerator storage tanks (intermittent), boiler blowdown, building 64-A sump (intermittent), steam conduit water, cooling tower blowdown, stormwater collected in secondary containment dikes and truck loading areas, test cell washdown water (intermittent), condensate from air receivers, hydrant testing, sprinkler system testing water, potable water used upon NCCW system failure, groundwater infiltration, drain cleanouts, and roof mounted air conditioner wash water (no detergent).

The non-stormwater flows from the individual outfall vaults are pumped to two 450,000-gal underground equalization tanks at the CDTS. The CDTS is a batch treatment process, and the system is operated (in one of four modes) when the water in the equalization tanks reaches about 300,000 gallons. The current operating mode consists of settling in a holding tank (common to each mode) and treatment through two granulated activated carbon (GAC) units in series. Other potential operating modes include settling in the holding tank, followed by (1) treatment of dissolved air floatation (DAF) in addition to the GAC treatment, (2) treatment of DAF in place of the GAC treatment, or (3) no treatment at all. These operating modes are discussed in the consent order. Over recent years the most typical mode is the use of DAF without GAC treatment. The permittee switched from treatment with DAF, to treatment with GAC, around December of 2008.

The two GAC units in series are monitored for breakthrough. The carbon was re-loaded in December 2008. *See* Attachment E for a process flow diagram of the CDTS.

The DAF system consists of two "mixers," or tanks, in series where polyaluminum chloride and anionic emulsion polymer are added, along with air, which floats the flocculated solids to the top of the tanks for removal. The sludge from the bottom of the tank is removed and combined with the skimmed flocculated solids for offsite treatment and disposal.

The permittee has the ability to sample both before and after the DAF treatment. The treated non-stormwater flows discharge through Outfall 027A to the Saugus River.

Given that pollutant discharges would be reduced the most by operating the CDTS in the mode utilizing both DAF and GAC treatment (see above), the draft NPDES permit requires the CDTS to be operated in this manner. Specifically, the draft permit requires that the permittee properly operate and maintain all treatment systems. The draft permit also includes appropriate effluent limits for the treated discharges from Outfall 027A.

B. Wet Weather Flows (Stormwater) and Commingled Wet and Dry Weather Flows (Stormwater and Non-Stormwater)

1. <u>Individual Outfall Vaults – Wet Weather Flows (Stormwater)</u>

When a typical storm event begins, stormwater quickly accumulates in the Drainage System and is channeled in the same network of outfalls (001, 007, 010, 019, 027, 028, 030 and 031) but at a much higher volume and velocity than non-stormwater flows during dry weather conditions. Since the gates of the individual outfall vaults are closed at the start of the storm, both the skimming and the sampling chambers of the vaults fill very rapidly, and within a few minutes the level of the surface in the chambers will have moved well beyond the high level to the high-high level, which trips the outfall gates to open. When the water reaches the high-high level, the sonic sensor shuts down all pumps to both the oil/water separator and the CDTS, and the stormwater (likely commingled with non-stormwater flow) is discharged to the river.

When the level of water in both chambers returns to the low level, the outfall gate closes and non-stormwater flows again begin to accumulate in the vaults. The sonic sensor is set to operate the pumps normally so that the water level in the skimming chamber is never lower than the baffle. This is designed to retain floating material for skimming.

As currently operated, a storm event of about 0.1 inches in magnitude triggers the gates of the individual outfall vaults to open by being raised, causing the discharge of any wastewater that is present (namely, stormwater commingled with any non-stormwater flow present in Drainage System) directly to the Saugus River, without treatment in the CDTS. The operation of each gate can be controlled electronically at a single location. The electronic system records the operations over the last 24 hours. The gates are set to open a few inches at a time, to attempt to reduce the velocity of the stormwater discharging from the vaults.

The draft permit contains conditions which require development and implementation of BMPs designed to minimize the presence of pollutants in stormwater flows. In addition, the draft permit has conditions that require BMPs to maximize the extent to which at least the first flush of stormwater (commingled with non-stormwater flows) will be transferred to the CDTS for treatment prior to discharge.

2. Individual Outfall Vaults and Outfalls – Commingled Wet and Dry Weather Flows (Stormwater and Non-Stormwater)

GE Aviation has identified four possible ways in which non-stormwater flows could be commingled and discharged with wet weather flows. First, it is conceivable that a small volume of non-stormwater could be present in the outfall vault at the point when a storm surge trips the gate to discharge to the river. In this case, a small volume of skimmed non-stormwater flow combined with a significant volume of stormwater may be discharged to the river. Second, groundwater could infiltrate into the Drainage System (as described below) at times when an outfall gate is open, resulting in a combined discharge of stormwater and non-stormwater flow (i.e., the infiltrated groundwater).

GE Aviation indicated in the *Response to Request for Information, Section 308(a) of the Clean Water Act (CWA)*, dated July 10, 2009, that the standard operating protocol calls for the CDTS operator to manually run the transfer pumps in all eight vaults during the days leading up to a significant storm event, to attempt to reduce the non-stormwater flows in the vaults to the low level. In addition, the presence of non-stormwater flows in the Drainage System during wet weather could be further reduced by avoiding activities that generate non-stormwater flows to the extent possible during wet weather conditions. For example, to the extent that equipment washing or maintenance generates non-stormwater flow, then these activities should be avoided to the extent possible during wet weather. The draft permit includes provisions requiring both the operating protocols described above as BMPs to minimize the discharge from the Drainage System outfalls of non-stormwater flow commingled with stormwater.

Third, GE indicates that there could be occasional and minor leakage around the gates at individual outfalls, due to the variance in static pressure associated with accumulated water held up behind the gate and the tidal pressure on the outside of the gate. Fourth, outfall gates could mistakenly be left open after periods of wet weather, allowing the discharge of non-stormwater flow during dry weather. The draft permit's conditions prohibit, during both wet and dry weather, the discharge to the river of non-stormwater flow from the Drainage System outfalls as a result of "leakage" or other equipment malfunction (e.g., pump or power failure, gate malfunctions). Any such discharges will be unlawful unless they comply with the "bypass" or "upset" conditions set forth in Parts II.B.4 and II.B.5 of the permit, Standard Conditions.

For most of the Drainage System outfalls, the 1993 permit established dry weather and wet weather monitoring requirements. The dry weather flows are now primarily supposed to be routed to the CDTS, but some dry weather flow could potentially be discharged out of individual outfalls in combination with stormwater, as described above.

To the extent that GE Aviation would discharge non-stormwater flows commingled with its stormwater, and these non-stormwater flows are not of a type typically authorized under the MSGP, the draft permit includes effluent discharge limits applicable to these non-allowable non-stormwater flows. The derivation of these effluent limits is explained farther below.

C. Groundwater

Remediation of contaminated groundwater is an ongoing effort throughout the site. Three pump-and-treat systems located onsite discharge treated groundwater to the Lynn POTW. GE Aviation states in the *Response to Request for Information, Section 308(a) of the Clean Water Act (CWA)*, dated July 10, 2009, that the drainage system could pass through light non-aqueous phase liquids (LNAPL) remediation sites at the facility.

Given the age of the Drainage System (dating back to the early 1900's), the seamed concrete/clay tile construction methods of the underground drainage pipes, the porous nature of the fill closest to the river, and the high relative elevation and tidal influence of the water table, it is expected that a significant (though indeterminate) component of wet weather discharges from the Drainage System outfalls consists of infiltrated groundwater commingled with stormwater. GE Aviation states that as the water table rises during wet weather or high tides, the static pressure of the groundwater surrounding partially filled drain pipes forces groundwater through seams and cracks into the pipes. Ultimately, such infiltrated groundwater may be discharged out the Drainage System outfalls commingled with stormwater. In addition, in its most recent Permit Renewal Application Amendment, GE Aviation states that although the facility has implemented an extensive drain relining effort to minimize or eliminate the potential for groundwater infiltration to the Drainage System, groundwater seepage may still account for some of the discharges from any of the Drainage System outfalls during wet weather.[4] At the same time, however, GE Aviation also stated in correspondence dated March 25, 2009, that <u>all</u> dry weather flows are transferred to the CDTS.[5] (In the Administrative Consent Order entered between MassDEP and GE in 1999, cited above, it was stated that pipe lining efforts would "substantially eliminate the discharge of untreated dry weather flow, including infiltration ...." 1999 MassDEP ACO ¶ 7.)

In further discussion with GE Aviation, the permittee stated that the Drainage System Outfalls (001, 007, 010, 019, 027, 028, 030, and 031) have essentially all their groundwater treated at the CDTS prior to discharge.[6] At the same time, GE Aviation also

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[4] NPDES Permit Renewal Application Amendment, September 2003.

[5] Email correspondence from Steven Lewis (GE Aviation) to Nicole Kowalski (EPA) dated March 25, 2009.

[6] Email correspondence from Steven Lewis (GE Aviation) to Nicole Kowalski (EPA) dated April 3, 2009.

has indicated that there is a potential for groundwater infiltration to commingle with discharges through Outfalls 014, 018, and 020.

GE Aviation elaborated in its *Response to Request for Information, Section 308(a) of the Clean Water Act (CWA)*, dated July 10, 2009, that when stormwater lines and manhole inverts have elevations below the (tidally-influence) groundwater elevation, that portion of the storm system is effectively submerged in groundwater and therefore has the potential of being infiltrated by groundwater. Static pressures could force seepage through cracks, joints, and along annular spaces behind separated pipe lining.

Based on all of the information provided by GE Aviation, specifically the most recent, *Response to Request for Information, Section 308(a) of the Clean Water Act (CWA)*, dated July 10, 2009, EPA believes that the potential for contaminated groundwater infiltration to all outfalls exists. GE Aviation acknowledges that prior groundwater investigations conducted in connection with site investigations under the Massachusetts Contingency Plan have detected the presence of the following constituents in the site groundwater:

PCBs (Aroclor 1242, Aroclor 1248, Aroclor 1260),
oil and grease (O&G),
metals (antimony, arsenic, beryllium, cadmium, calcium, chromium, copper, iron, ferrous iron, lead, magnesium, manganese, mercury, nickel, selenium, silver, sodium, thallium, zinc),
Volatile Petroleum Hydrocarbons (VPHs),
Extractable Petroleum Hydrocarbons (EPH),
Semi-Volatile Organic Compounds (SVOCs) (Acenaphthene, acenaphthylene, anthracene, benzo(a)pyrene, benzo(a)anthracene, benzo(g,h,i)perylene, benzo(b)fluoranthene, benzo(k)fluoranthene, bis(2-ethylhexyl)pthalate, carbazole, chrysene, dibenzo(a,h)anthracene, dibenzofuran, di-n-octylphthalate, diethylphthalate, p-dichlorobenzene, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, 1-methylnaphthalene, 2-methylnaphthalene, 4-methylphenol, 2,4-dimethylphenol, m-dichlorobenzene, o-dichlorobenzene, o-cresol, p-chloro-m-cresol, N-Nitroso-diphenylamine, naphthalene, phenanthrene, phenol, pyrene, total polyaromatic hydrocarbons (PAHs)),
Volatile Organic Compounds (VOCs) (acetone, benzene, bromodichloromethane, bromoform, bromomethane, 2-butanone, carbon disulfide, carbon tetrachloride (tetrachloromethane), chlorobenzene, chloroethane, chloroform, 1,1-dichloroethane, 1,1-dichloroethene, cis-1,2-dichloroethene, trans-1,2-dichloroethane, 1,2-dichloroethene, 1,2-dichlorobenzene, 1,3-dichlorobenzene, 1,4-dichlorobenzene, 1,4-dioxane, dichlorodifluoromethane, ethylbenzene, ethylether, 2-hexanone, isopropylbenzene, 4-methyl-2-pentanone, methylene chloride, methyltertbutylether naphthalene, n-butylbenzene, n-propylbenzene, p-cymene, sec-butyl benzene, tert-butyl benzene, tert-amyl methyl ether, 1,1,1-trichloroethane, 1,1,2-trichloroethane, 1,1,2,2-tetrachloroethane, 1,2,4-trimethylbenzene, 1,2,4-trichlorobenzene, 1,3,5-trimethylbenzene,

tetrachloroethene, toluene, trichloroethene, trichlorofluoromethane, vinyl chloride, m-xylene, m/p-xylene, o-xylene, total xylenes).[7,8]

As a result, it is reasonably possible that one or more of these contaminants could be present in any discharges of untreated infiltrated groundwater.

Furthermore, monitoring of non-stormwater flows in the outfall vaults indicates levels of copper, zinc, PCBs, and residual chlorine which exceed State water quality standards. Monitoring of non-stormwater flows in the outfall vaults also indicates elevated levels of Total Suspended Solids (TSS), antimony, iron, lead, nickel, vinyl chloride, and PAHs.[9]

The draft permit contains conditions that prohibit the discharge during dry weather of untreated contaminated groundwater, either alone or in combination with any other discharge, directly to the receiving water. Any dry weather discharges of contaminated groundwater must first receive treatment in the CDTS and be discharged from Outfall 027A. (As discussed farther below, the draft permit includes conditions imposing effluent limits and monitoring requirements for the CDTS discharges through Outfall 027A based on technology standards and water quality standards.) Any dry weather discharge of contaminated groundwater that has not first been treated in the CDTS will be unlawful unless it is an authorized "bypass" or "upset" discharge under the conditions of Parts II.B.4 and II.B.5 of the Standard Conditions of the permit.

Additionally, the draft permit requires development and implementation of site-specific BMPs to minimize the infiltration of contaminated groundwater into the drainage system. The BMPs require, at a minimum, that the Drainage System outfalls open only during wet weather (after the first flush of stormwater is transferred to the CDTS for treatment) and remain closed during all periods of dry weather. Additionally, the BMPs include inspection of the outfall pipelines which discharge directly to the receiving water (including, at a minimum, Outfalls 014, 018, and 020), and require upgrading the pipe lining integrity of outfalls expected to discharge contaminated groundwater directly to the receiving water. These measures will minimize both the commingling of groundwater contaminants with stormwater discharges from the Drainage System outfalls and the pollutant load within any non-stormwater discharges from the Drainage System outfalls.

The above-described prohibitions, BMPs and effluent limits are derived from the technology-based and water quality-based requirements of the CWA, as set forth farther below.

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[7] NPDES Permit Renewal Application Revision, May 2000.

[8] E-mail correspondence from Steven Lewis (GE Aviation) to Nicole Kowalski (EPA), March 25, 2009, Attachment: Complete list of constituents that have been detected in the groundwater at the site.

[9] Response to Request for Information, Section 308(a) of the Clean Water Act (CWA), July 10, 2009.

D. Excavation Dewatering

Occasionally, GE Aviation dewaters a remediation, construction or pipe repair-related excavation on site. Dewatering events typically involve removal of groundwater and/or "potable" water from shallow excavations below the water table on the site. Since groundwater is listed as contributing to non-stormwater flows and the CDTS is specifically designed to treat potential contaminants from groundwater infiltration, treatment at the CDTS is required prior to discharge of excavation dewatering under the existing State Administrative Consent Order (ACO).

When groundwater collects in an excavation area, the permittee is required to sample such water for total petroleum hydrocarbons (TPH). TPH measures the total concentration of all petroleum-related hydrocarbon compounds within a specified carbon range.[10] The petroleum-related compounds included within this analysis range from compounds with 6 carbon (C_6) atoms to compounds with 25 carbon atoms (C_{25}). TPH concentrations are commonly used by regulatory agencies in the United States to establish target cleanup levels for soil or water.[10] Site remediation projects conducted under State law in MA and NH have consistently imposed a maximum effluent limitation for TPH of 5.0 parts per million (ppm) or milligrams per liter (mg/l) and this limit is readily attainable with standard treatment technology.[11]

If TPH is measured at less than 5.0 mg/l, the excavation water may be pumped directly or indirectly to the CDTS underground storage tanks for eventual treatment in the CDTS. The permittee shall ensure that the excavation water is pumped to the CDTS and not commingled with stormwater for direct discharge to the receiving water. If TPH is measured at 5.0 mg/l or more, the permittee is required to containerize this excavation water and either (a) pump it to the Lynn POTW for treatment if it has specific approval to do so from the POTW, or (b) dispose of this water appropriately off-site.

E. Drainage System Cleaning

Periodically, GE Aviation performs routine cleaning of its drainage system, which includes vaults, catch basins, lines, manholes and lift stations, by pressure washing with potable water and using a vacuum or dredge to remove accumulated sediment. These solids are removed and disposed of as solid waste off-site. In the past, GE Aviation collected the water that drained from the solids for discharge to the POTW following analytical testing and approval from Lynn Water and Sewer Commission. In a letter to EPA dated October 9, 2001, GE Aviation sought approval to allow storm and wash water to remain in the drain system and be discharged through the related outfall to the Saugus River.

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10 Weisman, Wade. 1998. *Analysis of Petroleum Hydrocarbons in Environmental Media, Volume 1.* Total Petroleum Hydrocarbon Criteria Working Group Series, March 1998.

11 USEPA, Remediation & Miscellaneous Contaminated Sites General Permit (RGP), NPDES Permit No. MAG910000 & NHG910000.

GE Aviation stated in a letter dated May 19, 2009, that the cleaning process involves the use of a vactor truck, which uses city water (no detergent or solvents of any kind) to suspend and fluidize mainly sand and soil sediment within the catch basin. Once sediment is suspended in the water column, the slurry is vacuumed from the catch basin. Occasionally, the water is decanted from the slurry and discharged back into the catch basin while retaining the solids in the vactor truck. The water is then discharged into the Drainage System to the same catch basin from which it was removed.

The draft permit prohibits the discharge of drainage system cleaning water directly to the receiving water. All drainage system cleaning water shall be either disposed of offsite or transferred directly to the CDTS for treatment. The draft permit also requires proper off-site disposal of the solid waste and minimization of the amount of solids that are left behind in the drain lines. The use of detergents and/or solvents in Drainage System Cleaning is prohibited.

The draft permit also includes a BMP requirement that prohibits drainage system cleaning during wet weather conditions, and prior to periods of forecasted wet weather conditions. This will help to prevent, to the maximum extent practicable, the commingling of drainage system cleaning water with stormwater.

F. Chemical Additives

Numerous chemical additives are used at the facility during normal operations to minimize the corrosion of equipment parts, extend the life of rinse and cooling water, limit bio-growth in recirculated water, balance pH, prevent scaling, scavenge for oxygen, reduce foaming or remove dissolved/ionized solids. A list of *Water Treatment Chemicals Potentially Discharged to the Storm Drain* [Drainage System] is included in Attachment F.[12] Use of any unlisted additives must be approved by EPA prior to use onsite. Additionally, as described in detail in Part III.I of this fact sheet, below, the use of Foamtrol AF2290 is prohibited in the draft permit.

The draft permit prohibits the discharge of water containing additives (except cooling water authorized for discharge through Outfall 018 or 014) directly to the receiving water. The draft permit requires that any discharge of water containing additives (except cooling water authorized for discharge through Outfall 018 or 014) be transferred to the CDTS for treatment.

G. Stormwater Dye Tracing

GE Aviation performs routine stormwater dye tracing studies using a specially formulated version of Xanthene dye of a non-toxic nature.[13] Nearly all dye tracing studies take place during dry weather, therefore if a quantity of dye in visible concentration should reach the outfall, it would be trapped by a closed gate and be

[12] NPDES Permit Renewal Application Amendment, September 2003, Exhibit 2-2.
[13] NPDES Permit Renewal Application Amendment, September 2003, p. 2-11.

pumped to the CDTS, where it would be combined with additional non-stormwater flows prior to treatment.

The Massachusetts Water Quality Standards (314 CMR 4.05(4)(b)(6)) states that Class SB waters "shall be free from color and turbidity in concentrations or combinations that are aesthetically objectionable or would impair any use assigned to this class." Therefore, the permit requires, as a site-specific BMP, that no discharge shall contain dye in visible concentrations. Additionally, the draft permit prohibits performance of dye tracing studies during wet weather conditions, prior to periods of forecasted wet weather conditions, and whenever any outfall gate is open. The permittee shall visually inspect the outfalls for discharges of dye during the dye testing studies. Any discharge of visible dye shall be considered a violation of the permit. Part I.A.18 of the draft permit states that the discharge shall not cause objectionable discoloration of the receiving waters.

H. Oil Sheens

A general condition of the 1993 permit requires "no discharge of oil sheen in other than trace amounts." However, the Massachusetts Water Quality Standards (314 CMR 4.05(4)(b)(7)) state that Class SB waters "shall be free from oil, grease and petrochemicals that produce a visible film on the surface of the water, impart an oily taste to the water or an oily or other undesirable taste to the edible portions of aquatic life, coat the banks or bottom of the water course, or are deleterious or become toxic to aquatic life." Therefore, the draft permit replaces the current condition with a narrative condition tracking the language of the State water quality standards. In addition, given that a concentration of oil and grease of 15 mg/L is recognized as the level at which many oils produce a visible sheen, the draft permit also imposes an oil and grease limit of 15 mg/L for outfalls with discharges that are expected to be contaminated with oil and grease, as described below in Part V.C, Proposed Permit Effluent Limitations and Conditions.

I. Foam Control Plan

The current permit includes the following language which applies to all outfalls, "There shall be no discharge of floating solids, oil sheen, or visible foam in other than trace amounts."

Due to the natural characteristics of the Saugus River, turbulence at the discharge points on the riverbank can generate foam. Investigations conducted by ENSR for GE Aviation in October 1994 and September 1996 found that foam in the receiving water at Outfalls 014 and 018 was not the result of the addition of floating, suspended or settleable solids, or other pollutants, but rather occurred naturally due to turbulence and the natural salinity of the Saugus River. The study also stated that the foam was generated during mid-to-low tide due to non-laminar flow and the entrainment of air at the discharge point.

The Massachusetts Water Quality Standards (314 CMR 4.05(4)(b)(5)) state that Class SB waters "shall be free from floating, suspended and settleable solids in concentrations or combinations that would impair any use assigned to this class, that would cause aesthetically objectionable conditions, or that would impair the benthic biota or degrade the chemical composition of the bottom." Additionally, EPA's "Gold Book"[14] states that all waters shall be free from substances attributable to wastewater or other discharges that: settle to form objectionable deposits; float as debris, scum, oil, or other matter to form nuisances; and produce objectionable color, odor, taste, or turbidity.

To be consistent with these standards, the draft permit replaces the current permit requirement with a condition stating that "The effluent shall not contain a visible oil sheen, foam, or floating solids at any time." The permittee states that it plans to reduce the amount of foam generating during mid-to-low tide by injecting anti-foam chemicals into the discharges through Outfalls 014 and 018. EPA has approved the use of a water-based anti-foam agent in other individual NPDES permits. Injection of an oil-based formulation would be cause for concern, however, since this water is discharged directly to the receiving water. Therefore, the draft permit allows the use of Foamtrol AF3551, the water-based anti-foam agent currently in use at the site, but prohibits the use of Foamtrol AF2290, the oil-based anti-foam agent. Specifically, use of oil-based anti-foam agents, such as Foamtrol AF2290, is prohibited in the draft permit.

J. Cooling Water Intake Structures

The GE Aviation facility includes three cooling water intake structures (CWISs): the Power Plant CWIS, the Test Cell CWIS, and the Gear Plant CWIS. The Power Plant CWIS consists of three seawater pumps (total design capacity 172.8 MGD) and six condenser cooling pumps (total design capacity 58.3 MGD) that supply non-contact cooling water to the Power Plant. The Test Cell CWIS, located at the end of an intake canal perpendicular to the flow of the river, is equipped with two seawater pumps (total design capacity 78.5 MGD) that supply cooling water for aircraft engine testing. The Gear Plant CWIS is currently inactive and scheduled for demolition beginning October 2010. See the evaluation and determination of the BTA in Attachment J for a more detailed description of each CWIS.

IV. SUMMARY OF MONITORING DATA

The effluent limitations and all other requirements described herein may be found in the draft permit. The effluent data submitted by the permittee in discharge monitoring reports (DMRs) is summarized in Attachment G.

V. PERMIT BASIS AND EXPLANATION OF EFFLUENT/INTAKE LIMITS

A. Receiving Water Description

The Saugus River is located in the North Coastal River basin and is a tributary to Lynn Harbor. At the point of GE Aviation's discharge, the Saugus River is classified under the Massachusetts Department of Environmental Protection's (MassDEP) Surface Water

[14] EPA 440/5-86-001, Quality Criteria for Water 1986.

Quality Standards (SWQS), *see* 314 CMR 4.06(1)(d)(1) and Table 23, as a Class SB water and an Outstanding Resource Water (ORW).

ORWs are afforded higher protection to maintain their existing uses and water quality. Class SB waters are designated as a habitat for fish, other aquatic life and wildlife, including for their reproduction, migration, growth and other critical functions, and for primary and secondary contact recreation. In certain waters, habitat for fish, other aquatic life and wildlife may include, but is not limited to, seagrass. In approved areas, SB waters shall also be suitable for shellfish harvesting with depuration (Restricted Shellfish Areas). In addition, these waters are to have consistently good aesthetic value. This segment of the Saugus River, #MA93-44, is on the MassDEP's 2008 303(d) list of impaired waters (for fecal coliform, oil & grease, temperature, and flow alterations).

The segment of the Saugus River receiving GE Aviation's wastewater discharges, and providing the facility's water for cooling, lies within the Rumney Marsh Area of Critical Environmental Concern (ACEC). An ACEC receives special recognition by the State because of the quality, uniqueness, and significance of its natural and cultural resources. ACEC designation creates a framework for enhanced local, regional, and State stewardship of these critical resources. The purpose of the ACEC Program is to preserve, restore, and enhance critical environmental resources and resource areas of the Commonwealth of Massachusetts. The goals of the program are to identify and designate these ecological areas, to increase the level of protection for ACECs, and to facilitate and support the stewardship of ACECs.

Rumney Marsh is a biologically significant salt marsh adjacent to the Saugus River which provides habitat for a wide range of aquatic species and native and migratory birds. Due to the historical alteration of this wetland, there are ongoing efforts to restore portions of this salt marsh and the related intertidal areas. The majority of land surrounding the GE Aviation facility, including its CWISs, is located within this ACEC-designated area.

B. General Basis of Permit Requirements

The Clean Water Act (CWA), 33 U.S.C. §§ 1251 *et seq.*, prohibits the discharge of pollutants to waters of the United States without authorization from a National Pollutant Discharge Elimination System (NPDES) permit, unless the discharge is otherwise authorized by the statute. *See* 33 U.S.C. §§ 1311(a) and 1342(a). The CWA also prohibits a discharger from withdrawing water from a water body through a cooling water intake structure (CWIS) for its cooling needs unless authorized by an NPDES permit.

The NPDES permit is the mechanism used to implement the CWA's technology-based and water quality-based requirements on a facility-specific basis. As such, NPDES permits impose pollutant discharge limits, cooling water intake restrictions, and other requirements, such as requirements for best management practices, maintenance, monitoring and reporting.

The draft NPDES permit for GE Aviation was developed in accordance with statutory and regulatory requirements under the CWA and applicable Federal and State regulations. The regulations governing the EPA NPDES permit program are generally found at 40 CFR Parts 122, 124, 125, and 136.

When developing permit limits, EPA applies technology-based and water quality-based requirements. Where both types of requirements apply to a particular pollutant discharge or cooling water withdrawal, the more stringent requirement is included in the permit so that both types of requirements will be satisfied. EPA also considers any variances that may be requested, and considers the limits and conditions in any existing permit in the context of "anti-backsliding" requirements. *See* 33 U.S.C. § 1342(o).

1. Technology-Based Requirements

The CWA imposes a number of technology standards requiring the use of particular levels of pollution control technology. Federal technology-based treatment requirements represent the minimum level of control that must be imposed under Sections 301(b) and 402 of the CWA (*see* 40 CFR §125 Subpart A). Technology-based discharge standards include: (a) the best practicable control technology currently available (BPT) standard for a limited number of "conventional pollutants" and metals, (b) the best conventional control technology (BCT) standard for other conventional pollutants; and the best available technology economically achievable (BAT) standard for toxic and non-conventional pollutants.[15] *See* 33 U.S.C. §§ 1311(b)(1)(A), 1311(b)(2)(A), and 1311(b)(2)(E). In addition, CWA § 316(b) requires that the design, location, construction and capacity of a discharger's cooling water intake structure(s) (CWISs) reflect the best technology available for minimizing adverse environmental impacts (BTA). 33 U.S.C. § 1326(b). Which of the CWA's technology standards apply to a given facility is determined by a variety of factors, such as the type of pollutant at issue, the type of facility in question, and whether or not the facility has a CWIS.

Existing point sources discharging pollutants to receiving waters were initially subject to effluent limitations based on the BPT standard, which were to have been satisfied by July 1, 1977. *See* 33 U.S.C. §§ 1311(b)(1)(A), 1314(b)(1)(B). The BPT standard required compliance with effluent limitations based on the "best practicable control technology currently available." *Id.* The CWA sets forth a number of factors that EPA is to consider in determining the BPT. These factors are as follows:

(i) The age of equipment and facilities involved;
(ii) The process employed;
(iii) The engineering aspects of the application of various control techniques;
(iv) Process changes;
(v) Non-water quality environmental impacts (including energy requirements);

[15] The CWA also imposes "new source" standards under Section 306, 33 U.S.C. § 1316, for facilities considered to be "new sources" under the statute. The GE Aviation facility in Lynn is not, however, a "new source" under the CWA.

(vi) The total cost of application of technology in relation to the effluent reduction benefits to be achieved from such application; and
(vii) Such other factors as the Administrator deems appropriate.

33 U.S.C. § 1314(b)(1)(A). See also 40 C.F.R. § 125.3(d)(1).

Existing point sources discharging conventional pollutants are subject to effluent limitations based on the BCT standard, which were to have been satisfied by March 31, 1989. *See* 33 U.S.C. §§ 1311(b)(2)(E), 1314(b)(4)(A); *see also* 40 C.F.R. § 401.16 (conventional pollutants include biochemical oxygen demand (BOD), total suspended solids (TSS) (nonfilterable), pH, fecal coliform, oil and grease). The BCT standard requires compliance with limitations based on the "best conventional pollutant control technology." The CWA sets forth a number of factors that EPA must consider in determining the BCT. These factors are the same as those specified above with regard to the BPT standard, with two additions. First, a factor regarding comparative costs and benefits is specified that reads as follows: "the reasonableness of the relationship between the cost of attaining a reduction in effluent and the effluent reduction benefits derived." 33 U.S.C. § 1314(b)4)(B); 40 C.F.R. § 125.3(d)(2)(i). Second, the following additional relative cost factor also should be considered: "the comparison of the cost and level of reduction of such pollutants from the discharge from publicly owned treatment works to the cost and level of reduction of such pollutants from a class or category of industrial sources." Effluent limitations for conventional pollutants based on BCT may not be less stringent than those based on BPT, as BCT is a more advanced (i.e., stringent) standard than BPT.

Discharges of toxics and "nonconventional" pollutants (*i.e.*, pollutants that are neither "toxic" nor "conventional," such as heat) from existing point sources were required to comply by March 31, 1989, with effluent limitations based on the BAT standard. *See* 33 U.S.C. § 1311(b)(2)(A) and (F); *see also* 40 C.F.R. § 401.15 (list of toxic pollutants). The BAT standard requires compliance with:

> effluent limitations . . . which . . . shall require application of the best available technology economically achievable . . ., which will result in reasonable further progress toward the national goal of eliminating the discharge of all pollutants, as determined in accordance with regulations issued by the [EPA] Administrator pursuant to section 1314(b)(2) of this title, which such effluent limitations shall require the elimination of discharges of all pollutants if the Administrator finds, on the basis of information available to him ... that such elimination is technologically and economically achievable . . . as determined in accordance with regulations issued by the [EPA] Administrator pursuant to section 1314(b)(2) of this title . . ..

33 U.S.C. § 1311(b)(2)(A). That is, EPA must require the most stringent possible limits that could be met by use of the most effective pollution control technologies that are

technologically and economically achievable, and that will result in reasonable progress toward eliminating the discharge of the pollutant(s) in question. The CWA specifies the following factors for EPA to consider in determining the BAT:

(i) The age of equipment and facilities involved;
(ii) The process employed;
(iii) The engineering aspects of the application of various control techniques;
(iv) Process changes;
(v) Non-water quality environmental impacts (including energy requirements);
(vi) The cost of achieving such effluent reduction; and
(vii) Such other factors as the Administrator deems appropriate.

33 U.S.C. § 1314(b)(2)(A); 40 C.F.R. § 125.3(d)(3). Notably, these BAT factors do not include a comparison of the costs and benefits of the pollutant discharge reductions. *See EPA v. Nat'l Crushed Stone Ass'n*, 449 U.S. 64, 74 (1980) ("[s]imilar directions are given the Administrator for determining effluent reductions attainable from the BAT [as are given for the BPT standard,] except that in assessing BAT total cost is no longer to be considered in comparison to effluent reduction benefits").

BAT is the CWA's most stringent standard for existing dischargers. "Congress intended these limitations to be based on the performance of the single best-performing plant in an industrial field." Chem. Mfrs. Ass'n v. EPA, 870 F.2d 177, 226 (5th Cir.1989). See also Kennecott v. EPA, 780 F.2d 445, 448 (4th Cir. 1985) ("In setting BAT, EPA uses not the average plant, but the optimally operating plant, the pilot plant which acts as a beacon to show what is possible."). EPA has not defined "economically achievable" but pollution control technology is considered to be economically achievable if the cost of using it will not cause a plant to shut down.

CWA § 316(b) specifies the technology standard applicable to cooling water intake structures (CWISs). It requires that the location, construction, design and capacity of CWISs must reflect the best technology available for minimizing adverse environmental impacts (BTA). 33 U.S.C. § 1326(b). Thus, Section 316(b) dictates the aspects of CWISs that must be considered in determining the BTA: namely, their location, construction, design and capacity. The statute further dictates that the BTA must be an "available" techology – which EPA interprets to mean technologically and economically achievable – and the "best" technology for "minimizing" adverse environmental impacts. As a result, EPA interprets the statute to call for the cost of technological alternatives to be considered insofar as it might affect a technology's availability. Similarly, EPA considers technology issues, such as engineering considerations, insofar as they may affect an option's "technological availability" and its cost. In addition, EPA must consider the extent to which the options are able to reduce the adverse environmental impacts of CWIS operation to help determine which options "minimize" such adverse impacts.

The statute does not mandate additional specific factors to be considered in determining the BTA in the same way that CWA § 304(b) does so for the technology standards applicable to pollutant discharges. *See Entergy Corp. v. Riverkeeper, Inc.*, ___ U.S. ___, 129 S.Ct. 1498, 1507 (2009). As a result, EPA has discretion to reasonably consider other factors that it deems relevant. *See id.* at 1507 – 1509. In setting BTA standards in the past, EPA has used its discretion in appropriate cases to consider factors such as the ones specified for effluent discharge standards in CWA § 304(b) (e.g., non-water environmental effects and energy requirements). EPA has also exercised its discretion to consider a comparison of the costs and benefits of a given technology option. The Supreme Court recently confirmed that EPA has the discretion, but is not required, to consider such a comparison of costs and benefits. *See id.* at 1508.

EPA has two alternative methods for giving effect to the CWA's technology standards. First, EPA can approach the matter on an industrial category-wide basis (e.g., for steam-electric power plants or paper mills). Industrial categories may, in turn, be broken down into sub-categories based on factors such as the type of processes used or the location of the facilities (e.g., effluent limitations may be tailored for different types of paper mills). EPA then determines the pollution reduction method(s) that satisfies the applicable technology standard for that industrial category (e.g., BAT or BCT), and sets the effluent limitations for particular pollutants based on the use of that method. These industrial category-wide (or sub-category-wide) effluent limitations are referred to as National Effluent Limitation Guidelines (NELGs). Once a pertinent NELG has been developed, it is used to determine the limits to be included in individual facility permits. *See* 40 C.F.R. § 125.3(c)(1).

Second, when EPA has not developed an NELG (or a CWIS standard) for a particular industry, or for a particular pollutant discharged by an industry for which NELGs have otherwise been promulgated, the Agency uses its Best Professional Judgment (BPJ) to develop permit limits based on a case-by-case, site-specific application of the relevant technology standard. *See* 33 U.S.C. § 1342(a)(1)(B); 40 C.F.R. § 125.3(c)(2). *See also* 40 C.F.R. § 125.90(b) (BPJ-based requirements for CWISs under CWA §316(b)). As one court has explained, "BPJ limits constitute case-specific determinations of the appropriate technology-based limitations for a particular point source." *NRDC v. EPA*, 859 F.2d 156, 199 (D.C. Cir. 1988). This court further explained that:

> [i]n what EPA characterizes as a 'mini-guideline' process, the permit writer, after full consideration of the factors set forth in section 304(b), 33 U.S.C. § 1314(b), (which are the same factors used in establishing effluent guidelines), establishes the permit conditions 'necessary to carry out the provisions of [the CWA].' § 1342(a)(1). These conditions include the appropriate ... BAT effluent limitations for the particular point source. ... [T]he resultant BPJ limitations are as correct and as statutorily supported as permit limits based upon an effluent limitations guideline.

Id. See also Texas Oil & Gas Ass'n v. EPA, 161 F.3d 923, 929 (5th Cir. 1998) ("Individual judgments thus take the place of uniform national guidelines, but the technology-based standard remains the same.") Consistent with this understanding, EPA's regulations state that when developing an effluent limitation on a BPJ-basis, the permit writer considers the relevant factors specified in CWA § 304(b), *see* 40 C.F.R. § 125.3(d), "the appropriate technology for the category or class of point sources of which applicant is a member, based upon all available information," and "any unique factors relating to the applicant." *Id.* at § 125.3(c)(2)(i)-(ii).

Additional guidance about developing technology-based requirements on a BPJ basis is provided by the EPA's manual for permit writers. *See* Office of Wastewater Management, U.S. Environmental Protection Agency, "NPDES Permit Writers' Manual" (Permit Writers' Manual) (September 2010). The Permit Writer's Manual identifies a wide array of materials that can be used to inform BPJ permitting decisions, including EPA technical guidance documents pertaining to the development of technology and water-quality-based limits and permit compliance data. Notably, the list of BPJ permitting tools also specifically references other NPDES permits, including those from other media (i.e., RCRA and SPCC). Thus, the Permit Writers' Manual instructs that permit writers may derive BPJ limits by, among other things, (1) transferring numerical limitations from appropriate existing sources (*e.g.*, a similar NPDES permit or an existing ELG for an analogous industrial category), or (2) developing new numeric limitations.

With regard to the GE Aviation facility, there are no directly applicable NELGs. Therefore, EPA has determined technology-based requirements for this NPDES permit on a case-by-case, BPJ basis. This has involved consideration of the relative performance of alternative pollution reduction methods, including methods in use at other facilities, as well as the pertinent factors specified in Section 304(b) of the CWA, 33 U.S.C. § 1314(b), and 40 C.F.R. § 125.3(d).

EPA has also considered various NELGs which, although not strictly applicable to GE Aviation, provide relevant information because they were developed for industrial categories similar or analogous to the GE Aviation facility in important ways. In other words, these NELGs are not strictly determinative of the technology-based limits to be applied to the GE Aviation facility, but they provide useful information to inform EPA's BPJ.

The draft permit's effluent monitoring requirements have been established under the authority of Sections 308(a) and 1342(a)(2) of the Clean Water Act, 33 U.S.C. §§ 1318(a) and 1342(a)(2), and in accordance with EPA regulations set forth at 40 CFR § 122.41(j), 122.44(i) and 122.48. The monitoring program in the permit specifies routine sampling and analysis which will provide information on the facility's pollutant discharges and the reliability and effectiveness of the installed pollution abatement equipment. Approved analytical procedures are to be found in 40 CFR Part 136 unless other procedures are specified in the permit.

The CWA requires compliance with BPT, BCT and BAT effluent limits no later than March 31, 1989. *See* 33 U.S.C. § 1311(b)(1)(A) and (2); 40 C.F.R. § 125.3(a)(2). Thus, the statutory deadline for achieving compliance with effluent limits based on these standards has already passed and compliance is required immediately. NPDES permits may not include compliance schedules and deadlines that would purport to extend these statutory compliance deadlines. *See* 40 C.F.R. §122.47(a)(1).

2. Water Quality-Based Requirements

Water quality-based limitations are required in NPDES permits when effluent limits and other requirements and standards more stringent than technology-based requirements are necessary to maintain or achieve compliance with State or Federal water quality requirements. *See* 33 U.S.C. § 1311(b)(1)(C); 40 C.F.R. § 122.44(d)(1). State water quality standards (WQS) have three components: (a) beneficial designated uses for water bodies or segments of water bodies; (b) instream numeric and/or narrative water quality criteria intended to protect the assigned designated uses; and (c) antidegradation requirements intended to ensure that once a particular level of water quality is attained it will not be degraded, except under very limited circumstances, and to protect especially high quality or important water bodies. *See* 40 C.F.R. § 131.12; 310 CMR 4.04(3). The Massachusetts Surface Water Quality Standards, found at 314 CMR 4.00, include each of these three elements.

The State assigns each of the water bodies under its jurisdiction, and in some cases specific segments of these water bodies, to a particular water quality classification (e.g., Class A, Class B or Class C). Each water quality classification is assigned a particular set of designated uses and accompanying water quality criteria. Massachusetts also has a number of water quality criteria that apply to all its waters, including narrative water quality criteria requiring restrictions on the discharge of toxic constituents and mandating the use of EPA criteria established pursuant to Section 304(a) of the CWA unless the WQS specify a different criterion for the specific pollutant or the State establishes site-specific criteria.

When using chemical-specific numeric criteria to develop permit limits, both the acute and chronic aquatic-life criteria, expressed in terms of maximum allowable in-stream pollutant concentration, are used. Acute aquatic-life criteria are considered applicable to daily time periods (i.e., maximum daily limits), while chronic aquatic-life criteria are considered applicable to monthly time periods (i.e., average monthly limits). Chemical-specific limits are allowed under 40 CFR § 122.44(d)(1) and are implemented under 40 C.F.R. § 122.45(d). Pursuant to 40 C.F.R. § 122.45(d)(2), the Region has established maximum daily limits and average monthly discharge limits for specific chemical pollutants for this permit.

A facility's design flow is used when deriving constituent limits for daily and monthly time periods, as well as for weekly periods where appropriate. The dilution provided by the receiving water is also factored into this process where appropriate. Narrative criteria from the State's water quality standards provide a basis for limiting toxicity in discharges where (a) a specific pollutant can be identified as causing or contributing to the toxicity but the State has no numeric standard; or (b) toxicity cannot be traced to a specific pollutant.

NPDES permits must address any pollutant or pollutant parameter (conventional, non-conventional, toxic and whole effluent toxicity) that is or may be discharged at a level that causes, contributes, or has a "reasonable potential" to cause or contribute to an excursion above any water quality standard. *See* 40 C.F.R. § 122.44(d)(1). An excursion occurs if the projected or actual in-stream concentration of a pollutant discharge exceeds the applicable criterion or interferes with maintenance of applicable designated uses. In determining whether there is a reasonable potential for an excursion, EPA considers (a) existing controls on point and non-point sources of pollution; (b) pollutant concentrations and variability in the effluent and receiving water; (c) the sensitivity of the test species used in toxicity testing; (d) known water quality impacts of processes on wastewater; and, (e) where appropriate, dilution of the effluent in the receiving water. *See id.* In the case of this receiving water, EPA has conservatively assumed no dilution in evaluating the water quality-based criteria for toxic and non-conventional pollutants, given the tidal nature of the receiving water and the dearth of flow available at low tide, the value of the resource, and the assumption that non-allowable non-stormwater discharges receive internal dilution via commingling with stormwater in the Drainage System.

Federal regulations found at 40 CFR Section 131.12 require states to develop and adopt a statewide antidegradation policy, as part of their water quality standards, to ensure the maintenance and protection of existing instream water uses and the level of water quality necessary to protect the existing uses. Antidegradation policies are also supposed to maintain the quality of waters which exceed levels necessary to support propagation of fish, shellfish, and wildlife and to support recreation in and on the water, subject to limited exceptions. The Massachusetts Antidegradation Policy is found at Title 314 CMR 4.04.

The antidegradation requirements of the Massachusetts WQS provide heightened protection for Outstanding Resource Waters (ORWs). As previously mentioned, the GE Aviation facility discharges wastewater to, and withdraws water for cooling from, a segment of the Saugus River that is classified as an ORW under the Massachusetts WQS. *See* 310 CMR 4.06(1)(d)(2), 4.06(5) and 4.06 (Tables and Figures: Table 23 (Saugus River: Boston Street Bridge to the mouth -- Qualifiers ("Outstanding Resource Waters"). This segment of the river is also part of the State-designated Rumney Marshes Area of Critical Environmental Concern (ACEC), which is an extensive and biologically significant salt marsh system to the north of Greater Boston area.

The State's antidegradation requirements restrict both new (or increased) and existing discharges of pollutants to ORWs. While GE Aviation is not proposing new or increased pollutant discharges, its existing discharges still must satisfy the antidegradation requirements. Specifically, the State regulations provide that:

> [a]ny person having an existing discharge to these waters shall cease said discharge and connect to a Publicly Owned Treatment Works (POTW) unless it is shown by said person that such a connection is not reasonably available or feasible. Existing discharges not connected to a POTW shall be provided with the highest and best practical method of waste treatment

> determined by the Department as necessary to protect and maintain the outstanding resource water.

314 CMR 4.04(3)(a). Therefore, GE Aviation's existing discharges of pollutants to ORW portions of the Saugus River must cease and be redirected to a POTW (in this case, the Lynn Water & Sewer Commission POTW), unless such redirection is "not reasonably available or feasible," in which case such pollutant discharges must receive the "highest and best practical method of waste treatment" that MassDEP determines is needed to protect and maintain the ORW. In MassDEP's antidegradation policy document, entitled, "Implementation Procedures for the Antidegradation Provisions of the Massachusetts Surface Water Quality Standards, 314 CMR 4.00" (10/21/09) (MassDEP Antidegradation Implementation Procedures), the State explains that "[t]he purpose of this requirement is to minimize any degradation and to ensure that water quality remains as close to natural background conditions as feasible." *Id.* at 6.[16]

Under the State's WQS, the MassDEP implements an "authorization process" in connection with the application of its antidegradation requirements. *See* 314 CMR 4.04(5). In 314 CMR 4.05(5)(b), the WQS provide that, "[a]n authorization to discharge to the narrow extent [that discharges to ORWs are] allowed in 314 CMR 4.04(3) … may be granted by the Department where the applicant demonstrates compliance with 314 CMR 4.04(5)(a)2. through 314 CMR 4.04(5)(a)4." These provisions, in turn, specify as follows:

> (a) An authorization to discharge to waters designated for protection under 314 CMR 4.04(2) may be issued by the Department where the applicant demonstrates that:
>
> 2. No less environmentally damaging alternative site for the activity, receptor for the disposal, or method of elimination of the discharge is reasonably available or feasible;

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[16] MassDEP's 2009 Antidegradation Implementation Procedures supercedes its 1992 document entitled, "Antidegradation Review Procedure For Discharge Requiring A Permit Under 314 CMR 3.03." Nevertheless, the 1992 document is of interest in that its discussion of the antidegradation protections for ORWs is consistent with the 2009 document, but adds some additional detail regarding the "highest and best practical method of waste treatment" requirement. Specifically, the 1992 document states (at p. 7) that 314 CMR 4.05(3)'s restrictions on existing discharges to ORWs mean:

> … that existing discharges will be connected to POTW's where possible. Where it is not possible, treatment levels higher than those required by the technology-based review may be imposed. The purpose of this higher treatment is to provide the highest water quality possible so that the ORW is at minimal risk of degradation and to insure that water quality remains as close as natural background conditions as possible.

3. To the maximum extent feasible, the discharge and activity are designed and conducted to minimize adverse impacts on water quality, including implementation of source reduction practices; and
4. The discharge will not impair existing water uses and will not result in a level of water quality less than that specified for the Class.

314 CMR 4.04(5)(a)2 – 4.04(5)(a)4. The MassDEP Antidegradation Implementation Procedures, at 6, further state that:

> [i]n connection with an application for permit renewal, at its discretion, the Department may require an existing discharge to an ORW to undergo the authorization process in 314 CMR 4.04. This could be appropriate, for example, where new methods of reuse and conservation of wastewater, alternative methods of production or operation, improved process controls, or improved wastewater treatment facility operation may be available.

Thus, permit requirements for GE Aviation's existing discharges to ORW portions of the Saugus River must comply with the Massachusetts WQS's antidegradation requirements and may require a specific antidegradation authorization from the State.

3. Section 316(a) of the Clean Water Act

Heat is defined as a pollutant under Section 502(6) of the CWA. 33 U.S.C. § 1362(6). As with other pollutants, discharges of heat (or "thermal discharges") generally must satisfy both technology-based standards (specifically, the BAT standard) and any more stringent water quality-based requirements that may apply. State WQS may include numeric temperature criteria, as well as narrative criteria and designated uses, that apply to particular water body classifications and may necessitate restrictions on thermal discharges.

Section 316(a) of the CWA, 33 U.S.C. § 1326(a), provides, however, that thermal discharge limits less stringent than technology-based and/or water quality-based requirements may be authorized if the biological criteria of Section 316(a) are satisfied. The approval of less stringent thermal discharge limits under CWA § 316(a) is referred to as a "Section 316(a) variance." In addition, the Massachusetts SWQS provide that "any determinations concerning thermal discharge limitations in accordance with 33 U.S.C. 1251 § 316(a) will be considered site-specific limitations in compliance with 314 CMR 4.00." *See* 314 CMR 4.05(4)(a)(2)(c) and 4.05(4)(b)(2)(c) (for Class SA and SB waters, respectively).

Thermal discharge variances, and the demonstration that an applicant must make to obtain one, are addressed in CWA § 316(a) and EPA regulations, including those promulgated at 40 CFR §125, Subpart H. In essence, the applicant must demonstrate that the alternative, less stringent effluent limitations it desires, considering the cumulative impact of its thermal discharge together with all other significant impacts on the species affected, will assure the protection and propagation of a balanced, indigenous population of shellfish, fish and wildlife in and on the water body receiving the thermal discharge (BIP). *See* 33 U.S.C. § 1326(a); 40 C.F.R. § 125.73(a) and (c)(1)(i). An existing thermal discharger can perform either a predictive or a retrospective analysis in an effort to demonstrate that the protection and propagation of the BIP will be assured despite its proposed thermal discharge variance. If the applicant makes this demonstration to the satisfaction of EPA (or, if appropriate, the State), then the permitting authority may issue the permit with the requested alternative, variance-based thermal discharge limits. Conversely, if the demonstration does not adequately support the requested variance-based thermal discharge limits, then the permitting authority shall deny the requested variance. In that case, the permitting authority shall either impose limits based on the otherwise applicable technology-based and water quality-based requirements or, at its discretion, impose alternative variance-based limits that the permit record demonstrates *will* assure the protection and propagation of the BIP. *See also* Part V.C.8, below, for further discussion of this matter.

4. Requirements for Cooling Water Intake Structures under CWA § 316(b)

As indicated above, technology-based NPDES permit requirements for cooling water intake structures (CWISs) are based on CWA § 316(b), 33 U.S.C. § 1326(b), which requires "that the location, design, construction, and capacity of cooling water intake structures reflect the best technology available (BTA) for minimizing adverse environmental impact." As with effluent discharge limits, CWIS requirements must also comply with any more stringent conditions that might be necessary to achieve compliance with any applicable State water quality standards. *See* 40 C.F.R. § 125.84(e). The operation of CWISs can cause or contribute to a variety of adverse environmental effects, such (a) as killing or injuring tiny aquatic organisms, including but not limited to fish larvae and eggs, by entraining them in the water withdrawn from a water body and sent through the facility's cooling system (entrainment), and (b) killing or injuring larger organisms, including but not limited to juvenile and adult fish, by impinging them against the intake structure's screens, racks, or other structures (impingement). Section 316(b) applies if the applicant for a discharge permit seeks to withdraw cooling water from a water of the United States.

Therefore, CWA § 316(b) applies to this permit due to the operation of CWISs at the GE Aviation facility. At this time, there are no national categorical standards that are in effect that apply § 316(b) to the CWISs at the GE Aviation facility. As a result, EPA has developed technology-based requirements for the facility's CWISs by applying CWA § 316(b) on a BPJ, site-specific basis. *See* 40 C.F.R. § 125.90(b). EPA's evaluation and determination of the BTA for the Test Cell and Power Plant CWISs are set forth in Attachment J to this fact sheet.

5. Antibacksliding

A permit may not be renewed, reissued or modified with less stringent limitations or conditions than those contained in the previous permit unless in compliance with the anti-backsliding requirements of the CWA [see Sections 402(o) and 303(d)(4) of the CWA and 40 CFR §122.44(l)(1 and 2)]. EPA's antibacksliding provisions prohibit the relaxation of permit limits, standards, and conditions except under certain circumstances. Effluent limits based on BPJ, water quality, and State certification requirements must also meet the antibacksliding provisions found at Section 402(o) and 303(d)(4) of the CWA.

C. Proposed Permit Effluent Limitations and Conditions

In the text above, EPA explained in general terms the technology-based and water quality-based requirements of the CWA. In the text below, EPA explains how it has applied these requirements in developing a draft NPDES permit for GE Aviation. As a whole, the draft permit's conditions are based on a combination of technology-based and water quality-based requirements, as well as a CWA § 316(a) variance for thermal discharges.

The discussion below, and the draft permit itself, address dry weather and wet weather pollutant discharges separately, and cover GE Aviation's many discharge outfalls as well as its many different types of pollutant discharges and its withdrawals of river water for cooling uses. Monitoring requirements are also addressed.

1. <u>Drainage System Outfalls (Outfalls 001, 007, 010, 019, 027B, 028, 030, and 031)</u>

a. Requirements during dry weather

The draft permit includes conditions prohibiting dry weather discharges of non-stormwater flows, including contaminated groundwater infiltration, from Drainage System outfalls 001, 007, 010, 019, 027B, 028, 030, and 031. This prohibition is based on both a BPJ application of pertinent technology standards and Massachusetts water quality standards.

Dry weather discharges of non-stormwater flows from the facility through the Drainage System outfalls potentially include process wastewaters and contaminated groundwater infiltration. As detailed above, these non-stormwater flows could include a range of toxic, nonconventional and conventional pollutants. As a result, any such discharges would need to satisfy effluent limitations based on BAT and BCT requirements.

The BAT standard calls for the "best available technology economically achievable … which will result in reasonable further progress toward the national goal of eliminating the discharge of all pollutants …." 33 U.S.C. § 1311(b)(2)(A). The BCT standard calls for the "best conventional pollutant control technology." *Eliminating* dry weather discharges from these outfalls would clearly satisfy these standards.

Under its Administrative Consent Order (ACO) with MassDEP, GE Aviation designed its Drainage System to "substantially eliminate" dry weather discharges from the above-listed outfalls. To meet this standard, GE Aviation installed equipment enabling it to close these outfalls during dry weather and convey non-stormwater from the Drainage System vaults to the CDTS for treatment prior to discharge through Outfall 027A. GE

Aviation has also lined some Drainage System pipes to minimize the presence of infiltrated contaminated groundwater in the water in the Drainage System pipes and vaults.

In addition, other facilities dealing with the problem of contaminated groundwater infiltration have also eliminated dry weather discharges of untreated wastewater (including contaminated groundwater) by taking steps to prevent or minimize groundwater infiltration, and by installing systems to collect and treat such wastewater prior to discharge. For example, the ConocoPhillips bulk petroleum storage facility in East Boston, MA (NPDES Permit MA0004006), and the Exxon Mobil facility in Boston, MA (NPDES Permit MA0000833), both have installed, or are installing, systems to collect and treat contaminated groundwater and preclude discharges of untreated groundwater during dry weather.

In light of the above, eliminating untreated dry weather pollutant discharges from the listed Drainage System outfalls appears technologically and economically achievable for GE Aviation and would reduce pollutant discharges equivalent to that achieved by the best performing facilities.

EPA has also considered the various BAT and BCT factors specified above and can see no reason that a prohibition on dry weather discharges would not satisfy the BAT and BCT standards. The BAT factors, as discussed above, are as follows:

(i) The age of equipment and facilities involved;
(ii) The process employed;
(iii) The engineering aspects of the application of various control techniques;
(iv) Process changes;
(v) Non-water quality environmental impacts (including energy requirements);
(vi) The cost of achieving such effluent reduction; and
(vii) Such other factors as the Administrator deems appropriate.

The BCT factors, also discussed above, include the first five items listed above, along with the following two factors: (i) "the reasonableness of the relationship between the cost of attaining a reduction in effluent and the effluent reduction benefits derived;" and "the comparison of the cost and level of reduction of such pollutants from the discharge from publicly owned treatment works to the cost and level of reduction of such pollutants from a class or category of industrial sources." 33 U.S.C. § 1314(b)(4)(B); 40 C.F.R. § 125.3(d)(2)(i). Nothing about any of these factors would preclude a prohibition on dry weather discharges from constituting effluent limitations that satisfy the BAT and BCT standards, and GE Aviation should be able to meet such a prohibition with its existing Drainage System (perhaps with certain modifications).

EPA also considered the Massachusetts WQS and concludes that a prohibition on dry weather discharges would satisfy the State's antidegradation requirements, as detailed above.

b. Requirements during wet weather

During wet weather, the Drainage System collects stormwater which is commingled with various types of non-stormwater flows (including contaminated groundwater infiltration). As the water table rises during wet weather, the static pressure of the groundwater surrounding partially filled drain pipes forces groundwater through seams and cracks into the pipes. Therefore, it is expected that a significant (though indeterminate) percentage of discharges from the Drainage System outfalls during wet weather will include infiltrated groundwater (mixed with stormwater and certain other non-stormwater flows). This presents a particular threat of pollution to the Saugus River due to the historical groundwater contamination on site and the lack of treatment at the Drainage System outfalls.

Based on present information, EPA concludes that completely eliminating discharges from the Drainage System outfalls during wet weather does not appear to be technologically achievable at the present time. The overall volume of wastewater in the Drainage System, including stormwater, infiltrated groundwater and various non-stormwater flows, is neither fully quantified nor predictable, and it exceeds the capacity of the pipes and pumps to collect all of it and transfer it to the CDTS for storage and treatment.

Different issues are presented by (a) the stormwater (and *non-stormwater* (*i.e.*,"dry weather") flows typically authorized under the MSGP for discharge along with stormwater), and (b) the remaining non-stormwater flows that may be commingled with the stormwater but are not typically authorized under the MSGP for discharge together with the stormwater. Therefore, these two types of wastewater will be addressed separately below, beginning with the former.

i. Stormwater Discharges (including non-stormwater flows typically authorized under the MSGP for discharge with stormwater)

EPA reviewed the 2008 Multi-Sector General Permit for stormwater discharges from industrial sources (MSGP) for assistance in determining on a BPJ basis technology-based limits for GE Aviation's discharges of stormwater. The MSGP also authorizes the discharge of certain non-stormwater flows together with stormwater that is being discharged in compliance with relevant provisions of the MSGP. The non-stormwater flows are referred to in the MSGP as "allowable non-stormwater discharges," *see* MSGP § 1.1.3, and that phrase will be used here. Allowable non-stormwater flows include the following discharges:

- Discharges from fire-fighting activities;
- Fire hydrant flushings;
- Potable water, including water line flushings;
- Uncontaminated condensate from air conditioners, coolers, and other compressors and from the outside storage of refrigerated gases or liquids;
- Irrigation drainage;

- Landscape watering provided all pesticides, herbicides, and fertilizer have been applied in accordance with the approved labeling;
- Pavement wash waters where no detergents are used and no spills or leaks of toxic or hazardous materials have occurred (unless all spilled material has been removed);
- Routine external building washdown that does not use detergents;
- Uncontaminated ground water or spring water;
- Foundation or footing drains where flows are not contaminated with process materials; and
- Incidental windblown mist from cooling towers that collects on rooftops or adjacent portions of your facility, but not intentional discharges from the cooling tower (e.g., "piped" cooling tower blowdown or drains).

Sector AB of the MSGP (Transportation equipment, industrial or commercial machinery) specifies Stormwater Pollution Prevention Plan (SWPPP) components to regulate the discharge of stormwater, and Sector O of the MSGP (Steam Electric Generating Facilities) also contains SWPPP components, along with a benchmark monitoring concentration of 1.0 mg/L total iron. Since parts of the GE Aviation facility are engaged in the activities covered by these sectors, EPA has included technology-based permit limits for stormwater discharges (and allowable non-stormwater discharges) from these MSGP provisions in the SWPPP requirements of the draft permit. Monitoring for total iron is addressed under Section C.1.b.ii.j. (Metals) of this fact sheet.

ii. Non-Allowable Non-Stormwater Flows commingled with stormwater

As stated above, during wet weather GE Aviation's Drainage System collects and discharges stormwater commingled not only with allowable non-stormwater discharges, but also with other contaminated non-stormwater flows (such as contaminated groundwater infiltration). The draft NPDES permit for the facility sets limits on these "non-allowable non-stormwater flows[17]" that satisfy technology-based and water quality-based requirements.

As stated above, EPA does not currently deem it feasible for GE Aviation to eliminate the discharge of stormwater commingled with both allowable non-stormwater discharges and non-allowable non-stormwater discharges. Moreover, EPA does not currently deem it feasible for GE Aviation to completely eliminate the commingling of the non-allowable non-stormwater discharges with the stormwater. GE Aviation does not currently appear to be able to identify all of the pipes that are connected to and contribute wastewater to the Drainage System vaults. This is the result of the size of the GE Aviation site, the long

[17] Non-allowable non-stormwater flows discharged from this facility consist of contaminated groundwater, cooling water, condensate blowdown, steam conduit blowdown, boiler startup/soot blower drains/boiler draining for maintenance (intermittent), boiler filter backwash, ion exchange regeneration and backwash, de-aerator storage tanks (intermittent), boiler blowdown, building 64-A sump (intermittent), steam conduit water, cooling tower blowdown, stormwater collected in secondary containment dikes and truck loading areas, test cell washdown water (intermittent), hydrant testing, sprinkler system testing water, potable water used upon NCCW system failure, drain cleanouts (including drainage system cleaning), roof mounted air conditioner wash water (no detergent), excavation dewatering, and stormwater dye tracing.

history of industrial activity at the site, the failure to document the location of all the pipes that have been placed on the site, and the subterranean location of the piping. Furthermore, GE Aviation currently appears to be unable to fully eliminate the infiltration of groundwater into Drainage System pipes because (a) all pipes may not have been located, and (b) some may be submerged in the water table under certain conditions, such as when the water table rises due to the effects of stormwater infiltration or high tides. Thus, it may not be possible to undertake pipe lining projects across the entire site to prevent all groundwater infiltration.

While it may not be possible to completely eliminate the wet weather discharge of contaminated non-stormwater discharges commingled with stormwater, EPA concludes that additional steps can and should be taken to further reduce the amount of non-allowable non-stormwater flows discharged in this manner. GE Aviation should be able to further reduce these discharges through some combination of the following available measures (some of which are already used at the facility to some extent):

- isolate contaminated groundwater through storm drain inspection and repair;
- collect and treat contaminated groundwater separately through an alternative groundwater extraction system (such as wells or trenches) and provide treatment prior to discharge to either the Drainage System outfall vaults or the Saugus River;
- treat commingled contaminated groundwater, stormwater, and other wastewater flows prior to their discharge to the receiving water; and/or
- isolate non-allowable non-stormwater discharges through re-piping directly to the CDTS.

EPA is presently unable to determine all the specific steps that should be taken to reduce the non-allowable non-stormwater flows of concern commingled with stormwater. Therefore, EPA has included a narrative condition in the draft permit that calls for GE Aviation to eliminate to the maximum extent practicable the discharge of untreated non-allowable non-stormwater flows (other than allowable non-stormwater discharges) commingled with stormwater.

The draft permit requires implementation of certain Best Management Practices (BMPs) to help achieve the goal specified in the narrative condition. For example, the draft permit has conditions requiring BMPs to maximize the extent to which at least the first flush of stormwater will be transferred to the CDTS for treatment prior to discharge. The first flush of stormwater will mix with non-stormwater flow already accumulated in the Drainage System. As a result, the first flush of wet weather flow is likely to include a relatively substantial proportion of non-stormwater flow and capturing and treating it will help to minimize the discharge of untreated non-stormwater discharges commingled with stormwater. Thus, the draft permit requires that the Drainage System outfall gates open only during wet weather, after the first flush of pollutants has been transferred to the CDTS for treatment. In order to capture a sample representative of the commingled discharge, samples shall be taken during the first 30 minutes of stormwater discharge through the outfall (after the first-flush of stormwater flow is sent to the CDTS).

Additionally, the draft permit requires GE Aviation to develop a Stormwater Pollution Prevention Plan (SWPPP) with site specific BMPs, as required under 40 CFR § 122.44(k)(4), to eliminate, to the maximum extent possible, the discharge of non-allowable non-stormwater flows.

In addition, to the extent that the non-allowable non-stormwater discharges cannot be fully eliminated, the draft permit includes numeric effluent limits and monitoring requirements to address these discharges. These effluent limits and monitoring requirements pertain to the wide range of pollutants that may be present in non-allowable non-stormwater discharges from the Drainage System.

EPA has determined on a BPJ basis that the above combination of permit conditions will satisfy the BAT and BCT technology standards that apply for the control toxic, nonconventional and conventional pollutant discharges. These permit conditions should also satisfy Massachusetts WQS, including various specific numeric criteria (e.g., criteria for oil & grease) and the antidegradation provisions discussed above. In reaching this determination, EPA considered the BAT factors, detailed above, for the toxic and nonconventional pollutants, and the BCT factors, also detailed above, for the conventional pollutants. EPA also considered pollution control measures that have been taken at other facilities dealing with the problem of commingled stormwater and non-stormwater flows (including contaminated groundwater infiltration), as discussed above.

Finally, EPA has also considered the conditions in certain existing NELGs and NPDES permits for similar or analogous facilities or industries that could reasonably inform the development of permit conditions for GE Aviation. For example, EPA has promulgated NELGs for certain pollutants commonly discharged by the Steam Electric Power Generating Point Source Category (Steam Electric NELGs), *see* 40 CFR Part 423, but these NELGs do not strictly apply to the GE Aviation facility. [18] The Steam Electric NELGs are "applicable to discharges resulting from the operation of a generating unit by an establishment *primarily engaged in the generation of electricity* for distribution and sale which results primarily from a process utilizing fossil-type fuel … in conjunction with a thermal cycle employing the steam water system as the thermodynamic medium," 40 C.F.R. § 423.10 (emphasis added). GE Aviation's facility is *not* primarily engaged in the generation of electricity for distribution and sale.

While the Steam Electric NELGs do not directly apply to the GE Aviation facility, EPA has decided on a case-by-case, BPJ basis that it is reasonable to rely in part on the Steam Electric NELGs in developing certain technology-based limits for the GE Aviation facility. This makes sense because the Steam Electric NELGs do not apply to the facility only because it is not "primarily engaged in the generation of electricity for distribution and sale." GE Aviation does, however, operate a steam-electric power plant fired by oil for the production of steam and electricity on this site. In other words, the facility has pollutant "discharges resulting from the operation of a generating unit . . . engaged in the

[18] EPA has not promulgated NELGs for manufacturers of Aircraft Engine and Engine Parts (SIC 3724) and Speed Changers, or of Industrial High-Speed Drives, and Gears (SIC 3566).

generation of electricity . . . which results primarily form a process utilizing fossil-type fuel … in conjunction with a thermal cycle employing the steam water system as the thermodynamic medium." (In addition, while not primarily engaged in the generation of electricity for distribution and sale, GE Aviation does at times distribute and sell some of the electricity it generates.) As a result, the facility raises largely the same water pollution control issues as facilities that *are* covered by the Steam Electric NELGs.

The Steam Electric NELGs include the following effluent limits based on BPT:

a. for low volume waste sources:
   (1) 100.0 mg/L as a maximum and 30.0 mg/L as a 30-day average for Total Suspended Solids (TSS), and
   (2) 20mg/L as a maximum and 15.0 mg/L as a 30-day average for oil and grease (O&G);

b. for all discharges, except once-through cooling water: 6.0-9.0 SU for pH;

c. for all discharges: no discharge of polychlorinated biphenyl compounds (PCBs); and

d. for once-through cooling water and cooling tower blowdown: 0.5 mg/L as a maximum and 0.2 mg/L as an average for free available chlorine.

Additionally, the NELGs require, based on BAT, that cooling tower blowdown has non-detectable levels of the 126 priority pollutants contained in chemicals added for cooling tower maintenance, except that maximum and average limitations of 0.2 mg/L apply for total chromium, and maximum and average limitations of 1.0 mg/L apply for total zinc. The NELGs state that in the event that waste streams from various sources are combined for treatment or discharge, the quantity of each pollutant attributable to each controlled waste source shall not exceed the specified limitations for that waste source.

The Steam Electric NELGs do not include effluent limitations on the discharge of heat. Therefore, any technology-based thermal discharge limits would be based on a BPJ application of the BAT technology standard, which is applicable to non-conventional pollutants such as heat. (As discussed farther below, however, the permit's thermal discharges limits may, instead, be based on water quality-based requirements or a thermal discharge variance under CWA § 316(a). 33 U.S.C. § 1326(a).

In addition to the Steam Electric NELGs, EPA also considered the Remediation and Miscellaneous Contaminated Sites General Permit (RGP),[19] and its supporting analysis, to assist in determining technology-based limits for the permit because GE Aviation may discharge contaminated groundwater under certain circumstances. The RGP is an appropriate source of information because the groundwater contaminants of concern at GE Aviation are similar to those found in the groundwater at facilities surveyed in development of the RGP. Based on a review of the technology-based and water quality-

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[19] In writing this fact sheet, EPA referred to the 2005 RGP and fact sheet. The 2010 RGP, effective September 10, 2010, used the same basis in deriving limits for each of the parameters as the 2005 RGP (*see* Attachment A to the 2010 RGP Fact Sheet for the applicable 2005 RGP Fact Sheet Excerpts: http://www.epa.gov/region1/npdes/remediation/RGP2010_FactSheet_AttachmentA.pdf)

based limits included in the RGP, and other relevant factors, EPA has established BPJ-based effluent limits to address contaminated groundwater at GE Aviation.

c. Flow

While the current permit does not require flow monitoring for wet weather discharges through the Drainage System outfalls, conditions in the draft permit do require monitoring of the daily maximum and monthly average discharge flow during wet weather. Flow shall be estimated daily.

The permittee shall also record the dates and times when an outfall gate is open, along with the corresponding weather conditions at the time of gate opening and during the gate opening, the flow during gate opening, and the time when the gate closes, along with the corresponding weather condition. This information shall be submitted with the DMRs.

Opening of the gates during periods of dry weather is prohibited in the draft permit. The draft permit requires that the gates only open during wet weather, after the first flush of pollutants has been transferred to the CDTS for treatment. The draft permit also requires the permittee to develop and implement site specific BMPs to ensure the gates only open during periods of wet weather, and remain closed during all periods of dry weather.

d. pH

The Massachusetts Water Quality Standards (WQS) (314 CMR 4.05(4)(b)(3)) require that the pH of the receiving water be in the range of 6.5 through 8.5 standard units and not more than 0.2 units outside of the natural background range. The current permit sets a pH limitation range of 6.5 to 8.5 standard units (SU) for each Drainage System Outfall, consistent with State WQS.

Review of DMR data for the time period from October 1998 through October 2008 reveals that the effluent pH for Outfall 001 ranged from 5.3 to 7.9 SU, with five exceedences of the permitted pH limitation. However, during the last four years, the pH limitation range has only been violated on two occasions, with a minimum pH measurement of 5.9 SU. Review of DMR data shows the Outfall 007 pH limitation has been exceeded on four occasions, with the effluent pH ranging from 5.7 – 7.92 SU; the Outfall 010 pH limitation has been exceeded on four occasions, with the effluent pH ranging from 5.9 – 7.93 SU; the Outfall 019 pH limitation has been exceeded on two occasions, with the effluent pH ranging from 5.4 to 8.5 SU; the Outfall 027B pH limitation has been exceeded on one occasion, with the effluent pH ranging from 6.3 – 7.92 SU; the Outfall 028 pH limitation has been exceeded on two occasions, with the effluent pH ranging from 5.8 – 8 SU; the Outfall 030 pH limitation has not been exceeded, with the effluent pH ranging from 6.5 – 7.7 SU; and the Outfall 031 pH limitation has been exceeded on two occasions, with the effluent pH ranging from 6.2 – 7.71 SU.

The permittee has submitted information showing that the pH of precipitation in the vicinity of its facility ranges from 3.6 to 5.3 SU, with a mean pH of 4.44 SU (Page 2-12 of GE Aviation's September 2003 permit application amendment). Based on this new information that was not available at the time of writing the current permit (consistent with antibacksliding exceptions at 40 CFR 122.44(l)(2)(i)(B)(*1*)), EPA has revised the minimum pH limitation range from 6.5 to 6.0 SU. Due to the rapid mixing and neutralization in the Saugus River, EPA believes that the new pH effluent limitation range of 6.0 – 8.5 SU will be protective of the receiving water pH, and will ensure compliance with State WQS, while also satisfying the BCT standard. The new pH limits are also supported by the Steam Electric NELGs, as discussed above.

e. Oil and Grease (O&G)

Massachusetts Water Quality Standards for a Class SB water body (314 CMR 4.05(4)(b)(7)) require that these waters shall be free from oil, grease and petrochemicals (O&G) that produce a visible film on the surface of the water, impart an oily taste to the water or an oily or other undesirable taste to the edible portion of aquatic life, coat the banks or bottom of the water course, or are deleterious or become toxic to aquatic life. A concentration of oil and grease of 15 mg/L is recognized as a level at which many oils produce a visible sheen.

The current permit requires a monthly average O&G limit of 10 mg/L for each Drainage System Outfall, sampled quarterly during the first 60 minutes of a significant rainstorm event. Review of DMR data for the time period from October 1998 through October 2008 (wet weather sampling) reveals that the monthly average O&G effluent concentration for Outfall 001 has ranged from 5 mg/L to 9 mg/L; for Outfall 007 O&G has ranged from 5 – 8.4 mg/L; for Outfall 010 O&G has ranged from 5 – 8.1 mg/L; for Outfall 019 O&G has ranged from 5 – 10 mg/L; for Outfall 027B O&G has ranged from 5 – 5.2 mg/L; for Outfall 028 O&G has ranged from 0.5 – 5.2 mg/L; for Outfall 030 O&G has ranged from 0.5 – 8.5 mg/L; and for Outfall 031 O&G has ranged from 0.5 – 5.3 mg/L.

The monthly average O&G limit of 10 mg/L shall remain in the permit for each Drainage System outfall, based on anti-backsliding requirements found in 40 CFR §122.44(l). This limit will also satisfy the BAT standard, including Steam Electric NELGs for low volume waste, and State WQS. The draft permit also requires a daily maximum O&G limit of 15 mg/L, consistent with narrative State Water Quality Standards.

f. TSS

Massachusetts WQS (314 CMR 4.05(4)(b)(5)) require that Class SB waters "be free from floating, suspended and settleable solids in concentrations or combinations that would impair any use assigned to this class, that would cause aesthetically objectionable conditions, or that would impair the benthic biota or degrade the chemical composition of the bottom." Additionally, removing TSS is particularly important to maintaining good operation of subsequent treatment units in the system such as carbon adsorption (e.g., to prevent clogging of pores in the carbon granules) and to aid in the removal of contaminants that are adsorbed to soil particles. Treatment technology for removing TSS is well understood and a properly designed sedimentation and/or filtration system can readily remove TSS to low concentrations. In development of the RGP, EPA considered established effluent limitations from sewage treatment plants, EPA's General Permit for Construction Dewatering, EPA's promulgated NELGs at 40 CFR Part 436 for Mineral Mining, Industrial Sand category, EPA's proposed NELGs for Ore Mining categories, 40 CFR Part 440, standards, and technical factors, and set a technology-based TSS limit of 30 mg/L as a monthly average. The steam electric NELGs include a technology-based maximum daily TSS limit of 100 mg/l and monthly average of 30 mg/l for low volume waste sources (see Section C.b.ii of this fact sheet).

Heavy metals and polynuclear aromatic hydrocarbons (PAHs) are readily adsorbed onto particulate matter and the release of these compounds can be controlled, to an extent, by regulating the amount of suspended solids released into the environment. The collection of stormwater and GE Aviation's storm drain system cleaning procedures, could result in periods of elevated solids concentrations.

Sampling results of one wet weather event submitted by the permittee revealed TSS concentrations of 32 mg/L at Outfall 001; of non-detect (ND) at Outfall 007; of ND at Outfall 010; of 45 mg/L at Outfall 019; of 54 mg/L at Outfall 027B; of 7.5 mg/L at Outfall 028; of 39 mg/L at Outfall 030; and of ND at Outfall 031.[20] Sampling results of non-stormwater flows in the Outfall 001 vault[21] (which may commingle with the first flush of stormwater flows for direct discharge to the receiving water during wet weather) indicated a TSS concentration at the Outfall 001 vault of 41.6 mg/L.

Therefore, to assure that the State narrative standard regarding floating solids is maintained, the draft permit requires a maximum daily effluent limitation for TSS of 100 mg/L and an average monthly effluent limitation of 30 mg/L for the wet weather discharge from the Drainage System Outfalls. The draft permit also prohibits the discharge of drainage system cleaning water through the Drainage System Outfalls and contains a site specific BMP requiring proper disposal of solid waste from drainage system cleaning off-site and to minimize the amount of solids that are left behind in the drain lines.

g. Volatile Organic Compounds, Benzene, Toluene, Ethylbenzene, and Xylene

Groundwater contaminant monitoring data indicate that a variety of chemical contaminants are likely to be present in the groundwater. These chemicals could be present in discharges from the Drainage System outfalls to the extent that such discharges include groundwater infiltration. The data suggests that contaminants of concern include a range of volatile organic compounds (VOCs), including a variety of petroleum products (presumably present as a result of past spills of fuel and other materials).

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[20] NPDES Permit Renewal Application Revision, June 1998, Section 3 - EPA NPDES Form 2F: Storm Water Discharge Information.
[21] *Response to Request for Information, Section 308(a) of the Clean Water Act (CWA)*, July 10, 2009.

GE Aviation reported that VOCs historically detected in dry weather samples for Outfalls 007, 010, 027, 028, and 031 are likely associated with groundwater infiltration. Review of data submitted by GE Aviation indicates the presence of VOCs in stormwater discharges, with a total VOC concentration of 6.8 ug/L at Outfall 001; of 39 ug/L at Outfall 007; of 1 ug/L at Outfall 010; of 2 ug/L at Outfall 019; of 112.9 ug/L at Outfall 027; of 109 ug/L at Outfall 028; of 1176.4 ug/L at Outfall 030; of 483 ug/L at Outfall 031; and of 5.9 ug/L at Outfall 032.[22] Sampling of the non-stormwater flows in the Drainage System outfall vaults (which are expected to commingle with the first flush of stormwater flows during wet weather) indicates the presence of VOCs at Outfalls 001, 007, 030, and 031,[23] and a vinyl chloride concentration at the Outfall 007 vault of 2.6 ug/L.[24]

The following VOCs have been detected in the groundwater onsite:

> Acetone, benzene, bromodichloromethane, bromoform, bromomethane, 2-butanone, carbon disulfide, carbon tetrachloride (tetrachloromethane), chlorobenzene, chloroethane, chloroform, 1,1-dichloroethane, 1,1-dichloroethene, cis-1,2-dichloroethene, trans-1,2-dichloroethane, 1,2-dichloroethene, 1,2-dichlorobenzene, 1,3-dichlorobenzene, 1,4-dichlorobenzene, 1,4-dioxane, dichlorodifluoromethane, ethylbenzene, ethylether, 2-hexanone, isopropylbenzene, 4-methyl-2-pentanone, methylene chloride, methyltertbutylether naphthalene, n-butylbenzene, n-propylbenzene, p-cymene, sec-butyl benzene, tert-butyl benzene, tert-amyl methyl ether, 1,1,1-trichloroethane, 1,1,2-trichloroethane, 1,1,2,2-tetrachloroethane, 1,2,4-trimethylbenzene, 1,2,4-trichlorobenzene, 1,3,5-trimethylbenzene, tetrachloroethene, toluene, trichloroethene, trichlorofluoromethane, vinyl chloride, m-xylene, m/p-xylene, o-xylene, total xylenes.[25, 26]

VOCs such as benzene, toluene, ethylbenzene, and the three xylene compounds (BTEX), are normally found at relatively high concentrations in gasoline and light distillate products (e.g., diesel fuel). BTEX concentrations typically decrease in the heavier grades of petroleum distillate products (e.g., fuel oils).

Refined petroleum products contain numerous types of hydrocarbons. Individual components partition to environmental media on the basis of their physical/chemical properties (e.g., solubility, vapor pressure). Rather than attempt to establish effluent limits for every compound found in a petroleum release, limits are typically established for the compounds that would be most difficult to remove and that are most toxic. Generally, the higher the solubility of a VOC in water, the more difficult it is to remove.

[22] NPDES Permit Renewal Application Revision, June 1998, Section 3 - EPA NPDES Form 2F: Storm Water Discharge Information.
[23] *Response to Request for Information, Section 308(a) of the Clean Water Act (CWA)*, July 10, 2009.
[24] *Response to Request for Information, Section 308(a) of the Clean Water Act (CWA)*, July 10, 2009.
[25] NPDES Permit Renewal Application Revision, May 2000.
[26] E-mail correspondence from Steven Lewis (GE Aviation) to Nicole Kowalski (EPA), March 25, 2009, Attachment: Complete list of constituents that have been detected in the groundwater at the site.

The traditional approach for limiting effluents contaminated with gasoline or other light distillates is to place limits on the individual BTEX compounds and/or the sum of total BTEX compounds. Since many petroleum spills involve gasoline or diesel fuel, a traditional approach for such spills has been to place limits on the individual BTEX components and/or the sum of total BTEX compounds. Of these four compounds, benzene has the highest solubility, is one of the most toxic constituents, and is found at relatively high concentrations in gasoline and diesel fuel. The concentration of benzene in gasoline is approximately 20,000 parts per million (Potter and Simmons, 1998). For the reasons mentioned above, benzene can be considered one of the most important limiting pollutant parameters found in gasoline or diesel fuel. Building on this premise, benzene can be used as an indicator-parameter for regulatory as well as characterization purposes of stormwater that comes in contact with gasoline and diesel fuel. The primary advantage of using an indicator-parameter is that it can streamline monitoring efforts while simultaneously maintaining an effective level of environmental protection.

To establish effluent limitations for VOCs in the RGP, EPA evaluated both the technology and water quality-based information currently available. EPA reviewed monitoring reports submitted pursuant to approved groundwater site remediation projects in MA, as well as published technology information, and various water quality and cleanup standards published by EPA and the States. In general, the technology-based effluent limitations in the RGP are sufficient to meet the most conservative water quality standards, which are typically human health-based standards.

Specifically, the RGP contains BAT technology-based effluent limits of 100 ug/L for BTEX and 5.0 ug/L for benzene. In development of the RGP, EPA analyzed facilities with groundwater contamination situations similar to GE Aviation. The factors in the RGP analysis are comparable to the factors relevant to this individual permit; therefore, EPA is using similar logic to apply these technology-based limits to wet weather discharges through the Drainage System Outfalls because they are likely to include contaminated groundwater (albeit commingled with stormwater). (As detailed above, dry weather discharges from the Drainage System Outfalls are prohibited.)

Therefore, consistent with the RGP and individual permit effluent limits for contaminated groundwater discharges and combined discharges at similar facilities in Massachusetts, EPA has on a BPJ basis established BAT limits for benzene of 5.0 ug/L and total BTEX of 100 μg/L in wet weather discharges from the Drainage System outfalls. The draft permit also requires reporting without limits of toluene, ethylbenzene, and total xylenes. The technology limits are based on treatability using carbon adsorption, a proven technology capable of removing benzene and other petroleum hydrocarbons from water. As indicated above, however, GE Aviation may also be able to meet these limits during wet weather at the drainage system outfalls by taking steps to prevent or reduce contaminated groundwater infiltration into the Drainage System.

Additionally, the RGP contains the following effluent limits (max daily) for Chlorinated VOCs:

Table 1. Effluent Limits for Chlorinated VOCs

Parameter	Maximum Value (ug/L)
15. Carbon Tetrachloride	4.4
16. 1,4 (or p)-Dichlorobenzene (p-DCB)	5.0
17. 1,2 (or o)-Dichlorobenzene (o-DCB)	600
18. 1,3 (or m)-Dichlorobenzene (m-DCB)	320
19. 1,1 Dichloroethane (DCA)	70
20. 1,2 Dichloroethane (DCA)	5.0
21. 1,1 Dichloroethylene (DCE)	3.2
22. cis-1,2 Dichloroethylene (DCE)	70
23. Dichloromethane (methylene chloride)	4.6
24. Tetrachloroethylene (PCE)	5.0
25. 1,1,1 Trichloroethane (TCA)	200
26. 1,1,2 Trichloroethane (TCA)	5.0
27. Trichloroethylene (TCE)	5.0
28. Chloroethene (Vinyl Chloride)	2.0

The anticipated methods for removing benzene and BTEX are the same for removal of chlorinated VOCs (i.e., carbon adsorption treatment or various methods of reducing or preventing groundwater infiltration to the Drainage System); therefore, steps taken to meet the benzene and BTEX limits should also reduce the chlorinated VOCs to levels meeting the BAT standard. Therefore, the draft permit only requires monitoring at the Drainage System outfalls for each of the chlorinated VOCs listed directly above (*see* Table 1). The draft permit shall also require reporting of the total VOCs at the Drainage System Outfalls.

Finally, the draft permit also requires development and implementation of site-specific BMPs, including the elimination to the maximum extent practicable of non-allowable non-stormwater flows through the Drainage System outfalls (*see* the SWPPP, Part V.C.10 of the fact sheet and Part I.B.9 of the draft permit.) The monitoring data collected will help to determine the degree to which the BMPs have been successful at reducing the potential for non-allowable non-stormwater flows and contaminated groundwater infiltration to commingle with stormwater prior to discharge to the receiving water.

h. Cyanide

Compounds containing the cyanide group (CN) are used and readily formed in many industrial processes and can be found in a variety of effluents, such as those from the steel, petroleum, plastics, synthetic fibers, metal plating, and chemical industries. Cyanide occurs in water in many forms, including: hydrocyanic acid (HCN), the cyanide ion (CN^-), simple cyanides, metallocyanide complexes, and in organic compounds. "Free cyanide" is defined as the sum of the cyanide present as HCN and CN^-. The relative concentrations of these forms depend mainly on pH and temperature.

Both HCN and CN^- are toxic to aquatic life. However, the vast majority of free cyanide usually exists as the more toxic HCN. And, since CN^- readily converts to HCN at pH values that commonly exist in surface waters, EPA's cyanide criteria are stated in terms of free cyanide expressed as CN^-. Free cyanide is a more reliable index of toxicity to aquatic life than total cyanide because total cyanides can include nitriles (organic cyanides) and relatively stable metallocyanide complexes.

EPA's national water quality criteria for cyanide in saltwater is 1.0 ug/L (acute and chronic). As previously discussed in Section B.2 of this fact sheet (Water Quality-based Requirements), EPA has conservatively assumed no dilution of the effluent in the receiving water. Wet weather sampling results for Outfall 001 revealed cyanide at a concentration of 15 ug/L, which exceeds the water-quality based limit of 1.0 ug/L.[27] Wet weather sampling results for the other Drainage System Outfalls indicates non-detect for cyanide. Since the concentration of cyanide at Outfall 001 exceeded the water quality-based limit for cyanide, the draft permit requires a maximum daily water quality-based effluent limit of 1.0 ug/L for the discharge through Outfall 001.[28] Additionally, the other Drainage System Outfalls shall be monitored for total cyanide.

Limits for cyanide are based on EPA's water quality criteria expressed as micrograms (ug/L) of free cyanide per liter. There is currently no EPA approved method for free cyanide. Therefore, total cyanide must be reported. Although the effluent limit for cyanide is 1.0 ug/L, the compliance limit is equal to the minimum level (ML) of the test method (i.e., 10 ug/L for Method 335.4).

The development of the cyanide water quality-based effluent limit in the RGP (1.0 ug/L for saltwater), under which EPA analyzed facilities similar to GE Aviation, supports this effluent limitation determination. The factors assessed in the RGP analysis are comparable to the factors considered for this individual permit; therefore, EPA is using similar logic to support applying the saltwater cyanide limit established in the RGP to the discharge through Outfall 001 (stormwater commingled with contaminated groundwater).

Additionally, the draft permit requires development and implementation of site-specific BMPs, including elimination to the maximum extent practicable of non-allowable non-stormwater flows through the Drainage System Outfalls (*see* the SWPPP, Part I.B.9.b of the draft permit.)

i. Total Residual Chlorine (TRC)

The permittee performs periodic cleaning of the Drainage System and currently discharges the water associated with the cleaning through the corresponding Drainage System Outfall location. Potable water, which is expected to contain chlorine, is used for the cleaning. As a result, chlorine could be present in the discharge from the Drainage System outfalls if water associated with the cleaning process is discharged.

[27] NPDES Permit Renewal Application Revision, June 1998, Section 3 - EPA NPDES Form 2F: Storm Water Discharge Information.
[28] USEPA, Technical Support Document for Water Quality-based Toxics Control, p. 49.

The draft permit, however, prohibits the discharge of drain system cleaning water directly to the receiving water. All drain system cleaning water must be transferred offsite or to the CDTS for treatment. This requirement satisfies both the BAT standard and State WQS.

In addition to drain system cleaning, the facility also uses potable water (which could contain chlorine) throughout the plant for small NCCW operations, which discharge through Outfalls 001, 007, 027B, 028, and 030.

EPA's national water quality criteria for TRC in saltwater is 13 ug/L (acute) and 7.5 ug/L (chronic). As previously discussed above, EPA has conservatively assumed no dilution. The RGP sets effluent limits based on the EPA recommended water quality criteria of 7.5 ug/L for saltwater (chronic).

Sampling results of non-stormwater flows in the Drainage System outfall vaults[29] indicate TRC concentrations in the vaults at Outfalls 007, 019, 027, 028, 030, and 031 greater than 13 ug/L, the acute water quality criterion. This non-stormwater flow in the Drainage System vaults is expected to commingle with the first flush of stormwater flows. While this wastewater is currently discharged directly to the Saugus River, the draft permit calls for implementation of BMPs to prevent the discharge of the first flush of stormwater (commingled with various non-allowable non-stormwater flows) and, instead, to transfer it to the CDTS for treatment. Wet weather flows at the Drainage System outfall vaults have not been analyzed for TRC.

The draft permit requires development and implementation of site-specific BMPs, including elimination to the maximum extent practicable of non-allowable non-stormwater flows through the Drainage System outfalls (*see* the SWPPP, Part V.C.10 of the fact sheet and Part I.B.9 of the draft permit.) The draft permit also requires monthly monitoring of the monthly average and daily maximum TRC levels at the Drainage System outfalls. The results of monitoring will be useful in evaluating the effectiveness of the site-specific BMPs, which prohibit drain system cleaning during wet weather conditions and prior to periods of forecasted wet weather conditions, and require prevention of commingling of drainage system cleaning water with stormwater for discharge through the Drainage System outfalls. The monitoring will also be useful in evaluating the effectiveness of the BMPs at eliminating the discharge of non-allowable non-stormwater flows (specifically, potable NCCW) from the Drainage System outfalls.

j. Metals

Wet weather sampling results submitted by the permittee reveal elevated levels of metals in the discharges from several Drainage System Outfalls.[30]

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[29] *Response to Request for Information, Section 308(a) of the Clean Water Act (CWA)*, July 10, 2009.
[30] NPDES Permit Renewal Application Revision, June 1998, Section 3 - EPA NPDES Form 2F: Storm Water Discharge Information.

Specifically, the wet weather discharge through Outfall 001 has contained elevated levels of metals that exceed EPA's National Water Quality Criteria for cadmium, copper, lead, and zinc. Sampling results of non-stormwater flows in the Outfall 001 vault[31] (which are expected to commingle with the first flush of stormwater flows during wet weather) indicate elevated levels of antimony, copper, iron, and zinc.

The wet weather discharge through Outfall 007 has contained elevated levels of metals that exceed National Water Quality Criteria for cadmium and copper. Sampling results of non-stormwater flows in the Outfall 007 vault[32] (which are expected to commingle with the first flush of stormwater flows during wet weather) indicate elevated levels of copper and iron.

The wet weather discharge through Outfall 010 has contained elevated levels of metals that exceed National Water Quality Criteria for cadmium, copper, lead, and silver. Sampling results of non-stormwater flows in the Outfall 010 vault[33] (which are expected to commingle with the first flush of stormwater flows during wet weather) indicate elevated levels of copper, iron, and nickel.

The wet weather discharge through Outfall 019 has contained elevated levels of metals that exceed National Water Quality Criteria for cadmium, copper, lead, silver, and zinc. Sampling results of non-stormwater flows in the Outfall 019 vault[34] (which are expected to commingle with the first flush of stormwater flows during wet weather) indicate elevated levels of copper and nickel.

The wet weather discharge through Outfall 027B has contained elevated levels of metals, which exceed National Water Quality Criteria for cadmium, copper, lead, silver, and zinc.

The wet weather discharge through Outfall 028 has contained elevated levels of metals, which exceed National Water Quality Criteria for cadmium, copper, lead, silver, and zinc. Sampling results of non-stormwater flows in the Outfall 028 vault[35] (which are expected to commingle with the first flush of stormwater flows during wet weather) indicate elevated levels antimony, copper, iron, lead, nickel, and zinc.

The wet weather discharge through Outfall 030 has contained elevated levels of metals, which exceed National Water Quality Criteria for copper, lead, and zinc. Sampling results of non-stormwater flows in the Outfall 030 vault[36] (which are expected to commingle with the first flush of stormwater flows during wet weather) indicate elevated levels of copper, iron, and lead.

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[31] *Response to Request for Information, Section 308(a) of the Clean Water Act (CWA)*, July 10, 2009.
[32] *Response to Request for Information, Section 308(a) of the Clean Water Act (CWA)*, July 10, 2009.
[33] *Response to Request for Information, Section 308(a) of the Clean Water Act (CWA)*, July 10, 2009.
[34] *Response to Request for Information, Section 308(a) of the Clean Water Act (CWA)*, July 10, 2009.
[35] *Response to Request for Information, Section 308(a) of the Clean Water Act (CWA)*, July 10, 2009.
[36] *Response to Request for Information, Section 308(a) of the Clean Water Act (CWA)*, July 10, 2009.

The wet weather discharge through Outfall 031 has contained elevated levels of metals, which exceed National Water Quality Criteria for cadmium and copper. Sampling results of non-stormwater flows in the Outfall 031 vault[37] (which are expected to commingle with the first flush of stormwater flows during wet weather) indicate elevated levels of copper, iron, nickel, and zinc.

The draft permit prohibits non-stormwater discharges from the Drainage System outfalls, and requires implementation of site-specific BMPs to eliminate to the maximum extent practicable the discharge of non-allowable non-stormwater flows (commingled with stormwater) from the Drainage System outfalls. EPA has determined that this combination of permit requirements should either eliminate, or reduce as much as possible, the discharge of untreated metals from the Drainage System outfalls and should, therefore, satisfy the BAT technology standard and State WQS, including antidegradation requirements.

Therefore, the draft permit calls for monitoring of the metals which have been detected at elevated concentrations in the Drainage System outfalls. The draft permit requires monitoring of the Drainage System outfalls for antimony, cadmium, copper, iron, lead, nickel, silver, and zinc, all monitored at a frequency of 1/month. These monitoring requirements are for wet weather discharges, since discharge during dry weather conditions through the Drainage System outfalls is prohibited in the draft permit. The monitoring results may be used to determine whether the the site-specific BMPs have been effective at eliminating commingling of non-allowable non-stormwater flows and groundwater infiltration containing metals with wet weather flows prior to discharge to the receiving water. If toxic levels of metals continue to be discharged to the Saugus River after the implementation of the BMPs, further steps may be required to eliminate toxic discharges.

k. Polycyclic Aromatic Hydrocarbons (PAHs)

PAHs are a group of chemicals formed during the incomplete burning of coal, oil, gas, wood, garbage, or other organic substances, such as tobacco and charbroiled meat. There are more than 100 different PAHs. PAHs generally occur as complex mixtures (for example, as part of combustion products such as soot), not as single compounds. A few PAHs are used in medicines and to make dyes, plastics, and pesticides, whereas others are contained in asphalt used in road construction and in substances such as crude oil, coal, coal tar pitch, creosote, and roofing tar.

PAHs are found throughout the environment in the air, water, and soil. They can occur in the air attached to dust particles, or in the soil or sediment as solids.[38]

PAHs can enter surface water through discharges from industrial plants and wastewater treatment plants, and they can be released to soils at hazardous waste sites if they escape

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[37] *Response to Request for Information, Section 308(a) of the Clean Water Act (CWA)*, July 10, 2009.
[38] Agency for Toxics Substances and Disease Registry (ATSDR), 1995, *Toxicological Profile for Polycyclic Aromatic Hydrocarbons* (PB/95/264370), August 1995.

from storage containers. The movement of PAHs in the environment depends on various properties, such as how easily they dissolve in water or evaporate into the air. PAHs in general do not easily dissolve in water and may be present in air as vapors or adhered to the surfaces of small solid particles. Some PAHs evaporate into the atmosphere from surface waters, but most stick to solid particles and settle to the bottoms of rivers or lakes. PAHs can also bio-accumulate in fish and shellfish.

There are sixteen (16) PAH compounds identified as priority pollutants under the CWA (*See* 40 CFR Part 423 - Appendix A). "Group I" PAHs are the following seven carcinogens: benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene. "Group II" PAHs are the following nine priority pollutant PAHs, which are not considered carcinogenic alone but can enhance or inhibit the response of the carcinogenic PAHs: acenaphthene, acenaphthylene, anthracene, benzo(ghi)perylene, fluoranthene, fluorene, naphthalene, phenanthrene, and pyrene. Typically, PAH exposure would be to a mixture of PAHs rather than to an individual PAH.

EPA's National Recommended Water Quality Criteria include human health criteria of 0.0038 ug/L (water + organism) and 0.018 ug/L (organism only) for each individual Group I PAH. As previously discussed above, EPA has conservatively assumed no dilution.

The RGP establishes a water quality-based effluent limit of 0.0038 ug/L for each individual Group I PAH compound, with the compliance limit equal to the ML of the test method used. The RGP was developed based on analysis of facilities with groundwater contamination situations similar to GE Aviation; therefore, the factors in the RGP analysis are comparable to the factors in this individual permit.

Sampling results of non-stormwater flows in the Drainage System Outfall vaults[39] (which are expected to commingle with the first flush of stormwater flows during wet weather) indicate PAH concentrations at the vaults for Outfalls 001, 007, 010, 019, 028, and 031 greater than both the National Recommended Water Quality Criteria human health criteria of 0.0038 ug/L and 0.018 ug/L. Specifically, high levels of indeno(1,2,3-cd)pyrene for Outfalls 001; high levels of dibenzo(a,h)antracene for Outfalls 001; high levels of benzo(k)fluoranthene for Outfalls 019 and 028; and high levels of benzo(b)fluoranthene at Outfall 028. The draft permit prohibits discharges during dry weather conditions from the Drainage System outfalls.

Wet weather flows at the Drainage System outfall vaults have not been analyzed for PAHs. Therefore, the draft permit requires development and implementation of site-specific BMPs, including the elimination to the maximum extent practicable of non-allowable non-stormwater flows through the Drainage System Outfalls (*see* the SWPPP, Part I.B.9.b of the draft permit). The draft permit also requires monthly monitoring for each individual Group I PAH, along with reporting of total PAHs, at each Drainage System Outfall. The results of monitoring will be useful in evaluating the extent to which

[39] *Response to Request for Information, Section 308(a) of the Clean Water Act (CWA)*, July 10, 2009.

the BMPs have been effective at eliminating the discharge of PAHs with stormwater discharges (commingled with non-allowable non-stormwater flows) from the Drainage System outfalls. EPA has determined that these permit limits will satisfy the BAT standard and State WQS.

l. Polychlorinated Biphenyls (PCBs)

EPA's National Recommended Water Quality Criteria require a saltwater criterion continuous concentration (CCC) for PCBs of 0.03 ug/L, measured as total PCBs, as well as a human health criterion of 0.00064 ug/L (organism + water and organism only). For this draft permit, EPA has conservatively assumed no dilution in evaluating the water quality-based criteria, as previously discussed above.

In setting the effluent limits for PCBs in the RGP, EPA-NE took into consideration the toxicity, persistence and potential for bio-accumulation of PCBs in the environment. Therefore, the RGP requires an effluent limitation for total PCBs based on the current human health criterion of 0.000064 ug/L, with the compliance limit equal to the minimum level (ML) of the test method used. The development of this effluent limit in the RGP is based on past performance data for control technology. EPA anticipates that discharges containing PCBs can adequately be treated to "non-detection" levels using carbon adsorption.

Sampling results of one wet weather discharge event through each Drainage System Outfall vault indicated non-detect for total PCBs.[40] However, sampling results of non-stormwater flows in the Drainage System outfall vaults[41] (which are expected to commingle with the first flush of stormwater flows during wet weather) indicated a PCB concentration at the Outfall 001 vault of 0.11 ug/L, which is greater than EPA's National Recommended Water Quality Criteria (saltwater CCC) for PCBs of 0.03 ug/L.

Therefore, the draft permit prohibits discharges during dry weather conditions from the Drainage System outfalls and requires development and implementation of site-specific BMPs, including elimination to the maximum extent practicable of non-allowable non-stormwater flows through the Drainage System outfalls (*see* the SWPPP, Part I.B.9.b of the draft permit). The draft permit also requires monthly monitoring of total PCBs at the Drainage System outfalls, to help determine the effectiveness of the BMPs at eliminating the commingling of non-allowable non-stormwater flows with stormwater for direct discharge to the receiving water through the Drainage System outfalls. EPA has determined that the requirements in the draft permit will satisfy the BAT standard and State water quality standards.

m. Whole Effluent Toxicity Testing Requirements

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[40] NPDES Permit Renewal Application Revision, June 1998, Section 3 - EPA NPDES Form 2F: Storm Water Discharge Information.

[41] *Response to Request for Information, Section 308(a) of the Clean Water Act (CWA)*, July 10, 2009.

Section 101(a)(3), 33 U.S.C. § 1251(a)(3), declares that "it is the national policy that the discharge of toxic pollutants in toxic amounts be prohibited." EPA's Technical Support Document for Water Quality-Based Toxics Control, March 1991, EPA/505/2-90-001, recommends using an "integrated strategy" containing both pollutant- specific (chemical) approaches and whole effluent (biological) toxicity approaches to better detect toxics in effluent discharges. Pollutant-specific approaches, such as those in EPA's Gold Book (ambient water quality criteria) and State regulations, address individual chemicals, whereas whole effluent toxicity (WET) approaches evaluate interactions between pollutants (e.g., the "additive" and/or "synergistic" effects of pollutants), and can reveal the possible presence of unidentified pollutants. Region 1 adopted this "integrated strategy" on July 1, 1991, for use in permit development and applies it to protect aquatic life and human health in a manner that is cost-effective as well as environmentally protective.

Beyond the national policy of prohibiting the discharge of toxic pollutants in toxic amounts as declared in CWA § 101(a)(3), additional legal authority supports the imposition of toxicity testing requirements in NPDES permits. Sections 402(a)(2) and 308(a) of the CWA provide EPA and States with the authority to require a permittee to collect and submit toxicity testing data. Furthermore, Section 308(a)(A)(iii) of the statute specifies that EPA may require the application of biological monitoring methods where appropriate. At the same time, the Massachusetts Surface Water Quality Standards include the following narrative criterion for toxicity applicable to all the State's waters: "All surface waters shall be free from pollutants in concentrations or combinations that are toxic to humans, aquatic life or wildlife." 314 CMR 4.05(5)(e). The WQS also specify that:

> [f]or pollutants not otherwise listed in 314 CMR 4.00, the *National Recommended Water Quality Criteria: 2002, EPA 822R-02-047, November 2002* published by EPA pursuant to Section 304(a) of the Federal Water Pollution Control Act, are the allowable receiving water concentrations for the affected waters, unless the Department either establishes a site specific criterion or determines that naturally occurring background concentrations are higher.

Id. Section 301(b)(1)(C) of the CWA, in turn, specifies that discharges must meet effluent limits needed to satisfy applicable State WQS. In addition, it is common knowledge that point sources (including stormwater or groundwater) can contribute toxic pollutants to receiving waters. These pollutants can include metals, chlorinated solvents, PAHs and others. Furthermore, as discussed above, wastewater at GE Aviation (which can include contaminated groundwater) has been shown to contain toxic contaminants. In light of all this, the Region has included toxicity monitoring requirements in the draft permit.

Based on the possibility of toxicity resulting from both stormwater and groundwater in this case, the draft permit includes acute and chronic toxicity monitoring requirements. (See Policy for the Development of Water Quality-Based Permit Limitations for Toxic

Pollutants,50 Fed. Reg. 30,784 (July 24, 1985); EPA's *Technical Support Document for Water Quality-Based Toxics Control* on September, 1991; and MassDEP's Implementation Policy for the Control of Toxic Pollutants in Surface Waters (February 23, 1990).

The draft permit requires that the permittee conduct quarterly marine chronic (and modified acute) WET tests for each Drainage System Outfall. The chronic test may be used to calculate the acute LC_{50} at a 48-hour exposure interval. The permittee shall test the marine species Inland silverside, *Menidia beryllina* and the Sea Urchin, *Arbacia punctulata*. Toxicity test samples shall be collected and tests completed during the calendar quarters ending March 31st, June 30th, September 30th, and December 31st each year. Toxicity test results are to be submitted by the 15th day of the month following the end of the quarter sampled. The tests must be performed in accordance with test procedures and protocols specified in Attachment 1 of the permit.

After submitting one year and a minimum of four consecutive sets of WET test results, all of which demonstrate no toxicity, the permittee may request a reduction in the WET testing requirements. The permittee is required to continue testing at the frequency specified in the permit until notice is received by certified mail from EPA that the WET testing requirement has been changed.

2. Outfall 027A – Consolidated Drains Treatment System – treated non-stormwater flows and first flush of stormwater from Drainage System Outfalls

As explained earlier, the Consolidated Drains Treatment System (CDTS) is a collection and treatment system designed to eliminate the discharge of untreated non-stormwater flow, including groundwater infiltration, and to reduce the discharge of untreated infiltration during wet weather from the following seven existing storm drains: Outfalls 001, 007, 010, 019, 028, 030 and 031. In February 1999, MassDEP issued GE Aviation an ACO approving construction and operation of the CDTS.

The CDTS uses a combination of treatment steps. The contract operator of the CDTS determines the level of treatment based on the applicable permit limits and the quality of the non-stormwater flow or stormwater being treated at the time. The CDTS has two 450,000-gallon underground tanks that act as receiving, storage, and equalization tanks for the treatment system. These tanks provide initial phase separation, since the working volume in the tanks consists of the center volume (above any solids in the layer at the bottom of the tank, and below the light phase layer). On an annual basis, the equalization tanks are pumped down, cleaned, and inspected. The CDTS also has a dissolved air flotation (DAF) system. The DAF system doses influent with polymer and flocculent and micro bubble injection is used to float the suspended solids and the lighter O&G. Floating solids are then removed and directed to the waste storage tank. Finally, the CDTS also has carbon adsorption; specifically, a granulated activated carbon (GAC) system. When the GAC system is in use, treated or untreated process water is piped to two GAC canisters in series. This polishing step is capable of removing trace concentrations of organics. Process control and monitoring samples/readings are taken at transition points between process steps to track treatment results and enable the facility to maximize final effluent quality.

Along with the treated, combined non-stormwater flows, this outfall also discharges separate wet weather flows (without treatment) directly to the receiving water, similar to the other drainage system outfalls. Therefore, the draft permit includes two separate monitoring requirements for this outfall, one for treated non-stormwater flows, Outfall 027A (discussed directly below), and one for stormwater, Outfall 027B (discussed above in the Drainage System Outfalls section).

Outfall 027A discharges treated non-stormwater flows mixed with the first flush of stormwater from Outfalls 001, 007, 010, 019, 027, and 028, 030, and 031.

Non-stormwater flows originating in the Outfall 007 portion of the Drainage System (consisting of dynamometer NCCW, groundwater, condensate from steam heating and air conditioning systems, steam conduit water, emergency NCCW, and infiltrated groundwater) collect in the outfall vault and are directed to the CDTS for treatment. Non-stormwater flows originating in the Outfall 001 portion of the Drainage System (consisting of NCCW, referred to as "bypass overflows from dynamometers," and infiltrated groundwater) collect in the Outfall 001 vault and are pumped to the vault at Outfall 007, where they commingle with Outfall 007 non-stormwater flows for transfer to the CDTS.

Non-stormwater weather flows from the Outfall 010 portion of the Drainage System consist of condensate from steam heating and air conditioning systems, NCCW from industrial heat exchangers, and infiltrated groundwater.

Non-stormwater flows from the Outfall 019 portion of the Drainage System consist of steam condensate return from steam users, emergency steam condensate from small engine component testing, boiler filter backwash, ion exchange regeneration and backwash, condensate from steam heating and air conditioning systems, and infiltrated groundwater.

Non-stormwater flows originating in the Outfall 030 and Outfall 028 portions of the Drainage System consist of NCCW from heat exchangers and steam condensate and emergency NCCW from the Nitriding/Carburizing process, respectively, along with infiltrated groundwater. Non-stormwater flows originating in the Outfall 028 portion of the Drainage System collect in the Outfall 028 vault and are pumped to the vault at Outfall 030, where they commingle with Outfall 030 non-stormwater flows. The combined flows are then transferred to the CDTS for treatment.

Non-stormwater flows from the Outfall 031 portion of the Drainage System consist of steam conduit discharge, cooling tower blowdown, test cell washdown water, condensate from air receivers, and infiltrated groundwater.

Non-stormwater flow from the Outfall 027 drainage area consists of Building 64-A sump discharges, steam condensate return from steam users, oil cooler non-contact cooling water, air vacuum non-contact cooling water, steam conduit water, cooling tower blowdown, stormwater collected in secondary containment dikes and truck loading areas, and infiltrated groundwater. These flows are combined with flow from other outfalls in the equalization tank for treatment in the CDTS.

The draft permit requires development and implementation of BMPs to operate the Drainage System Outfall vault system to capture the first-flush of stormwater which flows through the Drainage System Outfalls for transfer and subsequent treatment in the CDTS. Therefore, the first-flush of stormwater is also expected to be discharged (along with the treated non-allowable non-stormwater flows) through Outfall 027A, after treatment in the CDTS. The BMPs include 1) evaluating the possibility of increasing the treatment capacity of the CDTS so that it is capable of treating commingled non-allowable non-stormwater flows (including contaminated groundwater) and the first-flush of stormwater flow (first 30 minutes of discharge) and 2) evaluating the feasibility of operating the Drainage System Outfall vault gates so that they remain closed when the water reaches the high-high level in the vault, and the pumps continue to transfer the water to the CDTS for treatment, to the maximum extent practicable.

The draft permit includes effluent limits, and associated monitoring requirements, based on the treatment capabilities of the CDTS (with an optimized combination of DAF and carbon adsorption) and State WQS. EPA has determined that these permit requirements will satisfy the BAT and BCT technology standards, as applicable, as well as State WQS.

a. Flow

The current permit includes a monthly average discharge flow limit of 0.3 MGD and a daily maximum flow limit of 0.83 MGD. These limits were based, however, on flow through former Outfall 027D, which consisted of stormwater runoff (from roof and yard drains), steam condensate, oil coolers, and floor drains. Under the draft permit, flow through this outfall consists of non-stormwater flows and first-flush of stormwater combined from multiple outfalls and treated in the CDTS prior to discharge through Outfall 027A.

Based on this re-routing of the non-stormwater flows from various outfalls for treatment in the CDTS and discharge through Outfall 027A, and the draft permit BMP requirement to increase the treatment capacity of the CDTS and applicable pumping capacity so that it is capable of treating commingled non-stormwater flows and the first-flush of stormwater flow, the draft permit shall require reporting only of the monthly average flow and maximum daily flow. Additionally, the draft permit requires that the flow through Outfall 027A shall not exceed the design capacity of the treatment system. The current design capacity is 500 gpm (0.72 MGD) as a maximum and 300 gpm (0.43 MGD) as an average, based on the pumping capacity from the equalization tanks.

EPA concludes that the new flow scheme for Outfall 027A represents a material and substantial change in the circumstances underlying this permit limit, and that this change justifies the requested new limit. As a result, the removal of the flow limit would not violate the CWA's anti-backsliding requirements. *See* 33 U.S.C. §§ 1342(o)(1) and (o)(2)(A); 40 CFR §§ 122.44(l)(2) and 122.62(a)(1). *See also* 33 U.S.C. § 1313(d)(4).

b. pH

The current permit imposes a pH effluent limit of 6.5 – 8.5 SU consistent with Massachusetts WQS. Review of DMR data for former Outfall 027D reveals that the pH effluent limit has been violated on only one occasion, with a range of 6.4 – 7.8 SU. The draft permit retains the pH limit of 6.5 – 8.5 SU, based on State WQS and anti-backsliding requirements found in 40 CFR §122.44(l).

c. Oil and Grease (O&G)

Massachusetts Water Quality Standards for a Class SB water body (314 CMR 4.05(4)(b)(7)) require that these waters shall be free from oil, grease and petrochemicals that produce a visible film on the surface of the water, impart an oily taste to the water or an oily or other undesirable taste to the edible portion of aquatic life, coat the banks or bottom of the water course, or are deleterious or become toxic to aquatic life. A concentration of oil and grease of 15 mg/L is recognized as a level at which many oils produce a visible sheen.

The current permit includes a monthly average O&G limit of 10 mg/L, and a daily maximum limit of 15 mg/L, for former Outfall 027D. Review of DMR data reveals that the O&G limit has not been exceeded. The monthly average O&G has ranged from 4 – 6.2 mg/L and the daily maximum O&G has ranged from 5 – 12.7 mg/L. The draft permit retains the monthly average O&G limit of 10 mg/L from the existing permit, based on anti-backsliding requirements found in 40 CFR §122.44(l), and also retains the daily maximum limit of 15 mg/L, consistent with narrative State Water Quality Standards.

d. TSS

Massachusetts Water Quality Standards (314 CMR 4.05(4)(b)(5)) require that Class SB waters "be free from floating, suspended and settleable solids in concentrations or combinations that would impair any use assigned to this class, that would cause aesthetically objectionable conditions, or that would impair the benthic biota or degrade the chemical composition of the bottom."

Additionally, a TSS limit is particularly important to maintaining good operation of subsequent treatment units in the system such as carbon adsorption (e.g. clogging of pores in the carbon granules) and to aid in the removal of contaminants that are adsorbed to soil particles. Treatment technology is well understood and a properly designed sedimentation and/or filtration system can readily remove TSS to low concentrations. Heavy metals and polynuclear aromatic hydrocarbons (PAHs) are readily adsorbed onto particulate matter and the release of these compounds can be controlled, to an extent, by regulating the amount of suspended solids released into the environment.

The current permit did not require monitoring for TSS at former Outfall 027D. Therefore, this discharge has not been sampled for TSS. However, to assure that the State narrative standard regarding floating solids is maintained, as well as to ensure proper operation of the treatment system, the draft permit establishes a BPJ-based maximum daily effluent limitation of 100 mg/L and an average monthly effluent limitation of 30 mg/L for the discharge from CDTS (Outfall 027A) consistent with the effluent limitations from the RGP and steam electric NELGs (see Section .C.1.b.ii.f).

e. Temperature

The current permit contains monthly average temperature limit of 85°F and a daily maximum limit of 90°F. Previous dry weather discharges from this outfall consisted of non-stormwater flows specific to the 027 drainage area, however, the dry weather discharges through Outfall 027A now consist of a mixture of treated non-stormwater flows collected from the vaults located at outfalls throughout the sites. These non-stormwater flows are collected and piped to equalization tanks prior to batch treatment in the CDTS. Since installation of the CDTS in 2000, the dry weather discharges through Outfall 027A have ranged in temperature from 43°F – 74°F on an average monthly basis, and from 46°F – 76°F on a daily maximum basis.

The Saugus River is a Class SB water under the Massachusetts WQS and the applicable numeric thermal criteria for SB waters provide that discharges may not cause ambient water temperatures to exceed either a daily maximum of 85°F (29.4°C) or a maximum daily mean of 80°F (26.7°C), and also may not cause a rise in temperature of more than 1.5°F (0.8° C) during the summer months (July through September) or 4° F (2.2° C) during the winter months (October through June). However, due to the residence time of the water in the equalization basins at the CDTS, the discharge is not expected to cause a rise in ambient water temperature. Therefore, the draft permit requires a reduced temperature limit at Outfall 027A of 85°F as a daily maximum, consistent with these WQS. This daily maximum limit of is more stringent than the current permit monthly average limit; therefore, compliance with this more stringent daily maximum limit of 85°F will ensure compliance with the current permit monthly average limit of 85°F. Thus, the draft permit requires the monthly average temperature to be monitored without limits.

f. Polychlorinated Biphenyls (PCBs)

PCBs have been detected in groundwater investigations conducted in connection with site investigations under the Massachusetts Contingency Plan. The current permit contains a limit of "< detectable limit" for the discharge through former Outfall 027D. Review of DMR data reveals that PCBs in the discharge through former Outfall 027D have been detected on 7 occasions, all at a concentration of 1 μg/L, and that monitoring for PCBs ceased on July 1999. In DMR cover letters, GE Aviation contends that a treatment system from which these pollutants originated was tied-in to the city sewer as of April 1999.

EPA's National Recommended Water Quality Criteria require a saltwater chronic criterion for PCBs of 0.03 ug/L, measured as total PCBs, as well as a human health criterion of 0.00064 ug/L. As previously discussed in Section B.2 of this fact sheet (Water Quality-based Requirements), EPA has conservatively assumed no dilution.

The draft permit requires a water-quality based monthly average limit of 0.03 ug/L, measured as total PCBs. EPA anticipates that discharges containing PCBs can adequately be treated to "non-detection" levels using carbon adsorption. The RGP requires a compliance limit equal to the minimum level (ML) associated with federally approved test method (Method 608). EPA approved Method 608 only has a detection level of 0.5 ug/l which may result in an incomplete quantification of total PCBs compared to other available methods with lower detection levels. For example, Method 8082 (and Modified Method 8082 which has a lower detection limit) is widely used for in-stream surface water analysis and is widely accepted in the scientific community. Although Method 8082 (and Modified Method 8082) is not, at this time, an EPA NPDES- approved method, it can be required by the Region in accordance with CFR 136.3 (c) as necessary for a more complete quantification of PCBs.

Therefore, the draft permit requires use of Method 8082, and a total PCB monthly average compliance limit equal to 0.065 ug/L, the ML of the test method used (Method 8082). Additionally, the permittee will: 1) use Modified Method 8082, (2) meet all the specifications within Modified Method 8082, (3) make every effort to achieve a minimum detection level (MDL) of 0.03 ug/L using Modified Method 8082, and (4) provide the result of total PCBs as the sum of all Aroclors. Sample results of less than 0.065 ug/L shall be reported as zero on the discharge monitoring report (DMR); numerical results of all samples, including results less than the ML, shall be reported in an attachment to the DMR.

g. Total Residual Oxidants (TRO)

The discharge through Outfall 027A contains commingled non-stormwater flows, several of which contain potable water (which is expected to contain chlorine). GE Aviation reports that potable water is used throughout the plant for several purposes, including steam generation, non-contact cooling, water treatment system regeneration, and cooling tower blowdown. Therefore, the draft permit contains a monitoring requirement for TRO at Outfall 027A, since the potential for discharge of potable water commingled with marine water exists.

h. Total Petroleum Hydrocarbons (TPH)

Outfall 027A discharges treated non-stormwater flows, including contaminated groundwater, along with the first-flush of stormwater from the Drainage System Outfalls.

TPH has been detected in groundwater investigations conducted at GE Aviation in connection with site investigations under the Massachusetts Contingency Plan.

According to the RGP, "Oil & Grease" was the primary petroleum related parameter used in many of EPA-NE's individual NPDES permits and is a common parameter in many of EPA's promulgated industrial effluent guidelines. The "hydrocarbon" fraction of the oil and grease parameter, or TPH, was determined to be the most appropriate parameter for inclusion in the RGP. EPA-NE has been incorporating TPH as a parameter at all petroleum related site remediation projects.

In setting the technology-based effluent limits for TPH in the RGP, EPA reviewed a number of sources. As stated in the RGP, site remediation projects in Massachusetts and New Hampshire have consistently set a maximum value of 5.0 mg/l for the discharge of TPH. The RGP indicates that this limit is readily attainable with standard treatment technology, with reported results typically "less than" the laboratory reporting levels (0.2 - 0.5 mg/l).

The factors in the RGP analysis are comparable to the factors in this individual permit; therefore, EPA is using similar logic to support the TPH limit established for Outfall 027A, which discharges treated non-stormwater flows, including contaminated groundwater. Therefore, the draft permit requires a technology-based TPH limit of 5.0 mg/L, as a daily maximum, monitored monthly.

i. Polycyclic Aromatic Hydrocarbons (PAHs)

There are sixteen (16) PAH compounds identified as priority pollutants under the CWA (*See* 40 CFR Part 423 - Appendix A). "Group I" PAHs are the following seven carcinogens: benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene. "Group II" PAHs are the following nine priority pollutant PAHs, which are not considered carcinogenic alone but can enhance or inhibit the response of the carcinogenic PAHs: acenaphthene, acenaphthylene, anthracene, benzo(ghi)perylene, fluoranthene, fluorene, naphthalene, phenanthrene, and pyrene. Typically, PAH exposure would be to a mixture of PAHs rather than to an individual PAH.

The above listed PAHs have been detected in groundwater investigations conducted at GE Aviation in connection with site investigations at the facility under the Massachusetts Contingency Plan. The current permit did not require monitoring for PAHs at former Outfall 027D. Therefore, this discharge has not been sampled for PAHs.

EPA's National Recommended Water Quality Criteria require human health criteria of 0.0038 ug/L (water + organism) and 0.018 ug/L (organism only) for each individual Group I PAH. Similarly, the RGP contains a water-quality based limit for individual Group I PAH compounds of 0.0038 ug/L, with the compliance limit equal to the ML of the test method used. The RGP also sets technology-based limits of 10.0 ug/L for total Group I PAHs (sum of the individual isomers) and 100.0 ug/L for total Group II PAHs;

since typical treatment technology is expected to remove these compounds to below detection levels.

The factors in the RGP analysis are comparable to the factors in this individual permit; therefore, EPA is using similar logic to support the PAH limits for Outfall 027A, which discharges treated non-stormwater flows, including contaminated groundwater. Therefore, this permit shall require monthly monitoring of individual Group I PAHs at Outfall 027A. Additionally, the draft permit shall require technology-based effluent limits of 10.0 ug/L for total Group I PAHs and 100.0 ug/L for total Group II PAHs.

j. Metals

The non-stormwater flows treated by the CDTS and discharged through Outfall 027 may contain metals due to the contaminated groundwater infiltration. GE Aviation acknowledges that prior groundwater investigations conducted in connection with site investigations under the Massachusetts Contingency Plan have detected the presence of the following metals: antimony, arsenic, beryllium, cadmium, calcium, chromium, copper, iron, ferrous iron, lead, magnesium, manganese, mercury, nickel, selenium, silver, sodium, thallium, and zinc. The current permit did not require monitoring for metals at former Outfall 027D. Therefore, this discharge has not been sampled for metals. The draft permit requires monitoring at Outfall 027A for these metals, all monitored at a frequency of 1/month.

k. Volatile Organic Compounds (VOCs), Benzene, Toluene, Ethylbenzene, Xylene (BTEX), and Methyl-tert-butyl Ether (MTBE)

Review of DMR data reveals that monitoring for benzene, toluene, ethylbenzene, xylene, total BTEX, and methyl tert-butyl ether (MTBE) ceased on July 1999. In DMR cover letters, GE Aviation contends that a treatment system from which these pollutants originated has been tied in to the city sewer as of April 1999. This permit shall continue to require sampling of these parameters, some with effluent limits as outlined below, to confirm their absence. The permittee may request a reduction in monitoring frequency after 1 year (a minimum of 4 samples) of sampling data showing non-detect for any parameter. The permittee is required to continue testing at the frequency specified in the permit until the permittee receives a certified letter from EPA indicating a change in the permit conditions.

Monitoring data submitted by GE Aviation reveals that a number of VOCs have been detected in the discharge from Outfall 027, specifically, chloroethane, 1,1-dichloroethane, toluene, 1,1,1-trichloroethane, trichloroethene, vinyl chloride (chloroethene), 1,2-dichloroethene, bromodichloromethane, chloroform, and tetrachloroethene. The RGP requires effluent limitations for contaminated groundwater of 70 ug/L for 1,1-dichlorethane, of 200 ug/L for 1,1,1-trichlorethane, and 2.0 ug/L for vinyl chloride (chloroethene). The levels of vinyl chloride in the discharge from Outfall 027 exceeded

2.0 ug/L on two occasions, with the concentration ranging from 1.7 – 2.3 ug/L during monthly samples collected in 2006.[42]

Regarding the specific VOC compounds detected, the following VOCs have been detected in the groundwater onsite:

> Acetone, benzene, bromodichloromethane, bromoform, bromomethane, 2-butanone, carbon disulfide, carbon tetrachloride (tetrachloromethane), chlorobenzene, chloroethane, chloroform, 1,1-dichloroethane, 1,1-dichloroethene, cis-1,2-dichloroethene, trans-1,2-dichloroethane, 1,2-dichloroethene, 1,2-dichlorobenzene, 1,3-dichlorobenzene, 1,4-dichlorobenzene, 1,4-dioxane, dichlorodifluoromethane, ethylbenzene, ethylether, 2-hexanone, isopropylbenzene, 4-methyl-2-pentanone, methylene chloride, methyltertbutylether naphthalene, n-butylbenzene, n-propylbenzene, p-cymene, sec-butyl benzene, tert-butyl benzene, tert-amyl methyl ether, 1,1,1-trichloroethane, 1,1,2-trichloroethane, 1,1,2,2-tetrachloroethane, 1,2,4-trimethylbenzene, 1,2,4-trichlorobenzene, 1,3,5-trimethylbenzene, tetrachloroethene, toluene, trichloroethene, trichlorofluoromethane, vinyl chloride, m-xylene, m/p-xylene, o-xylene, total xylenes.[43,44]

VOCs such as benzene, toluene, ethylbenzene, and the three xylene compounds (BTEX) are normally found at relatively high concentrations in gasoline and light distillate products (e.g., diesel fuel). BTEX concentrations typically decrease in the heavier grades of petroleum distillate products (e.g., fuel oils). The traditional approach for limiting effluents contaminated with gasoline or other light distillates is to place limits on the individual BTEX compounds and/or the sum of total BTEX compounds. As described previously in this fact sheet, benzene can be used as an indicator-parameter for regulatory as well as characterization purposes of stormwater that comes in contact with gasoline and diesel fuel. The primary advantage of using an indicator-parameter is that it can streamline monitoring efforts while simultaneously maintaining an effective level of environmental protection.

To establish appropriate effluent limitations in the RGP for VOCs, EPA evaluated both the technology and water quality-based information currently available. During development of the RGP, EPA reviewed the substantial number of monitoring reports submitted pursuant to approved site remediation projects in MA, as well as the published technology information available on various EPA and other internet sites, and the various water quality and cleanup standards published by EPA and the States. In general, the technology-based effluent limitations in the RGP are sufficient to meet the most conservative water quality standards, typically, human health based standards.

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[42] E-mail correspondence from Steven Lewis (GE Aviation) to George Papadopoulos (EPA), May 20, 2007, Attachment: VOC laboratory analyticals for fiscal year 2006.

[43] NPDES Permit Renewal Application Revision, May 2000.

[44] E-mail correspondence from Steven Lewis (GE Aviation) to Nicole Kowalski (EPA), March 25, 2009, Attachment: Complete list of constituents that have been detected in the groundwater at the site.

Specifically, the RGP contains technology-based effluent limits of 100 ug/L for BTEX, 5.0 ug/L for benzene, and the technology-based limits listed below for chlorinated VOCs (*see* Table 1). In development of the RGP, EPA analyzed facilities with contaminated groundwater remediation situations similar to GE Aviation. The factors in the RGP analysis are comparable to the factors in this individual permit; therefore, EPA is using similar logic to apply these technology-based limits to the discharge through Outfall 027A (which treats contaminated groundwater).

Therefore, consistent with the RGP and individual permit effluent limits for contaminated groundwater discharges and combined discharges at similar facilities in Massachusetts, EPA has, based on BPJ, established technology-based effluent limits in the draft permit for benzene of 5.0 ug/L, total BTEX of 100 µg/L, and chlorinated VOCs, as listed below in Table 1. The draft permit also continues a maximum daily limit of 100 ug/L for MTBE from the current permit consistent with antibacksliding, and requires reporting without limits for toluene, ethylbenzene, total xylenes, and total VOCs at Outfall 027A.

Table 1. Effluent Limits for Chlorinated VOCs

Parameter	Maximum Value (ug/L)
15. Carbon Tetrachloride	4.4
16. 1,4 (or p)-Dichlorobenzene (p-DCB)	5.0
17. 1,2 (or o)-Dichlorobenzene (o-DCB)	600
18. 1,3 (or m)-Dichlorobenzene (m-DCB)	320
19. 1,1 Dichloroethane (DCA)	70
20. 1,2 Dichloroethane (DCA)	5.0
21. 1,1 Dichloroethylene (DCE)	3.2
22. cis-1,2 Dichloroethylene (DCE)	70
23. Dichloromethane (methylene chloride)	4.6
24. Tetrachloroethylene (PCE)	5.0
25. 1,1,1 Trichloroethane (TCA)	200
26. 1,1,2 Trichloroethane (TCA)	5.0
27. Trichloroethylene (TCE)	5.0
28. Chloroethene (Vinyl Chloride)	2.0

The technology limits are based on treatability using carbon adsorption, a proven technology capable of removing benzene and other petroleum hydrocarbons from water. The data collected will be useful in characterizing the discharge through Outfall 027A and ensuring proper operation of the treatment system.

l. Cyanide

Compounds containing the cyanide group (CN) are used and readily formed in many industrial processes and can be found in a variety of effluents, such as those from steel, petroleum, plastics, synthetic fibers, metal plating, and chemical industries. Cyanide occurs in water in many forms, including: hydrocyanic acid (HCN), the cyanide ion

(CN^-), simple cyanides, metallocyanide complexes, and as organic compounds. "Free cyanide" is defined as the sum of the cyanide present as HCN and CN^-. The relative concentrations of these forms depend mainly on pH and temperature.

EPA's national water quality criteria for cyanide in saltwater is 1.0 ug/L (acute and chronic). Cyanide has been detected in wet weather discharges onsite at a concentration exceeding the water quality criteria, specifically at Outfall 001. The draft permit requires development and implementation of BMPs to ensure treatment of the first-flush of stormwater through the Drainage System Outfalls by the CDTS. Therefore, since Outfall 027A discharges the treated non-allowable non-stormwater flows, including contaminated groundwater, commingled with the first-flush of stormwater from the Drainage System Outfalls, the draft permit requires monitoring for total cyanide at Outfall 027A.

The development of the cyanide water quality-based effluent limit in the RGP (1.0 ug/L for saltwater), under which EPA analyzed facilities with contaminated groundwater remediation situations similar to GE Aviation, supports this determination. The factors in the RGP analysis are comparable to the factors in this individual permit; therefore, EPA is using similar logic to support the cyanide monitoring requirements at Outfall 027A.

m. Whole Effluent Toxicity Testing Requirements

The general bases for the draft permit's whole effluent toxicity testing requirements for Outfall 027A and the CDTS are the same as those presented above with regard to the Drainage System Outfalls. As explained above, it is common knowledge that stormwater and groundwater discharges may contain toxic constituents. These constituents can include metals, chlorinated solvents, aromatic hydrocarbons and others. Indeed, as discussed above, contaminated stormwater and groundwater has been a particular problem at the GE Aviation site.

Therefore, based on the possibility of toxicity resulting from discharges of both stormwater and groundwater, the draft permit includes acute and chronic toxicity monitoring requirements in accordance with EPA national and regional policy and MassDEP policy. (See Policy for the Development of Water Quality-Based Permit Limitations for Toxic Pollutants,50 Fed. Reg. 30,784 (July 24, 1985); EPA's *Technical Support Document for Water Quality-Based Toxics Control* on September, 1991; and MassDEP's Implementation Policy for the Control of Toxic Pollutants in Surface Waters (February 23, 1990). Specifically, the draft permit requires that the permittee conduct quarterly marine chronic (and modified acute) WET tests for this outfall. The chronic test may be used to calculate the acute LC_{50} at the 48-hour exposure interval. The permittee shall test the following marine species: Inland silverside (*Menidia beryllina*) and the Sea Urchin (*Arbacia punctulata*). Toxicity test samples shall be collected and tests completed during the calendar quarters ending March 31st, June 30th, September 30th, and December 31st each year. Toxicity test results are to be submitted by the 15th day of the month following the end of the quarter sampled. The tests must be performed in accordance with test procedures and protocols specified in Attachment 1 of the permit.

After submitting one year and a minimum of four consecutive sets of WET test results, all of which demonstrate no toxicity, the permittee may request a reduction in the WET testing requirements. The permittee is required to continue testing at the frequency specified in the permit until notice is received by certified mail from EPA that the WET testing requirement has been changed.

3. Outfall 014 – Engine Testing Facility

Non-stormwater flows through this outfall consist of NCCW from aircraft engine test facility heat exchangers, condensate blowdown, and engine and compressor test facility NCCW. Additionally, groundwater infiltration into the pipe system which discharges through this outfall is expected. These non-stormwater flows currently discharge directly to the receiving water without treatment.

Under the current configuration at Outfall 014, contaminated groundwater potentially discharges directly to the receiving water. However, the draft permit prohibits the discharge of contaminated groundwater directly to the receiving water. Unlike the Drainage System Outfalls, Outfall 014 does not contain an outfall vault which pumps to the CDTS. Therefore, the site specific BMPs, which attempt to eliminate the discharge of contaminated groundwater directly to the receiving water by ensuring manual operation of the transfer pumps at the Drainage System Outfall vaults to capture the first flush of stormwater, are not practicable for implementation at this Outfall. The draft permit requires development and implementation of site specific BMPs to eliminate, to the maximum extent practicable, the discharge of contaminated groundwater directly to the receiving water from this Outfall.

The BMPs include, at a minimum, inspection of the outfall pipelines to determine the extent of contaminated groundwater infiltration, development and implementation of a pipe lining project to eliminate potential contaminated groundwater infiltration to this outfall (to supplement the previously completed pipe lining project of a portion of the Outfall 014 drainage system),[45] and reconfiguration of the outfall piping to eliminate the discharge of untreated non-allowable non-stormwater flows directly to the receiving water. The site specific BMPs are described in the SWPPP, Part I.B.9 of the permit and Part V.C.9 of this fact sheet, below.

Additionally, the draft permit shall require monitoring at Outfall 014 based on the current configuration, which allows commingling of contaminated groundwater for discharge to the receiving water. The results of the samples collected from the Outfall 014 discharge may be used to determine the extent to which the site specific BMPs have eliminated the discharge of contaminated groundwater directly to the receiving water.

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[45] NPDES Permit Renewal Application Amendment, September 2003.

a. Flow

The Test Cell CWIS associated with this outfall consists of an intake channel recessed approximately 150 feet into the Saugus River bank. This CWIS is described in Attachment J to this fact sheet. The Engine Test Facility operates intermittently (an average of about 60 hours per month) at a capacity utilization rate of approximately 5 to 8%. The intake channel has accumulated silt over time, and therefore, flows at this point are restricted. As little as about 12 inches of cooling water depth is available above the silt layer within an hour of slack low tide. Accordingly, engine tests must be coordinated with higher tide periods to allow for adequate testing time and cooling water flow.

Effluent flow at Outfall 014 is calculated based on the runtime operation of each pump, with pump on and off times electronically monitored, and the pump capacity curves for these pumps. Actual flows from this outfall have ranged from 0.00002 MGD to 40.3 MGD as a daily maximum and 0.00002 to 9.3 MGD as a monthly average (during the time period of October 1998 through July 2008). This reflects the occasional and intermittent use of the engine test facility and use of the Test Cell CWIS.

The draft permit requires reduction in the monthly average effluent flow from Outfall 014 to 5 MGD from March 1 to July 31, as explained in the Section 316(b) determination, Attachment J to this fact sheet. The monthly average flow limit from August 1 to February 28 remains unchanged at 27 MGD and the daily maximum limit remains unchanged at 45 MGD, to reflect actual operating conditions expected over a long period.

b. Temperature

In developing limits for thermal discharge, EPA and MassDEP must consider applicable technology-based requirements, water quality-based requirements, and any request for a CWA §316(a) variance. The development of the thermal discharge limits based on a CWA §316(a) variance are discussed below in Part V.C.8, below.

The current permit requires temperature effluent limitations of 90°F as a monthly average and 95°F as a daily maximum. The effluent temperature is measured with a temperature probe toward the end of the effluent pipe. Review of DMR data shows that there have not been any exceedences of the temperature limits, as the daily maximum effluent temperature has ranged from 35°F – 86°F and the monthly average effluent temperature has ranged from 32.1 – 84°F. As explained under 316(a), Part V.C.8 of this fact sheet, the maximum daily temperature limit in the current permit has been reduced to 90ºF. Compliance with a daily maximum limit of 90ºF will ensure compliance with the monthly average limit of 90ºF in the current permit. Review of DMR data shows that the discharge has not exceeded 90ºF on any occasion (during the time period of October 1998 through July 2008). A limit of 90ºF is also consistent with the limit included under CWA § 316(a) in the NPDES permit recently issued to Wheelabrator Saugus, a facility whose discharge to the Saugus River is located across the river and a bit upstream of GE Aviation's discharge.

c. pH

The current permit requires a pH limitation range of 6.5 – 8.5 SU. Review of DMR data reveals that the daily maximum pH has ranged from 7.4 – 8.58 SU, with 3 exceedences of the high-end pH range. This permitted pH range will remain in the permit to maintain adherence to State Water Quality Standards.

d. Oil and Grease (O&G)

The current permit requires a narrative limit for O&G, that there shall be no discharge of oil sheen in other than trace amounts. Massachusetts Water Quality Standards for Class SB water bodies (314 CMR 4.05(4)(b)(7)) specify narrative criteria for O&G, requiring these waters to be free from oil, grease and petrochemicals that produce a visible film on the surface of the water, impart an oily taste to the water or an oily or other undesirable taste to the edible portion of aquatic life, coat the banks or bottom of the water course, or are deleterious or become toxic to aquatic life. A concentration of oil and grease of 15 mg/L is recognized as a level at which many oils produce a visible sheen.[46] Therefore, in order to satisfy the narrative criteria from the WQS, the draft permit includes for this outfall a maximum daily oil and grease limit of 15 mg/L, monitored monthly.

e. TSS

Massachusetts Water Quality Standards (314 CMR 4.05(4)(b)(5)) require that Class SB waters "be free from floating, suspended and settleable solids in concentrations or combinations that would impair any use assigned to this class, that would cause aesthetically objectionable conditions, or that would impair the benthic biota or degrade the chemical composition of the bottom."

Heavy metals and PAHs are readily adsorbed onto particulate matter and the release of these compounds can be controlled, to an extent, by regulating the amount of suspended solids released into the environment. Sampling results submitted by the permittee reveals a TSS concentration of 14 mg/L in the discharge through Outfall 014 (see Attachment I).[47]

In order to assure that the State narrative standard regarding floating solids is maintained, and since metals and other contaminants often adhere to solids, the draft permit includes a maximum daily effluent limitation of 100 mg/L and an average monthly effluent limitation of 30 mg/L for total suspended solids from this outfall, sampled monthly.

f. Total VOCs, Total BTEX, Benzene, Toluene, Ethylbenzene, Total Xylenes

Groundwater contaminant monitoring data indicate that a variety of chemical contaminants are likely to be present in the groundwater. These chemicals could be

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[46] USEPA. 1976. *The Red Book – Quality Criteria for Water.* July 1976.
[47] NPDES Permit Renewal Application Revision, June 1998, Section 3 - EPA NPDES Form 2C: Wastewater Discharge Information.

present in discharges from this outfall to the extent that it potentially includes groundwater infiltration. The data suggests that contaminants of concern include a range of volatile organic compounds (VOCs), including a variety of petroleum products (presumably present as a result of past spills of fuel and other materials). VOCs such as benzene, toluene, ethylbenzene, and the three xylene compounds (BTEX), are normally found at relatively high concentrations in gasoline and light distillate products (e.g., diesel fuel).

Therefore, the permittee shall monitor for the presence of total VOCs, total BTEX, benzene, toluene, ethylbenzene, and total xylenes to help determine whether the previously completed pipe lining project at Outfall 014 was successful at eliminating the infiltration of contaminated groundwater into the drainage system. Monitoring for each parameter is required on a quarterly basis.

g. Metals

The permittee shall monitor for the presence of metals to help determine whether the previously completed pipe lining project at Outfall 014 was successful at eliminating the infiltration of contaminated groundwater into the drainage system.

The permittee reports that during downtime events, near-zero flow results in a reduced wetted internal surface area throughout the cooling water channel. Smaller wetted surface area generally means more internal iron surface area of pipes, pumps, valves, etc., exposed to moist air and prone to oxidation. Therefore, when the outfall is put back online and cooling water pumping begins, the first flush of discharge has the potential to contain elevated levels of iron.[48] Additionally, condensate blowdown, which has the potential to contain elevated levels of iron, discharges through Outfall 014. Sampling results submitted by the permittee reveals an iron concentration of 0.13 mg/L in the discharge through Outfall 014 (see Attachment I).[49]

Additionally, sampling results submitted by the permittee reveal the presence of metals in the discharge through Outfall 014 (see Attachment I).[50] Specifically, iron, chromium, and lead have been detected in the Outfall 014 discharge. Therefore, monitoring for iron, chromium, and lead is required at Outfall 014, on a monthly basis. .

h. PAHs

The permittee shall monitor for the presence of total PAHs to help determine whether the previously completed pipe lining project at Outfall 014 was successful at eliminating the infiltration of contaminated groundwater into the drainage system. Monitoring for total PAHs is required on a quarterly basis.

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48 NPDES Permit Renewal Application Amendment, September 2003.

49 NPDES Permit Renewal Application Revision, June 1998, Section 3 - EPA NPDES Form 2C: Wastewater Discharge Information.

50 NPDES Permit Renewal Application Revision, June 1998, Section 3 - EPA NPDES Form 2C: Wastewater Discharge Information.

i. PCBs

The permittee shall monitor for the presence of total PCBs to help determine whether the previously completed pipe lining project at Outfall 014 was successful at eliminating the infiltration of contaminated groundwater into the drainage system. Monitoring for total PCBs is required on a quarterly basis.

j. Whole Effluent Toxicity Testing Requirements

The general bases for the draft permit's whole effluent toxicity testing requirements for Outfall 014 are the same as those presented above with regard to the Drainage System Outfalls.

Based on the possibility of toxicity in the discharge from Outfall 014 resulting from groundwater, and in accordance with EPA national and regional policy as well as MassDEP policy, the draft permit includes acute and chronic toxicity testing requirements. (See Policy for the Development of Water Quality-Based Permit Limitations for Toxic Pollutants,50 Fed. Reg. 30,784 (July 24, 1985); EPA's *Technical Support Document for Water Quality-Based Toxics Control* on September, 1991; and MassDEP's Implementation Policy for the Control of Toxic Pollutants in Surface Waters (February 23, 1990).

The draft permit requires that the permittee conduct quarterly marine chronic (and modified acute) WET tests for this outfall. The chronic test may be used to calculate the acute LC_{50} at the 48-hour exposure interval. The permittee shall test the marine species Inland silverside, *Menidia beryllina* and the Sea Urchin, *Arbacia punctulata*. Toxicity test samples shall be collected and tests completed during the calendar quarters ending March 31st, June 30th, September 30th, and December 31st each year. Toxicity test results are to be submitted by the 15th day of the month following the end of the quarter sampled. The tests must be performed in accordance with test procedures and protocols specified in Attachment 1 of the permit.

After submitting one year and a minimum of four consecutive sets of WET test results, all of which demonstrate no toxicity, the permittee may request a reduction in the WET testing requirements. The permittee is required to continue testing at the frequency specified in the permit until notice is received by certified mail from EPA that the WET testing requirement has been changed.

4. Outfall 018 – Power Plant (018A-dry weather / 018B-wet weather / 018C - internal outfall)

Non-stormwater flows through this outfall consist of NCCW (river water) from power plant generating equipment, turbine condensate, boiler startup/soot blower drains/boiler draining for maintenance, boiler filter backwash, ion exchange regeneration and backwash, de-aerator storage tanks, steam condensate return from steam users, and boiler blowdown. Additionally, groundwater infiltration into the pipe system which discharges through this outfall is expected. The non-stormwater discharge to the receiving water during dry weather conditions through this outfall shall be identified as Outfall 018A.

This outfall also discharges stormwater during wet weather directly to the receiving water, which shall be identified as Outfall 018B. As explained for the Drainage System Outfalls, it is expected that an indeterminate percentage of stormwater discharges consist of infiltrated groundwater. As the water table rises in wet weather, the static pressure of the groundwater surrounding partially filled drain pipes forces groundwater through seams and cracks into the pipes and out the outfall with the stormwater. Therefore, the draft permit also includes wet weather monitoring requirements for this Outfall.

Allowable non-stormwater flows, as defined by EPA's 2008 MSGP, discharging through this outfall include turbine condensate and steam condensate. Additionally, this outfall discharges non-stormwater flows of other types than those authorized under the MSGP. These flows consist of boiler startup/soot blower drains/boiler draining for maintenance, boiler filter backwash and ion exchange regeneration and backwash, de-aerator storage tanks, and boiler blowdown. Therefore, the draft permit requires internal sampling of these non-allowable non-stormwater flows. This internal outfall shall be identified as Outfall 018C.

Unlike the Drainage System Outfalls, Outfall 018 does not contain an outfall vault. Therefore, the site specific BMPs which attempt to eliminate the discharge of contaminated groundwater to capture the first flush of stormwater are not practicable for implementation at this Outfall. Under the current configuration at Outfall 018B, the first flush of stormwater commingled with contaminated groundwater is discharged directly to the receiving water. Additionally, infiltrated contaminated groundwater potentially discharges during dry weather through Outfall 018A.

Therefore, the draft permit requires development and implementation of alternate BMPs at Outfall 018, to eliminate the discharge of contaminated groundwater directly to the receiving water through this Outfall. The BMPs include inspection of the outfall pipelines to determine the extent of contaminated groundwater infiltration, development and implementation of a pipe lining project to eliminate potential contaminated groundwater infiltration to this outfall, and if pipeline rehabilitation is infeasible, pipeline replacement. The site specific BMPs are described in the SWPPP, Part I.B of the permit and Part V.C.9 of this fact sheet, below.

Additionally, the draft permit requires monitoring at Outfall 018 based on the current configuration, which allows commingling of contaminated groundwater for discharge to the receiving water. The results of the samples collected from the Outfall 018 discharge may be used to determine the extent to which the site specific BMPs have eliminated the discharge of contaminated groundwater directly to the receiving water.

a. Flow

This outfall discharges NCCW more or less continuously in support of electricity production needs of this facility. The CWIS associated with this outfall has three intake bays, each with single-entry, single-exit vertical traveling screens. Water is pumped through these screens by three variable speed pumps – one pump for each traveling screen. The actual intake of water from the Saugus River is at a depth of approximately 12 feet below mean low water. *See* Attachment J to this fact sheet for a description of this CWIS. The permittee states that the design flow for Outfall 018A is 57.6 MGD and the typical flow is 28.0 MGD.

As explained in Part V.C.10.a, below, the monthly average effluent flow limit for Outfall 018A will be reduced approximately 20%, from 35.6 MGD to 28.7 MGD. The daily maximum limit will remain 35.6 MGD. This flow reduction is a component of the BTA that EPA has determined for the Power Plant CWISs for this permit. Effluent flows are calculated based on the runtime operation of each pump, with pump on and off times electronically monitored, and the pump capacity curves for these pumps. Average monthly flows from Outfall 018A have ranged from 20.9 to 32.1 MGD during the period from October 1998 to October 2008. Maximum daily flows have ranged from 21.36 to 35.5 MGD during the same monitoring period. Additionally, during wet weather discharges through Outfall 018B and during dry weather discharges through Internal Outfall 018C, the draft permit requires monitoring of flow, without limits.

b. pH

The current permit requires a pH effluent limitation range of 6.5 – 8.5 SU. Review of DMR data shows that the effluent pH has ranged from 7.02 to 8.8 SU, with 1 violation of the pH limitation range. This permitted pH range will remain in the permit based on anti-backsliding requirements found in 40 CFR §122.44(l) and to maintain consistency with State Water Quality Standards. This limit shall be required for both dry and wet weather discharges (both Outfall 018A and 018B). The draft permit also establishes BPJ-based numeric limits for Outfall 018C (6.0 – 9.0 SU) consistent with the steam electric NELGs discussed in Section C.1.b.ii of this fact sheet.

c. Temperature

In developing limits for thermal discharge, EPA and MassDEP must consider applicable technology-based requirements, water quality-based requirements, and any request for a CWA §316(a) variance. The development of the thermal discharge limits based on a CWA §316(a) variance are discussed below in Part V.C.8, below.

The current permit contains effluent limitations of 90°F for monthly average and 95°F for daily maximum temperature in the current permit. The effluent temperature is electronically sampled at regular intervals using a probe embedded at about the center of the discharge flow pipe and plotted on a chart recorder. There have been no violations of these temperature limits, as the maximum daily effluent temperature has ranged from 50

– 95°F and the average monthly temperature has ranged from 43.7 – 86.4°F during the period from October 1998 to October 2008. Review of DMR data shows that the last time the discharge exceeded 90°F was in August 2002. The maximum daily temperature limit for Outfall 018A shall be reduced to 90°F, as explained in Part V.C.8 of this fact sheet. Compliance with this daily maximum limit of 90°F will ensure compliance with the monthly average temperature limit in the current permit of 90°F at Outfall 018A.

During wet weather discharges through Outfall 018B, the draft permit shall require monitoring of temperature, without limits.

d. Oil and Grease (O&G)

The current permit includes a narrative limit for O&G specifying that there shall be no discharge of oil sheen in other than trace amounts. Sampling results submitted by the permittee reveals an O&G concentration of 1 mg/L in the discharge through Outfall 018A (see Attachment I).[51] The discharge through Outfall 018B has not been sampled for O&G.

Massachusetts Water Quality Standards for Class SB water bodies (314 CMR 4.05(4)(b)(7)) require these waters to be free from oil, grease or petrochemicals that produce a visible film on the surface of the water, impart an oily taste to the water or an oily or other undesirable taste to the edible portion of aquatic life, coat the banks or bottom of the water course, or are toxic or otherwise deleterious to aquatic life. A concentration of oil and grease of 15 mg/L is recognized as a level at which many oils produce a visible sheen. Therefore, in order to satisfy the narrative criteria from the WQS, the draft permit requires a maximum daily oil and grease limit of 15 mg/L, monitored monthly, at both Outfall 018A and 018B.

EPA has promulgated NELGs for certain pollutants commonly discharged by the Steam Electric Power Generating Point Source Category (Steam Electric NELGs), *see* 40 CFR Part 423. Specifically, Part 423.12 requires an O&G limit for low-volume waste sources[52] of 15 mg/L as a monthly average and 20 mg/L as a maximum daily. The flows through Outfall 018C (boiler startup/soot blower drains/boiler draining for maintenance, boiler filter backwash and ion exchange regeneration and backwash, de-aerator storage tanks, and boiler blowdown) are comparable to these low-volume waste sources; therefore, EPA has used BPJ in applying these O&G limits to internal Outfall 018C.

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[51] NPDES Permit Renewal Application Revision, June 1998, Section 3 - EPA NPDES Form 2C: Wastewater Discharge Information.

[52] Low volume wastes sources (as defined in 40 CFR Part 423.11) include, but are not limited to: wastewaters from wet scrubber air pollution control systems, ion exchange water treatment system, water treatment evaporator blowdown, laboratory and sampling streams, boiler blowdown, floor drains, cooling tower basin cleaning wastes, and recirculating house service water systems. Sanitary and air conditioning wastes are not included.

e. TSS

Massachusetts Water Quality Standards (314 CMR 4.05(4)(b)(5)) require that Class SB waters "be free from floating, suspended and settleable solids in concentrations or combinations that would impair any use assigned to this class, that would cause aesthetically objectionable conditions, or that would impair the benthic biota or degrade the chemical composition of the bottom."

Heavy metals and PAHs readily adhere to particulate matter and the discharge of these compounds can be controlled, to an extent, by regulating the amount of suspended solids discharged. Sampling results submitted by the permittee reveal a TSS concentration of 9 mg/L in the discharge through Outfall 018A (see Attachment I).[53] The discharge through Outfall 018B has not been sampled for TSS.

In order to assure that the State narrative standard regarding floating solids is maintained, and since metals and other contaminants often adhere to solids, the draft permit includes a maximum daily effluent limitation of 100 mg/L, and an average monthly effluent limitation of 30 mg/L, for total suspended solids (TSS) from this outfall, for both dry and wet weather discharges (i.e., Outfalls 018A and 018B), sampled monthly.

Additionally, EPA has used BPJ in applying the Steam Electric Power Generating Point Source Category (Steam Electric NELGs) for low volume waste sources (*see* 40 CFR Part 423.12). Specifically, Part 423.12 requires a TSS limit for low-volume waste sources[54] of 30 mg/L as a monthly average and 100 mg/L as a maximum daily. The flows through Outfall 018C (boiler startup/soot blower drains/boiler draining for maintenance, boiler filter backwash and ion exchange regeneration and backwash, de-aerator storage tanks, and boiler blowdown) are comparable to these low-volume waste sources; therefore, EPA has used BPJ in applying these TSS limits to internal Outfall 018C.

f. Metals

The discharge through Outfall 018 has the potential to contain contaminated groundwater infiltration. Additionally, steam condensate, one of the non-stormwater flows which currently discharges through Outfall 018A, has the potential to contain elevated levels of iron. Sampling results submitted by the permittee reveal elevated levels of metals in the discharge from Outfall 018A (see Attachment I).[55] Specifically, the discharge through Outfall 018A has contained elevated levels of metals which exceed National Water Quality Criteria for copper and selenium. Therefore, the draft permit requires daily

[53] NPDES Permit Renewal Application Revision, June 1998, Section 3 - EPA NPDES Form 2C: Wastewater Discharge Information.

[54] Low volume wastes sources include, but are not limited to: wastewaters from wet scrubber air pollution control systems, ion exchange water treatment system, water treatment evaporator blowdown, laboratory and sampling streams, boiler blowdown, floor drains, cooling tower basin cleaning wastes, and recirculating house service water systems. Sanitary and air conditioning wastes are not included.

[55] NPDES Permit Renewal Application Revision, June 1998, Section 3 - EPA NPDES Form 2C: Wastewater Discharge Information.

maximum limits consistent with the National Water Quality Criteria CMCs for copper and selenium, at a frequency of 1/month. The discharge through Outfall 018A has also detected arsenic, cadmium, aluminum, cobalt, iron, titanium, chromium, lead, mercury, and zinc. These metals shall also be monitored at a frequency of 1/month.

The metals data collected will help determine the effectiveness of the site specific BMPs at eliminating the discharge of contaminated groundwater directly to the receiving water through Outfall 018. Specifically, the draft permit requires a BMP to develop and implement a pipe lining project to eliminate potential contaminated groundwater infiltration to this outfall, which discharges non-stormwater flows directly to the receiving water.

The discharge through Outfall 018B has not been sampled for metals. Therefore, during wet weather discharges through Outfall 018B, the draft permit requires the same metal monitoring requirements outlined above (without limits) for dry weather, as there is potential for contaminated groundwater infiltration during wet weather discharges as well.

g. VOCs

Groundwater contaminant monitoring data indicate that a variety of chemical contaminants are likely to be present in the groundwater. These chemicals could be present in discharges from this outfall to the extent that it potentially includes groundwater infiltration. The data suggests that contaminants of concern include a range of volatile organic compounds (VOCs), including a variety of petroleum products (presumably present as a result of past spills of fuel and other materials). VOCs such as benzene, toluene, ethylbenzene, and the three xylene compounds (BTEX), are normally found at relatively high concentrations in gasoline and light distillate products (e.g., diesel fuel).

Therefore, the permittee shall monitor for the presence of total VOCs, total BTEX, benzene, toluene, ethylbenzene, and total xylenes during both dry and wet weather (Outfall 018A and 018B) to help determine the extent to which site-specific BMPs have been successful at eliminating the infiltration of contaminated groundwater into the drainage system. Monitoring for each parameter is required on a quarterly basis.

h. PAHs

The permittee shall monitor for the presence of total PAHs, during both dry and wet weather (Outfall 018A and 018B), to help determine the extent to which site-specific BMPs have been successful at eliminating the infiltration of contaminated groundwater into the drainage system. Monitoring for total PAHs is required on a monthly basis.

j. PCBs

The permittee shall monitor for the presence of total PCBs, during both dry and wet weather (Outfall 018A and 018B), to help determine the extent to which site-specific BMPs have been successful at eliminating the infiltration of contaminated groundwater into the drainage system. Monitoring for total PCBs is required on a monthly basis.

h. Total Residual Oxidants (TRO)

The discharge through Outfall 018A contains several non-stormwater flows, one of which is steam condensate composed of potable water (which is expected to contain chlorine). Therefore, the draft permit contains a dry weather monthly monitoring requirement for TRO at Outfall 018A, since the potential for discharge of potable water commingled with marine water exists.

i. Whole Effluent Toxicity Testing Requirements

The general bases for the draft permit's whole effluent toxicity testing requirements for Outfalls 018A and 018B are the same as those presented above with regard to the Drainage System Outfalls.

Based on the possibility of toxicity resulting from both stormwater and groundwater, in accordance with EPA national and regional policy, and in accordance with MassDEP policy, the draft permit includes acute and chronic toxicity testing requirements. (See Policy for the Development of Water Quality-Based Permit Limitations for Toxic Pollutants,50 Fed. Reg. 30,784 (July 24, 1985); EPA's *Technical Support Document for Water Quality-Based Toxics Control* on September, 1991; and MassDEP's Implementation Policy for the Control of Toxic Pollutants in Surface Waters (February 23, 1990).

The draft permit provides that the permittee must conduct quarterly marine chronic (and modified acute) WET tests for this outfall. The chronic test may be used to calculate the acute LC_{50} at the 48-hour exposure interval. The permittee shall test the marine species Inland silverside, *Menidia beryllina* and the Sea Urchin, *Arbacia punctulata*. Toxicity test samples shall be collected and tests completed during the calendar quarters ending March 31st, June 30th, September 30th, and December 31st each year. Toxicity test results are to be submitted by the 15th day of the month following the end of the quarter sampled. The tests must be performed in accordance with test procedures and protocols specified in Attachment 1 of the permit.

The draft permit requires both wet and dry weather toxicity monitoring (both Outfall 018A and 081B), since the potential for contaminated groundwater infiltration exists during both dry and wet weather.

After submitting one year and a minimum of four consecutive sets of WET test results, all of which demonstrate no toxicity, the permittee may request a reduction in the WET testing requirements. The permittee is required to continue testing at the frequency specified in the permit until notice is received by certified mail from EPA that the WET testing requirement has been changed.

5. Outfall 020

A feature of the power house intake is the presence of a wide, shallow concrete trough that returns overflow from the intake equalization basin to the Saugus River about 50 feet downstream of the end of the debris/fish return trough. According to the permittee, current operations attempt to minimize the amount of cooling water which spills into this trough.

The 1993 permit authorized the discharge of river water not used in cooling, as well as stormwater and NCCW from rotor testing through this outfall. In June of 2000, the permittee discontinued dry and wet weather discharges through Outfall 020 with the exception of the discharges of unused river water. There is also a potential, however, for groundwater infiltration to this outfall. Therefore, at present, this outfall discharges unused river water potentially mixed with contaminated groundwater infiltration.

The draft permit calls for development and implementation of site-specific BMPs for outfalls which discharge during dry weather and whose effluent potentially includes contaminated groundwater. These BMPs include steps such as pipe lining to eliminate potential infiltration by contaminated groundwater, similar to that completed for the Outfall 014 drainage system. The site-specific BMPs are described in the SWPPP, Part I.B of the permit, and Part V.C.9 of this fact sheet.

Additionally, the draft permit shall require monitoring at Outfall 020 based on the current configuration, which allows commingling of contaminated groundwater for discharge to the receiving water. The results of the samples collected from the Outfall 020 discharge may be used to determine the extent to which the site specific BMPs have eliminated the discharge of contaminated groundwater directly to the receiving water.

a. Flow

The current permit limits average monthly flow from this outfall to 16.9 MGD. This flow limit, however, was based on contributions from several other sources in addition to the discharge of un-used water. DMR data shows no exceedances of the effluent flow limit (all flows have been reported as 16.9 MGD). GE Aviation has not reported flows from Outfall 020 since March 2004. In addition, GE Aviation states that it attempts to operate the pump intake system to minimize overflows to the maximum extent possible. The average monthly flow limit in the current permit shall be retained in the draft permit. The draft permit also specifies reporting of the daily maximum flow through Outfall 020.

b. pH

The current permit requires a pH effluent limitation range of 6.5 – 8.5 SU. DMR data for dry weather discharges reveals no violations, with pH values ranging from 6.8 to 8.49 SU. The draft permit retains the same pH limits to maintain consistency with Massachusetts WQS and federal anti-backsliding requirements.

c. Oil and Grease (O&G)

The draft permit includes a maximum daily O&G limit of 15 mg/L for this outfall to comply with Massachusetts WQS. The WQS require Class SB waters to be free from oil, grease and petrochemicals that produce a visible film on the surface of the water, impart an oily taste to the water or an oily or other undesirable taste to the edible portion of aquatic life, coat the banks or bottom of the water course, or are toxic or otherwise deleterious to aquatic life. 314 CMR 4.05(4)(b)(7). Sampling results submitted by the permittee reveals an O&G concentration of 1 mg/L in the discharge through Outfall 020 (see Attachment I).[56] The draft permit sets 15 mg/L as the maximum daily limit for O&G because 15 mg/L is a recognized level at which many oils produce a visible sheen.

d. TSS

Massachusetts WQS, *see* 314 CMR 4.05(4)(b)(5), require that Class SB waters "be free from floating, suspended and settleable solids in concentrations or combinations that would impair any use assigned to this class, that would cause aesthetically objectionable conditions, or that would impair the benthic biota or degrade the chemical composition of the bottom." Heavy metals and PAHs are readily adsorbed onto particulate matter and the release of these compounds can be controlled, to an extent, by regulating the amount of suspended solids released into the environment.

Sampling results from one wet weather event submitted by the permittee showed a TSS level at Outfall 020 of 26 mg/L.[57] In order to assure compliance with the State's narrative criterion for floating solids, and since metals and other contaminants often adhere to solids, the draft permit sets the following limits on discharges of Total Suspended Solids (TSS) from this outfall: (a) a maximum daily limit of 100 mg/L; and (b) an average monthly limit of 30 mg/L.

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[56] NPDES Permit Renewal Application Revision, June 1998, Section 3 - EPA NPDES Form 2C: Wastewater Discharge Information.

[57] NPDES Permit Renewal Application Revision, June 1998, Section 3 - EPA NPDES Form 2F: Storm Water Discharge Information.

e. VOCs

The permittee shall monitor for total VOCs to help determine whether the site-specific BMPs have eliminated infiltration of contaminated groundwater into the drainage system. Monitoring for total VOCs is required on a quarterly basis.

f. PAHs

The permittee shall monitor for the presence of total PAHs to help determine whether the site-specific BMPs have eliminated infiltration of contaminated groundwater into the drainage system. Monitoring for total PAHs is required on a quarterly basis.

g. PCBs

The permittee shall monitor for the presence of total PCBs to help determine whether the site-specific BMPs have eliminated infiltration of contaminated groundwater into the drainage system. Monitoring for total PCBs is required on a quarterly basis.

h. Metals

Sampling results submitted by the permittee reveal elevated levels of metals in the discharge from several outfalls.[58] Specifically, discharges through Outfall 020 have contained levels of metals exceeding the National Water Quality Chronic Criteria CMCs for arsenic, cadmium, copper, and selenium. High levels of aluminum, cadmium, iron, and antimony were also detected in this discharge. Therefore, the draft permit requires requires monthly monitoring of arsenic, copper, selenium, aluminum, cadmium, iron, and antimony at Outfall 020.

The metals data collected will help determine the effectiveness of the site specific BMPs at eliminating the discharge of contaminated groundwater directly to the receiving water through Outfall 020. Specifically, the BMP to development and implementation a pipe lining project to eliminate potential contaminated groundwater infiltration to this outfall, which discharges non-stormwater flows directly to the receiving water.

i. Whole Effluent Toxicity Testing Requirements

The general bases for the draft permit's whole effluent toxicity testing requirements for Outfall 020 is the same as those presented above with regard to the Drainage System Outfalls.

Based on the possibility of toxicity resulting from both stormwater and groundwater, in accordance with EPA national and regional policy, and in accordance with MassDEP policy, the draft permit includes acute and chronic toxicity testing requirements. (See <u>Policy for the Development of Water Quality-Based Permit Limitations for Toxic</u>

[58] NPDES Permit Renewal Application Revision, June 1998, Section 3 - EPA NPDES Form 2F: Storm Water Discharge Information.

Pollutants,50 Fed. Reg. 30,784 (July 24, 1985); EPA's *Technical Support Document for Water Quality-Based Toxics Control* on September, 1991; and MassDEP's Implementation Policy for the Control of Toxic Pollutants in Surface Waters (February 23, 1990).

The draft permit provides that the permittee must conduct quarterly marine chronic (and modified acute) WET tests for this outfall. The chronic test may be used to calculate the acute LC_{50} at the 48-hour exposure interval. The permittee shall test the marine species Inland silverside, *Menidia beryllina* and the Sea Urchin, *Arbacia punctulata*. Toxicity test samples shall be collected and tests completed during the calendar quarters ending March 31st, June 30th, September 30th, and December 31st each year. Toxicity test results are to be submitted by the 15th day of the month following the end of the quarter sampled. The tests must be performed in accordance with test procedures and protocols specified in Attachment 1 of the permit.

After submitting one year and a minimum of four consecutive sets of WET test results, all of which demonstrate no toxicity, the permittee may request a reduction in the WET testing requirements. The permittee is required to continue testing at the frequency specified in the permit until notice is received by certified mail from EPA that the WET testing requirement has been changed.

6. Outfall 032 - Internal Outfall

Stormwater regularly collects within the secondary containment areas at the jet fuel farm, around tanks, in the truck unloading ramps, and in other areas. Since the approved closing of Outfall 32W in February 2002 (letter from Rachel Becker, GE Aviation, 2/8/2002), stormwater accumulation in these containment areas has reportedly been collected and transferred via underground piping to the CDTS for treatment prior to discharge to the river. The transfer process is manually initiated, allowing the permittee to inspect the containment areas for excessive oil accumulation due potentially to tank, truck, or filter leak or failure. Therefore, this permit requires that any such containment water shall be inspected for evidence of an oil sheen or other contamination prior to such water being routed to the CDTS. In the event that a sheen is observed, the permittee shall eliminate the sheen prior to discharging the water from the containment area to the CDTS, or appropriately dispose of this water off-site.

7. Unauthorized Discharges

a. Outfalls 003 and 005

In the current permit, Outfalls 003 and 005 are emergency discharges, only used in the case of a cooling tower failure. These outfalls are currently sealed and have not been used since 1994.[59] Therefore, discharge through these outfalls is not authorized by the draft permit. Any discharge through these outfalls shall be reported as a bypass, in accordance with Part II.B.4, Standard Conditions.

[59] NPDES Permit Renewal Application, June 1998.

b. Outfall 029 - Gear Plant (Steam Turbine Test Facility)

This outfall is located downstream of Outfalls 014 and 018, the other two large NCCW outfalls, in an area of generally less deep water. The CWIS associated with this facility is located at the end of a long wooden pier that crosses shallow water flats. It pumps cooling water from the edge of the main Saugus River channel and lies in relatively deeper water than the outfall location. Redundant pumps at the CWIS, with a combined design capacity of 57.6 MGD, have not been operated for over 10 years. Therefore, there has not been a discharge of NCCW or other water from this outfall in the last 10 years or more. The permittee plans to demolish the Gear Plant intake and thus eliminate the associated discharge through Outfall 029. Therefore, this permit does not authorize the discharge of NCCW (or any other pollutant) from this outfall.

8. <u>Thermal Discharge Limits (Outfalls 014 & 018)</u>

In developing thermal discharge limits for Outfalls 014 and 018A, EPA must consider applicable technology-based requirements, water quality-based requirements, and any request for a CWA §316(a) variance. As noted above, this segment of the Saugus River is on the MassDEP's 2006 303(d) list of impaired waters for thermal modifications.

a. Technology-Based Requirements

As previously discussed, given the absence of an applicable ELG for the thermal discharge from this facility, the permit writer is authorized under Section 402(a)(1)(B) of the CWA and 40 C.F.R § 125.3 to establish technology-based thermal discharge limits by applying the BAT standard on a case-by-case, BPJ basis.

In setting a BAT effluent limit on a BPJ basis, EPA considers the relative capability of available technological alternatives and seeks to identify the best performing technology for reducing pollutant discharges (i.e., for approaching or achieving the national goal of eliminating the discharge of pollutants). In addition, before determining the BAT, EPA also considers the following factors : (1) the age of the equipment and facilities involved; (2) the process employed; (3) the engineering aspects of the application of various control techniques; (4) process changes; (5) the cost of achieving such effluent reduction; (6) non-water quality environmental impacts (including energy requirements); (7) the appropriate technology for the category or class of point sources of which the applicant is a member based upon all available information; and (8) any unique factors relating to the applicant. *See* 33 U.S.C. § 1314(b)(2)(B); 40 C.F.R. §§125.3(c)(2)(i) and (ii), and 125.3(d)(3). EPA has considered each of these factors in the context of this BPJ determination of the BAT for controlling thermal discharges at GE Aviation.

Although GE Aviation is a manufacturing facility, the power generating capability at the Power Plant, along with the operation of the CWISs and discharge of NCCW, make GE Aviation similar in important ways to steam electric power plants. The generation of power at GE's Power Plant requires some sort of cooling system for condensing the steam used to drive its electrical generation turbines. Therefore, for the purposes of this discussion and analysis, GE Aviation will be compared directly to power plants whose primary function is the generation and transmission of electricity by means of the steam cycle.

"Open-cycle" (or "once-through") cooling systems typically produce the highest levels of thermal discharges (and water withdrawals), as compared to closed-cycle or partially closed-cycle systems. In this case, the entire volume of cooling water (and thus waste heat) is discharged to the receiving water. GE Aviation currently operates with an open-cycle cooling system. "Closed-cycle" cooling systems reduce thermal discharges (and cooling water withdrawals). In a closed-cycle system, cooling water is used to condense the steam, but rather than discharge the heated water, a cooling system is used to remove most of the waste heat from the cooling water so that the water can be reused for additional cooling.

Given that GE Aviation is an existing facility that would require retrofitting to achieve technologically-driven improvements, EPA has looked to the existing steam electric facilities that have achieved the greatest reductions in thermal discharges through technological retrofits. As a general matter, the best performing facilities in terms of reducing thermal discharges at existing open-cycle cooling power plants are those facilities that have converted from open-cycle cooling to closed-cycle cooling using some type of "wet" cooling tower technology. Converting to closed-cycle cooling can reduce heat load to the receiving water by 95% or more.[60] EPA's research has identified a number of facilities that have made this type of technological improvement. See *Draft Permit Determinations Document for Brayton Point Station NPDES Permit*, at pp. 7-37 to 7-38; *Responses to Comments for Brayton Point Station NPDES Permit*, at p. IV-115.[61,62]

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[60] Retrofitting all four generating units at Brayton Point Station in Massachusetts will reduce the heat load to Mount Hope Bay (the receiving water) by approximately 96%. USGenNE. Brayton Point Station 316(a) and 316(b) Demonstration. December 2001.

[61] In the Phase I CWA § 316(b) Rule, EPA determined that entrainment and impingement mortality reductions commensurate with the use of closed-cycle cooling reflect the BTA for *new* facilities with CWISs. *See* 40 C.F.R. Part 125, Subpart I (Phase I CWA § 316(b) Rule).

[62] Although the use of "dry" cooling might achieve an even greater marginal reduction in entrainment and impingement, EPA has not identified a single case of a facility retrofitting from open-cycle cooling to dry cooling. Although EPA is unaware of any technical reason that such a conversion would necessarily be impracticable at all facilities—though it seems likely that it would be infeasible at a larger proportion of existing facilities than would a conversion to wet cooling because of factors such as the greater space needed for dry cooling—it would likely achieve only a small marginal additional reduction over the high end of the reduction range for wet cooling towers and would be significantly more expensive. In the absence of examples of such a conversion ever having been implemented, EPA is not prepared to determine that converting to dry cooling is the required BTA for an existing facility like the GE Aviation plant. It should also be noted that in developing the Phase I Rule, EPA similarly declined to mandate dry cooling as the required BTA for new facilities, while recognizing that dry cooling was a *permissible* technology that would satisfy § 316(b) if a facility chose to install it.

EPA has determined that closed-cycle cooling using wet, mechanical draft cooling towers would be the BAT for the reduction of thermal discharges at GE Aviation. As part of its determination of the BTA for GE Aviation's CWISs under CWA § 316(b), EPA evaluated alternative cooling system technologies in light of their feasibility and the various factors listed above (e.g., cost, engineering considerations). *See* Attachment J. EPA relies upon and incorporates by reference that analysis here, aside from the consideration of comparative cost/benefit analysis, which does not apply for setting BAT discharge limits. *See. e.g., In re Dominion Brayton* Point, 12 E.A.D. at 546. At GE Aviation, with a wet cooling tower system, the remaining discharge volume (consisting of cooling tower blowdown) would be small enough that it could be discharged directly to the Lynn Municipal Sewer System, which would eliminate the discharge of cooling water from the Power Plant (Outfall 018) and/or Test Cell (Outfall 014) to the receiving water.

b. Water Quality-Based Requirements

Water quality-based requirements would be based on the Massachusetts WQS's numeric and narrative temperature criteria, designated and existing uses, and antidegradation and mixing zone policies. The State's WQS classify the Saugus River as a Class SB water and, accordingly, prohibit discharges from causing (a) ambient water temperatures to exceed either a daily maximum of 85°F (29.4°C) or a maximum daily mean of 80°F (26.7°C), or (c) a rise in temperature due to a discharge of more than 1.5°F (0.8° C) during the summer months (July through September) or 4° F (2.2° C) during the winter months (October through June). In addition, the WQS would require that thermal discharges be limited so as to allow the designated uses for SB waters, including the provision of good quality fish habitat and a recreational fishing resource, to be attained. At GE Aviation, technology-based thermal limits based on retrofitting either or both the Power Plant and Test Cell operations with closed-cycle cooling would result in more stringent limits (reducing heat load by 95% or more) than would be required by water quality-based thermal limits.

c. CWA § 316(a) Variance-Based Limits

Under 40 CFR Part 125 Subpart H, discussed in Section V.A.3 of this fact sheet, thermal discharge effluent limitations or standards established in permits may be less stringent than those required by otherwise applicable standards "if the discharger demonstrates to the satisfaction of the director that such [otherwise required] effluent limitations are more stringent than necessary to assure the protection and propagation of a balanced, indigenous community of shellfish, fish and wildlife in and on the body of water into which the discharge is made" (BIP). 40 CFR § 125.73(a). *See also* 33 U.S.C. § 1326(a); 40 C.F.R. § 125.70. If the applicant makes this demonstration to the satisfaction of EPA (or if appropriate, the State), then the permitting authority may issue the permit with less stringent variance-based limitations that are sufficient to assure the protection and propagation of the BIP. Conversely, if the demonstration does not adequately support the requested variance-based thermal discharge limits, then the permitting authority shall deny the requested variance. In that case, the permitting authority may either impose different variance-based limits that it determines are justified by the permit record (i.e., that will assure the protection and propagation of the BIP), or impose limits based on the otherwise applicable technology-based and water quality-based requirements.

In the existing GE permit, issued in 1993, EPA concluded that limits less stringent than required by State WQS or technology-based requirements would assure the protection and propagation of the BIP in the Saugus River. The existing permit allows a maximum daily thermal discharge of 95ºF and an average monthly thermal discharge of 90ºF from Outfalls 018 and 014, based on a CWA § 316(a) variance. In its application to renew this permit, GE did not specifically request a § 316(a) variance for the thermal discharge from outfalls 014 and 018. However, the permittee did not request any alteration of existing permit limits, which EPA interprets to be a request for an renewal of the existing § 316(a) variance. The availability of new information since the last permit decision has prompted EPA to re-evaluate the current § 316(a)-based permit limits to ensure the BIP continues to be protected.

d. Determination under CWA § 316(a)

The draft permit's thermal discharge limits are based on a § 316(a) variance to allow GE to discharge heat to the Saugus River in a manner that will exceed the MA WQS and federal technology-based limits under the BAT standard, but will nonetheless assure the protection and propagation of the BIP. Since the 1993 "tentative decision that thermal discharges satisfy the 316(a) provision" (1993 Fact Sheet, p.10), EPA has received additional monitoring and modeling studies pertaining to GE's thermal discharges.[63] In addition, the status of several resident and anadromous fish species in the Saugus River has changed.[64] This additional information prompted EPA to re-evaluate whether the currently permitted 95˚F maximum discharge limit continues to assure the protection and propagation of the BIP of the Saugus River.

One important consideration is that the existing limits in the 1993 permit were based on a § 316(a) variance that was, at least in part, supported by near-field modeling from 1993. However, this near-field modeling assumed maximum discharge temperatures of 91˚F and 90˚F at Outfalls 018 and 014, respectively, both of which are less than the currently permitted maximum discharge temperature of 95˚F.

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[63] Wheelabrator Saugus (WS), an upstream facility, contracted with Applied Science Associates (ASA) to develop a multi-layer, three-dimensional hydrothermal model to predict the duration and extent of the combined thermal impacts in the Saugus River under varying thermal discharge scenarios from both WS and GE Aviation. Results are provided in ASA's 2004 Report entitled Temperature Mapping and Hydrothermal Model Calibration of the Lower Saugus River Estuary and Environmental Strategic Systems' 2005 Report entitled Narrative Summary: Response to EPA request for additional Modeling Results Presentation. EPA also reviewed the thermal plume survey and far- and near-field modeling that GE Aviation submitted for the last permit issuance (Thermography Study General Electric River Works Facility and Thermal/Biological Impact Analysis – Outfall 014 General Electric River Works Facility).

[64] Both rainbow smelt and river herring have experienced declining populations in recent years. In fact, both rainbow smelt and river herring are listed as Species of Concern by the National Oceanographic and Atmospheric Administration (NOAA), and the Massachusetts Division of Marine Fisheries (MassDMF) provides further protection for river herring through a moratorium on the harvest, possession, and sale of river herring extended through 2011.

Another important consideration is that EPA recently re-issued the NPDES permit for Wheelabrator Saugus (WS), an upstream facility[65] with a year-round maximum effluent temperature limit of 90°F based on a § 316(a) variance. WS's permit application requested an increase in the maximum daily temperature limit from 90°F to 95°F (the current limit at GE). EPA considered monitoring data for thermal effluents in the Saugus River,[66] a predictive model evaluating thermal effluent from both WS and GE,[67] and pertinent life history and thermal tolerance data for several fish species that are commercially important (winter flounder) or recreationally important (striped bass), or that have experienced population declines that have prompted regulators to impose fishing moratoria to safeguard remaining populations (e.g., alewife).[68] EPA denied WS's request for an increase in the maximum temperature limit based on the Agency's conclusion that discharge temperatures in excess of 90°F would not be protective of the BIP. In particular, EPA concluded that winter flounder, alewife, and striped bass juveniles may experience thermally-induced sub-lethal and lethal adverse impacts at temperatures between 86° and 90°F, and that temperatures greater than 90°F would create completely unsuitable habitat. *See* WS fact sheet, p. 17, and WS RTC, Response to General Comment, p.6.

Thermal monitoring in August 2001 demonstrated that river temperatures in the vicinity of GE Outfalls 014 and 018 can exceed 86°F around low slack tide during the hottest months of the year (see Figures 2.11 to 2.15 in ASA 2004 Report). The maximum daily discharge temperature from Outfall 018 during August 2001 was 95°F, which suggests that the thermal discharge, at the currently permitted maximum temperature, may contribute to river temperatures at which several species exhibit sub-lethal and lethal effects. Consistent with the analysis presented in the WS fact sheet and RTC, EPA concludes that a thermal discharge of 95°F would, under certain conditions, raise river temperatures to levels that pose a risk of significant adverse thermal impacts to at least 3 important resident species in the Saugus River (winter flounder, alewife, and striped bass). As a result, EPA has determined that a thermal discharge limit of 95°F would not reasonably assure the protection and propagation of the BIP as required by CWA § 316(a). EPA has reproduced the relevant portions of the analysis from the WS permit record as Attachment K to this fact sheet and incorporates that analysis herein by this reference.

Based on its review of thermal monitoring reflecting the GE Aviation discharge, EPA is granting GE Aviation a CWA § 316(a) variance, but is specifying a more stringent maximum daily temperature limit of 90°F in the draft permit, as compared to the 95°F maximum daily limit in the current permit. As explained above, EPA concludes that a thermal discharge 95°F would not assure the protection and propagation of the BIP because it would pose a risk of adverse thermal impacts to several important species that

[65] Fact Sheet, Wheelabrator Saugus MA
[66] ASA 2004
[67] EES 2005
[68] See Fact Sheet, Wheelabrator Saugus MA, Response to Comments Wheelabrator Saugus MA, and references therein.

are part of the BIP of the Saugus River. A maximum daily temperature limit of 90˚F at Outfalls 014 and 018 is more consistent with the near-field modeling that supported the 1993 § 316(a) variance in the current permit. Modeling results from 1993 demonstrate that maximum river temperatures would be expected to be more protective (i.e., less than 86˚F) at discharge temperatures of 90° to 91˚F.[69] Furthermore, temperatures in the river would not be expected to approach this range except during the half-hour period surrounding slack tide at certain times during the year. However, conditions that may result in potentially harmful temperatures are expected to occur only during the half-hour time frame surrounding low slack tide on the hottest days of the year (e.g., during July and August), and modeling suggests that only a small portion of the river would reach these maximum temperatures. EPA concludes that a 90˚F effluent limit poses a threat of only a limited thermal impact to the BIP and, as a result, will assure the BIP's protection and propagation.

It should also be noted that, based on a review of DMR data, the Outfall 018 effluent has not exceeded 90ºF since August 2002, and the Outfall 014 effluent has not exceeded 90ºF on any occasion (during the time period of October 1998 through July 2008). Therefore, EPA does not anticipate that major operational changes would result from the more stringent thermal limits included in the draft permit.

The Massachusetts WQS specify that variance-based discharge limits set in compliance with CWA § 316(a) are deemed to comply with 314 CMR 4.00. Specifically, 314 CMR 4.05(4)(b)2.c states:

> … alternative effluent limitations established in connection with a variance for a thermal discharge issued under 33 U.S.C. § 1251 (FWPCA, § 316(a)) and 314 CMR 3.00 are in compliance with 314 CMR 4.00. As required by 33 U.S.C. § 1251 (FWPCA, § 316(a)) and 314 CMR 3.00, for permit and variance renewal, the applicant must demonstrate that alternative effluent limitations continue to comply with the variance standard for thermal discharges ….

Because EPA has concluded that the thermal discharge limits in the draft permit comply with CWA § 316(a), the agency also conclude that these limits comply with the Massachusetts WQS at 314 CMR 4.00. EPA will continue to coordinate review of these issues, including with regard to the consideration of public comments. Ultimately, the permit will be subject to certification by the State under CWA § 401(a)(1) that its conditions comply with the WQS.[70]

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[69] According to near-field modeling at permitted discharge flows and an ambient river temperature of 75˚F, a maximum river temperatures of 84.5˚F would be expected with a maximum discharge temperature of 91˚F from Outfall 018, and a maximum river temperature of 84.4˚F would be expected at a maximum discharge temperature of 90˚F at Outfall 014 (Table 4-4 ENSR 1993a and Table 4-2 ENSR 1993b).

[70] The Massachusetts WQS include antidegradation requirements that protect the existing quality of the State's waters in a variety of ways, including provisions that provide special protections for waters of especially high quality. *See* 314 CMR 4.04. *See also* 40 C.F.R. § 131.12. State antidegradation policy and implementation methods must be "consistent with" CWA § 316(a). 40 C.F.R. § 131.12(a)(4). *See also* 33 U.S.C. § 1313(g) (State water quality standards "relating to heat" must be "consistent with" CWA §

e. Temperature Limits and Anti-Backsliding

The draft permit complies with the the CWA's anti-backsliding requirements, set forth in Section 402(o) of the CWA and 40 C.F.R. §122.44(l). These requirements generally bar the relaxation of prior permit limits, subject to certain exceptions. The draft permit's thermal discharge limits are, however, *more stringent* than the current permit's limits. Second, the anti-backsliding prohibitions apply only to the renewal, reissuance, or modification of technology-based or water quality-based effluent limits. They do not apply to the thermal discharge limits in the existing permit, which were based on a CWA § 316(a) variance.

9. Stormwater Pollution Prevention Plan (SWPPP)

This facility engages in activities which could result in the discharge of pollutants to waters of the United States either directly or indirectly through stormwater runoff. These operations include at least one of the following in an area potentially exposed to precipitation or stormwater: material storage, in-facility material transfer, material processing, and material handling, or loading and unloading. To control the activities/operations, which could contribute pollutants to waters of the United States, potentially violating the State's WQS, the draft permit requires the facility to develop, implement, and maintain a Stormwater Pollution Prevention Plan (SWPPP) containing best management practices (BMPs) appropriate for this specific facility. *See* Sections 304(e) and 402(a)(1) of the CWA and 40 CFR §122.44(k). Specifically, storage areas for aircraft engine parts are an example of material storage operations at this facility that should be included in the SWPPP. The collection of stormwater in secondary containment areas is an example of a material handling operation to be included in the SWPPP.

The goal of the SWPPP is to reduce, or prevent, the discharge of pollutants through the stormwater system. The SWPPP serves to document the selection, design and installation of control measures, including BMPs. Additionally, the SWPPP requirements in the draft permit are intended to provide a systematic approach by which the permittee shall at all times, properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the permittee to achieve compliance with the conditions of the permit. The SWPPP shall be prepared in

316(a)). There may, of course, be more than one way that a state could design its thermal standards and antidegradation requirements to be "consistent with" CWA § 316(a). In any event, the draft permit proposes to require a reduced volume of thermal effluent, a lower maximum temperature limit of 90°F, and a reduced volume and velocity of cooling water withdrawals coupled with an improved screening system to reduce entrainment and impingement. These requirements are as stringent as, or more stringent than, the limits in the current permit and should yield substantial environmental improvements. EPA has coordinated with MassDEP on the development of this permit and expects that the MassDEP will find, consistent with EPA's assessment, that the limits proposed in the draft permit will satisfy the State's antidegradation requirements. EPA concludes that the draft permit will not result in any degradation of the water quality in the Saugus River and will, instead, enhance the protection of the river and its aquatic life.

accordance with good engineering practices and identify potential sources of pollutants, which may reasonably be expected to affect the quality of stormwater discharges associated with industrial activity from the facility. The SWPPP, upon implementation, will become a non-numerical effluent limitation or other condition that supports any numerical effluent limitations in the draft permit. Consequently, the SWPPP is equally as enforceable as the numerical limits.

The SWPPP development process involves the following four main steps:

(1) Form a team of qualified facility personnel who will be responsible for developing and updating the SWPPP and assisting the plant manager in its implementation;
(2) Assess the potential stormwater pollution sources;
(3) Select and implement appropriate management practices and controls for these potential pollution sources;
(4) Periodically reevaluate the effectiveness of the SWPPP in preventing stormwater contamination and in complying with the terms and conditions of the draft permit;

Additionally, the permittee shall develop and implement a plan for controlling infiltration of groundwater and inflow of non-allowable non-stormwater flows to the Drainage System. The plan shall be submitted to EPA and MassDEP within six (6) months of the effective date of this permit. The plan shall include an ongoing program to identify and remove sources of infiltration and inflow, and an inflow identification and control program that focuses on the disconnection and redirection of non-allowable non-stormwater flows. A summary report of all actions taken to minimize infiltration and inflow during the previous calendar year shall be submitted to EPA and MassDEP annually, by March 31st. The summary report shall, at a minimum, include: a map and a description of inspection and maintenance activities conducted and corrective actions taken during the previous year; a map with areas identified for infiltration and inflow investigation/action in the coming year; and a calculation of the annual average infiltration and inflow and the maximum monthly infiltration and inflow for the reporting year.

Additionally, the draft permit requires development and implementation of the following site-specific BMPs, at a minimum:

a. The permittee shall eliminate all discharges during dry weather[71] conditions through the Drainage System Outfall vaults (Outfall Serial Numbers 001, 007, 010, 019, 027B, 028, 030, and 031). To achieve this, the permittee shall develop and implement the following BMPs, at a minimum:
   i. The Drainage System Outfall gates shall only open during wet weather[71], after the first flush of pollutants (along with non-allowable non-stormwater flows in the vaults) has been transferred to the CDTS for treatment.

[71] For the purposes of this permit, at any time weather conditions are considered either "wet weather" conditions or "dry weather" conditions. Wet weather is defined as any time period that begins with an hour that received 0.1 inches or more of rainfall (or equivalent precipitation) and continues until two hours past the last hour that precipitation is recorded. Dry weather is any time which is not wet weather.

ii. The Drainage System Outfall gates shall remain closed, and without leaks, during all periods of dry weather.

b. The permittee shall eliminate, to the maximum extent practicable, the discharge of non-stormwater flows (other than "allowable non-stormwater flows")[72] either alone or commingled with stormwater directly to the receiving water. To achieve these two objectives, the permittee shall implement all practicable steps including, but not limited to, the following BMPs:

i. Reconfigure the vault system to ensure that during dry weather all flows in the Drainage System are transferred to the CDTS for treatment prior to discharge.

ii. Operate the Drainage System vaults, outfalls and pumps so that the first-flush of stormwater flow (first 30 minutes of stormwater flow) commingled with non-stormwater flow (including contaminated groundwater) is not discharged directly to the Saugus River and is, instead, conveyed to the CDTS for treatment. If the permittee determines that this is presently infeasible due to capacity limitations of the system, then the permittee must evaluate what steps would be needed to make it feasible, including increasing pumping capacity, storage capacity and/or the treatment capacity of the CDTS, or reducing sources of infiltration to the system to free up existing capacity. Such evaluation must be submitted to EPA and the MassDEP for review in an annual report, due by March 31st each year.

iii. Manually operate the transfer pumps in all eight vaults during the days leading up to a significant storm event to reduce the non-stormwater flows to the low level in the vaults and, as a result, to help eliminate, to the maximum extent practicable, the amount of non-allowable non-stormwater flows that are commingled with stormwater flows in the Drainage System vaults and discharged to the Saugus River from the Drainage System Outfalls.

iv. Evaluate the feasibility of operating the Drainage System Outfall vault gates so that they remain closed when the water reaches the high-high level in the vault, and the pumps continue to transfer the water to the CDTS for treatment, to the maximum extent practicable.

v. Isolate each source of non-allowable non-stormwater flow, to the maximum extent practicable, and re-pipe it directly to the CDTS for treatment.

c. During wet weather conditions, during periods leading up to forecasted wet weather conditions, and whenever any outfall gate is open, eliminate, to the maximum extent practicable, the generation of non-allowable non-stormwater flows that would be discharged from the Drainage System Outfalls (Outfall Serial Numbers 001, 007, 010, 019, 027B, 028, 030, and 031). To satisfy this requirement, the following discharges are prohibited:

i. Intermittent discharges during wet weather and during periods leading up to forecasted wet weather conditions. Intermittent discharges consist of: de-aerator storage tanks, building 64-A sump, test cell washdown, stormwater collected in secondary containment dikes and truck loading areas, hydrant testing, sprinkler system testing water, stormwater dye tracing.

ii. Any discharges from cleaning processes during wet weather, and during periods leading up to forecasted wet weather conditions. Such cleaning processes

[72] "Non-stormwater flows other than 'allowable non-stormwater flows'" are herein referred to as "non-allowable non-stormwater flows."

include, at a minimum, drain cleanouts (including drain system cleaning) and roof mounted air conditioner washing (no detergent).

iii. Any discharge from routine maintenance that generates wastewater discharges during wet weather and during periods leading up to forecasted wet weather conditions, to the maximum extent practicable. Routine maintenance consists of: boiler startup/soot blower drains/boiler draining for maintenance (intermittent), boiler filter backwash, ion exchange regeneration and backwash.

iv. Any discharge from any remaining non-allowable non-stormwater discharge flows during wet weather and during periods leading up to forecasted wet weather conditions, to the maximum extent practicable. These non-allowable non-stormwater flows include, at a minimum, potable water used upon NCCW system failure, steam conduit water, excavation dewatering, contaminated groundwater, cooling water (not including the discharges of NCCW through Outfalls 014 and 018), condensate blowdown, steam conduit blowdown, boiler blowdown, and cooling tower blowdown.

d. In the event of any generation of nonallowable non-stormwater flows during wet weather conditions, or during periods leading up to forecasted wet weather conditions (as identified immediately above in Parts i-v), the permittee shall record the type of flow generated, the corresponding weather conditions, the reason the flow was generated during wet weather conditions, and the fate of the non-stormwater flow in question. The permittee shall submit this information to EPA-NE in an annual report, due by March 31st each year.

e. Eliminate the discharge of contaminated groundwater infiltration to the receiving water at Outfalls 014, 018, and 020. At a minimum, the permittee shall develop and implement the following site-specific BMPs:

i. Inspect outfall pipelines to determine the extent of contaminated groundwater infiltration to all outfalls which discharge directly to the receiving water, and upgrade or replace any leaking pipelines;

ii. Upgrade pipe lining integrity at pipes contributing to outfalls which are expected to discharge contaminated groundwater infiltration directly to the receiving water. The lining of the systems shall include complete internal sand blasting of the pipe, complete sealing of the internal structure with applied liquid sealant, installation of fiberglass type material, and a final layer of liquid finish coating;

iii. Or if pipeline rehabilitation is infeasible, develop and implement a plan for pipeline replacement.

iv. Provide an annual report on the progress of the pipe rehabilitation and replacement until the permittee certifies that no groundwater is discharged through Outfalls 014, 018, or 020. The annual report is due by March 31st each year.

f. Inspect all stormwater collected within the secondary containment areas at the jet fuel farm, around tanks, in the truck unloading ramps, in the Outfall 032 drainage area, and from other areas for evidence of an oil sheen or other contamination prior to such water being routed to the CDTS. In the event that a sheen is observed, the permittee shall eliminate the sheen prior to discharging the water from the containment area or dispose of the water offsite.

g. Perform regular cleaning of the Drainage System pipelines. Dispose of all solids offsite which are accumulated as a result of the cleaning. Minimize the amount of solids left behind in the storm drains and dispose of all collected solids off-site in a manner that complies with federal, State and local laws, regulations and ordinances. Ensure all drainage system cleaning water is disposed of offsite or goes directly to the CDTS for treatment.
h. Ensure the sonic sensor in each outfall vault is operated normally so that the water level in the skimming chamber is never lower than the baffle designed to retain floating material for skimming. The permittee shall report any instances when this is not the case to EPA-NE on an annual basis.
i. Develop and implement a written schedule for inspection and cleaning of all oil/water separators at each Drainage System Outfall vault on a regular basis.
j. Prior to washing roof mounted air conditioner (AC) units, inspect each AC unit for the presence of any visible oil and grease spots or spills. If any such oil and grease is found, manually remove according to normal spill clean-up protocol before any spray washing begins.
k. Containerize any wash water containing detergent and remove offsite for subsequent treatment or disposal.
l. Discharge of any water containing additives (except cooling water authorized for discharge through Outfall 018 or 014) is prohibited. Transfer any discharge containing additives (except cooling water authorized for discharge through Outfall 018 or 014) to the CDTS for treatment.
m. BMPs consistent with the sector specific BMPs included in Sector AB (Transportation equipment, industrial or commercial machinery) and Sector O (Steam Electric Generating Facilities) of the MSGP.

10. <u>Section 316(b) determination</u>

For this permit, EPA is making a 316(b) determination for this facility on a BPJ basis. EPA has considered the design, construction, and capacity of the existing CWISs, improvements proposed by GE Aviation, available technologies, and potential adverse environmental impacts and determined that the following measures represent BTA. This determination is set forth in Attachment J, *Assessment of Cooling Water Intake Structure (CWIS) Technologies and Determination of Best Available Technology (BTA) under Section 316(b)*, to this fact sheet. The draft permit at Part I.C requires the facility to implement changes to the current CWISs to reflect the BTA to minimize the adverse environmental impacts associated with impingement and entrainment.

a. Power Plant CWIS

To minimize impingement mortality, the permittee shall reduce the through-screen velocity at any new or existing screening system to a level no greater than 0.5 fps.

To minimize entrainment, the permittee shall either (a) maintain a year-round monthly average intake flow of 28.7 MGD, commensurate with a 20% reduction in average monthly flow from the current permit; *and* install and operate a fine mesh wedgewire screen with a slot or mesh size no greater than 0.5 mm and a pressurized system to clear debris from the screens; *or* (b) maintain a year-round maximum daily intake flow commensurate with the operation of a closed-cycle cooling system.

b. Test Cell CWIS

To minimize impingement, the permittee shall improve the existing coarse mesh traveling screen with new fiberglass fish lifting buckets, a low pressure spraywash, separate fish and debris return troughs, and a new return trough that avoids high elevation drops and 90-degree turns, and that returns fish to a location that minimizes potential for re-impingement and is submerged at all tidal stages.

To minimize entrainment, the permittee shall operate the CWIS with an average monthly limit of 5 MGD from March 1 to July 31 and an average monthly limit of 27 MGD from August 1 to February 28.

11. Biological Monitoring

The permit's monitoring requirements have been established to yield data representative of the facility's pollutant discharges and CWIS operations under the authority of Sections 308(a) and 402(a)(2) of the CWA and consistent with 40 C.F.R. §§ 122.41 (j), 122.43(a), 122.44(i) and 122.48.

EPA has determined on a site-specific, BPJ basis that the requirements in Part I.C of the draft permit will ensure that the facility's CWISs reflect the BTA for this specific facility and will minimize entrainment and impingement of all life stages of fish. The draft permit at Part I.D requires monitoring impingement and entrainment of aquatic organisms to confirm EPA's evaluation of the likely environmental impact on the aquatic community of the Saugus River resulting from the design and operational changes to the facility's CWISs.

The draft permit at Part I.A. requires effluent monitoring during wet weather events to determine if the potential discharge of contaminated groundwater infiltration could result in the discharge of potentially harmful levels of metals, polychlorinated biphenyls (PCBs), or polycyclic aromatic hydrocarbons (PAHs) from the facility's drainage outfalls. In support of this effluent monitoring, EPA has proposed a limited bioaccumulation survey using the blue mussel (*Mytilus edulis*). Mussels are particularly suited for monitoring water quality because contaminant levels in their tissue respond to changes in ambient environmental levels and accumulate with little metabolic transformation. Since 1986, NOAA's Mussel Watch Program has used the bioaccumulation properties of mussels and other shellfish in a long-term ecosystem monitoring program to assess contamination of the coastal zone on a national scale.[73] EPA's *Technical Support Document for Water Quality-based Toxics Control*

[73] Kimbrough, KL, WE Johnson, GG Lauenstein, JD Christensen, DA Apeti. 2008. An Assessment of Two Decades of Contaminant Monitoring in the Nation's Coastal Zone. Silver Spring, MD. NOAA Technical Memorandum NOS NCCOS 74. 105 pp.

recommends the use of biological assessments as a method to detect the aggregate effect of impacts upon an aquatic community, including identifying where site-specific criteria modifications may be needed to protect a waterbody, and in evaluating the effectiveness and documenting the biological benefits of pollution controls in the receiving water (Section 1.4.1, p. 18-19). The results from the mussel bioaccumulation study will provide valuable information on the potential biological impacts resulting from the discharge of contaminated groundwater at GE Aviation and will support future evaluations of the effectiveness of the proposed requirements to minimize the discharge of non-allowable, non-stormwater discharges.

The biological monitoring studies proposed in the draft permit are reasonable and appropriate in light of the need to gather data to ensure that the permit, and future renewals of it, will comply with the CWA and the Magnuson-Stevens Fishery Conservation and Management Act, 16 U.S.C. §§ 1801, et. seq.

VI. ENDANGERED SPECIES ACT (ESA)

Section 7(a) of the Endangered Species Act of 1973, as amended (ESA), grants authority to and imposes requirements upon Federal agencies regarding the conservation of endangered and threatened species of fish, wildlife, or plants ("listed species"), and the habitat of such species that has been designated as critical ("critical habitat"). The ESA requires Federal agencies, in consultation with and with the assistance of the Secretary of Interior, to insure that any action that they authorize, fund, or carry out, in the United States or upon the high seas, is not likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of critical habitat. The United States Fish and Wildlife Service (USFWS) typically administers Section 7 consultations for birds and terrestrial and freshwater aquatic species, while the National Marine Fisheries Service (NMFS) typically administers Section 7 consultations for marine species and anadromous fish.

EPA has reviewed the listing of federal endangered or threatened species of fish, wildlife, and plants to see if any such listed species might potentially be impacted by the reissuance of this NPDES permit and has not found any such listed species. Upon review of the current endangered and threatened species in the area, EPA has determined that there are no listed species expected to be present in the vicinity of the outfalls or CWISs of this Facility. Therefore, EPA does not need to consult with NMFS or USFWS under the ESA because EPA's permitting action will not affect listed species.

During the public comment period, EPA has provided a copy of the draft permit and fact sheet to both NMFS and USFWS.

VII. ESSENTIAL FISH HABITAT (EFH)

Under the 1996 Amendments (PL 104-267) to the Magnuson-Stevens Fishery Conservation and Management Act (16 U.S.C. § 1801 et seq. (1998)), EPA is required to consult with the National Marine Fisheries Services (NMFS) if EPA's action or proposed actions that it funds, permits, or undertakes, may adversely impact essential fish habitat such as: waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity (16 U.S.C. § 1802 (10)). Adversely impact means any impact which reduces the quality and/or quantity of EFH (50 C.F.R. § 600.910(a)). Adverse effects may include direct (e.g., contamination or physical disruption), indirect (e.g., loss of prey, reduction in species' fecundity), site-specific or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions.

EFH is only designated for species for which federal fisheries management plans exist (16 U.S.C. § 1855(b) (1) (A)). EFH designations for New England were approved by the U.S. Department of Commerce on March 3, 1999. The following is a list of the EFH species and applicable life stage(s) for Massachusetts Bay, to which the Saugus River discharges:

Species	**Eggs**	**Larvae**	**Juveniles**	**Adults**
Atlantic cod (*Gadus morhua*)	X	X	X	X
haddock (*Melanogrammus aeglefinus*)	X	X		
Pollock (*Pollachius virens*)	X	X	X	X
Whiting (*Merluccius bilinearis*)	X	X	X	X
Red hake (*Urophycis chuss*)	X	X	X	X
white hake (*Urophycis tenuis*)	X	X	X	X
Winter flounder (*Pseudopleuronectes americanus*)	X	X	X	X
yellowtail flounder (*Pleuronectes ferruginea*)	X	X	X	X
windowpane flounder (*Scopthalmus aquosus*)	X	X	X	X
American plaice (*Hippoglossoides platessoides*)	X	X	X	X
ocean pout (*Macrozoarces americanus*)	X	X	X	X
Atlantic halibut (*Hippoglossus hippoglossus*)	X	X	X	X
Atlantic sea scallop (*Placopecten magellanicus*)	X	X	X	X
Atlantic sea herring (*Clupea harengus*)		X	X	X
Long finned squid (*Loligo pealei*)	n/a	n/a	X	X
Short finned squid (*Illex illecebrosus*)	n/a	n/a	X	X
Atlantic butterfish (*Peprilus triacanthus*)	X	X	X	X
Atlantic mackerel (*Scomber scombrus*)	X	X	X	X

summer flounder (*Paralicthys dentatus*)				X
Scup (*Stenotomus chrysops*)	n/a	n/a	X	X
black sea bass (*Centropristus striata*)	n/a		X	X
Surf clam (*Spisula solidissima*)	n/a	n/a	X	X
bluefin tuna (*Thunnus thynnus*)			X	X

A review of past studies indicates that multiple life stages of several of these species are present in the Saugus River in the vicinity of the discharge. Refer to **Tables 1 through 4.** Therefore, EPA has determined that this facility's operation has the potential to adversely affect EFH species in the Saugus River. These effects may be direct or indirect. For example, entrainment or impingement of an EFH species by the facility would be a direct effect. Harm to species that are not EFH species themselves, but serve as prey species for EFH species, could indirectly harm the EFH species. Here, anadromous fish species such as alewife and American shad enter the Saugus River from Massachusetts Bay and move past the facility to spawn upstream. These fish may be affected by the facility's thermal discharge plumes and/or its the cooling water intake operations. They are not EFH species, but may be selected as prey by EFH species. If facility operations affect these prey species, they may also indirectly affect EFH species through loss of prey.

Based on the available information, EPA has concluded that the limits and conditions contained in this draft permit will minimize adverse effects to EFH species. These conditions are discussed in detail above. They include the following: requirements for reduced intake flow to minimize potential adverse impacts from entrainment and impingement, particularly as it occurs during periods of peak larval density; installation of upgraded screening systems to reduce entrainment and maximize the survival of any organisms impinged on the new screens, including requirements for low through-screen velocity; and improvements to the fish return system to minimize potential adverse impacts from impingement associated with the CWIS. Additionally, the permit's limits on thermal discharges will assure the protection and propagation of the Saugus River's BIP, and the other effluent limits in the permit will satisfy technology-based requirements and Massachusetts WQS.

EPA believes the draft permit adequately protects EFH species, and therefore additional mitigation is not warranted. EPA will consult with NMFS regarding this draft permit and will send NMFS a copy of the draft permit and fact sheet.

VIII. MONITORING AND REPORTING

The effluent monitoring requirements have been established to yield data representative of the discharge under authority of Section 308 (a) of the CWA in accordance with 40 CFR §§122.41 (j), 122.44 (l), and 122.48.

The draft permit includes new provisions related to Discharge Monitoring Report (DMR) submittals to EPA and the State. The draft permit requires that, no later than one year after the effective date of the permit, the permittee submit all monitoring data and other reports required by the permit to EPA using NetDMR, unless the permittee is able to demonstrate a reasonable basis, such as technical or administrative infeasibility, that precludes the use of NetDMR for submitting DMRs and reports ("opt-out request").

In the interim (until one year from the effective date of the permit), the permittee may either submit monitoring data and other reports to EPA in hard copy form, or report electronically using NetDMR.

NetDMR is a national web-based tool for regulated Clean Water Act permittees to submit discharge monitoring reports (DMRs) electronically via a secure Internet application to U.S. EPA through the Environmental Information Exchange Network. NetDMR allows participants to discontinue mailing in hard copy forms under 40 CFR § 122.41 and § 403.12. NetDMR is accessed from the following url: http://www.epa.gov/netdmr. Further information about NetDMR, including contacts for EPA Region 1, is provided on this website.

EPA currently conducts free training on the use of NetDMR, and anticipates that the availability of this training will continue to assist permittees with the transition to use of NetDMR. To participate in upcoming trainings, visit http://www.epa.gov/netdmr for contact information for Massachusetts.

The draft permit requires the permittee to report monitoring results obtained during each calendar month using NetDMR, no later than the 15th day of the month following the completed reporting period. All reports required under the permit shall be submitted to EPA as an electronic attachment to the DMR. Once a permittee begins submitting reports using NetDMR, it will no longer be required to submit hard copies of DMRs or other reports to EPA and will no longer be required to submit hard copies of DMRs to MassDEP. However, permittees must continue to send hard copies of reports other than DMRs to MassDEP until further notice from MassDEP.

The draft permit also includes an "opt-out" request process. Permittees who believe they can not use NetDMR due to technical or administrative infeasibilities, or other logical reasons, must demonstrate the reasonable basis that precludes the use of NetDMR. These permittees must submit the justification, in writing, to EPA at least sixty (60) days prior to the date the facility would otherwise be required to begin using NetDMR. Opt-outs become effective upon the date of written approval by EPA and are valid for twelve (12) months from the date of EPA approval. The opt-outs expire at the end of this twelve (12) month period. Upon expiration, the permittee must submit DMRs and reports to EPA using NetDMR, unless the permittee submits a renewed opt-out request sixty (60) days prior to expiration of its opt-out, and such a request is approved by EPA.

Until electronic reporting using NetDMR begins, or for those permittees that receive written approval from EPA to continue to submit hard copies of DMRs, the draft permit requires that submittal of DMRs and other reports required by the permit continue in hard copy format. Hard copies of DMRs must be postmarked no later than the 15th day of the month following the completed reporting period.

IX. STATE CERTIFICATION REQUIREMENTS

EPA may not issue a permit unless the State Water Pollution Control Agency with jurisdiction over the receiving waters certifies that the effluent limitations contained in the permit are stringent enough to assure that the discharge will not cause the receiving water to violate State Water Quality Standards. The staff of the Massachusetts Department of Environmental Protection has reviewed the draft permit and advised EPA that the limitations are adequate to protect water quality. EPA has requested permit certification by the State pursuant to 40 CFR 124.53 and expects that the draft permit will be certified.

X. ADMINISTRATIVE RECORD, PUBLIC COMMENT PERIOD, HEARING REQUESTS, AND PROCEDURES FOR FINAL DECISION

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 Nicole Kowalski, U.S. EPA, Office of Ecosystem Protection, Industrial Permits Branch, 5 Post Office Square, Suite 100 (OEP06-4), Boston, Massachusetts 02109-3912. 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 issues proposed to be raised in the hearing. A public meeting may be held if the criteria stated in 40 C.F.R. § 124.12 are satisfied. In reaching a decision on the final permit, the EPA will respond to all significant comments and make these responses available to the public on EPA's website and at EPA's Boston office.

Following the close of the comment period, and after any public hearings, if such hearings are held, the EPA 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 petition for review of the permit to EPA's Environmental Appeals Board consistent with 40 C.F.R. § 124. 19.

XI. EPA & MassDEP CONTACTS

Additional information concerning the draft permit may be obtained between the hours of 9:00 a.m. and 5:00 p.m., Monday through Friday, excluding holidays, from the EPA and MassDEP contacts below:

Nicole Kowalski, EPA New England – Region 1
5 Post Office Square, Suite 100 (OEP06-4)
Boston, Massachusetts 02109-3912
Telephone: (617) 918-1746 FAX: (617) 918-0746
email: kowalski.nicole@epa.gov

Kathleen Keohane, Massachusetts Department of Environmental Protection
Division of Watershed Management, Surface Water Discharge Permit Program
627 Main Street, 2nd Floor
Worcester, Massachusetts 01608
Telephone: (508) 767-2856 FAX: (508) 791-4131
email: kathleen.keohane@state.ma.us

____
Date

Stephen S. Perkins, Director
Office of Ecosystem Protection
U.S. Environmental Protection Agency

XII. ATTACHMENTS

A. Outfall Flow History and Detail

B. Location of GE Lynn River Works Facility (site map)

C. River Works NPDES Outfalls/Intakes

D. Typical Outfall on the Saugus River (Diagram of Drainage System Outfall Vault)

E. Process Flow Diagram - Consolidated Drains Treatment System

F. Water Treatment Chemicals Potentially Discharged to the Storm Drain [Drainage System]

G. DMR Data Summary

H. GE Aviation Stormwater Sampling Results

I. GE Aviation Process Water Sampling Results

J. Assessment of Cooling Water Intake Structure (CWIS) Technologies and Determination of Best Available Technology (BTA) under Section 316(b)

K. Thermal Analysis from Derivation of Permit Limits for Wheelabrator Saugus (NPDES Permit No. MA0028193)

Attachment A

Outfall Flow History and Detail
General Electric Aircraft Engines
NPDES Permit Application Amendment

Outfall No.	Operation		Original Permit exp 1993 Feb-90	Daily Flow Limitation (MGD)	Monitoring Requirements Limits O&G	VOC	pH	Temp	Other	Notes
001 [1,2,3,4,5]	Dry weather flows are directed to Drain 007 then to CDTS, Outfall 027	Dry	3,000 gpd							Pumps To 007; No Dry Limits
	Stormwater	Wet	90,965 gpd	None	Quarterly wet Weather/10 mg/l Avg. Mo		Quarterly 6.5-8.5			
003	Emergency Non-Contact Cooling Water (NCCW)	Dry	300,000 gpd	0.55 Avg. Mo.1.4 Max. Day			Weekly 6.5-8.5	Weekly/95 Avg. Mo. 105 Max. day		Emergency Cooling Water Only
005	Emergency Non-Contact Cooling Water	Dry	110,000 gpd	0.55 Avg. Mo.1.4 Max. Day			Weekly 6.5-8.5	Weekly/95 Avg. Mo. 105 Max. day		Emergency Cooling Water Only
007 [1,2,3,4,5]	Dry weather flows from 001 Condensate from steam heating and air conditioning systems (seasonal) Steam conduit water discharge Emergency Non-Contact Cooling Water (NCCW) Dry weather flows are directed to CDTS, Outfall 027 Total Dry + NCCW	Dry	20,000 gpd 266,000 gpd 286,000 gpd	Emergency 0.3 Avg. Mo. 1.0 Max. Day Other 0.24 Avg. Mo. 0.24 Max. Day			Weekly 6.5-8.5	Emergency Weekly/95 Avg. Mo.: 105 Max. day Other Weekly/90		ACO eliminated Dry Weather Flow Limitations and Monitoring requirements; Dry Weather Limits Discontinued; Receives Dry Weather Flows from 001;
	Stormwater	Wet	1.35 mgd	None	Quarterly wet Weather/10 mg/l Avg. Mo		Quarterly 6.5-8.5			
009	Non-Contact Cooling Water from heat exchangers & dynamometer instruments in engine test cells. Floor Drains Total Dry Weather	Dry	150,000 gpd 200 gpd 150,200 gpd							CLOSED: Re-routed to Outfall 010 Early 90's
	Stormwater	Wet	26,180 gpd							
010 [1,2,3,4,6]	Condensate from steam heating and air conditioning systems (seasonal) Non-Contact Cooling Water from Industrial heat exchangers. Dry weather flows are directed to CDTS, Outfall 027 Total Dry Weather	Dry	0.9 mgd 0.9 mgd	5.36 Avg. Mo. 7.18 Max. Day			Weekly 6.5-8.5	Weekly/85.2 Avg. Mo.: 90 Max. day		ACO eliminated Dry Weather Flow Limitations and Monitoring requirements; Dry Weather Limits Discontinued
	Stormwater	Wet		None	Quarterly wet Weather/10 mg/l Avg. Mo		Quarterly 6.5-8.5			
013	Non-Contact Cooling Water from manufacturing operations. Non-Contact Cooling Water from dynamometer. Steam Condensate. Total Dry Weather	Dry	36,000 gpd 150,000 gpd 10,000 gpd 196,000 gpd							CLOSED: Re-routed to Outfall 010 Early 90's
	Stormwater	Wet	768,570 gpd							
014	Non-Contact Cooling Water from aircraft engine test facility heat exchangers Condensate Blowdown Engine & Compressor Test Facility NCCW Total Dry Weather	Dry	22.3 mgd 300,000 gpd 22.6 mgd	27 Avg. Mo. 45 Max. Day			Weekly 6.5-8.5	Weekly/90 Avg. Mo.: 95 Max. day		TEST CELL RIVER CWIS; City water substituted for cooling (EPA Letter 10/27/97 0 Anti-foam agent added (14A)
015	Non-Contact Cooling Water from Industrial heat exchangers. Steam Condensate Floor Drains Total Dry Weather	Dry	15,000 gpd 250 gpd 250 gpd 15,500 gpd							CLOSED: Re-routed to Outfall 019 Early 90's
	Stormwater	Wet	21,505 gpd							
017	Contact Cooling Water. Total Dry Weather	Dry	5,000 gpd 5,000 gpd							CLOSED: Re-routed to Outfall 019 Early 90's
	Stormwater	Wet	50,490 gpd							
018	Non-contact cooling water (river water) from power plant generating equipment Turbine condensate (intermittent) Boiler startup/soot blower drains/boiler draining for maintenance (intermittent) Boiler Filter Backwash & Ion Exchange Regeneration & Backwash De-aerator storage tanks (intermittent) Steam condensate return from steam users (seasonal) Boiler blowdown Total Dry Weather	Dry	33.0 mgd 10,000 gpd 19,000 gpd 200 gpd 33.3 mgd	35.6 Avg. Mo. 35.6 Max. Day			Weelky 6.5-8.5	Weekly/90 Avg. Mo.:95 Max. day		POWER PLANT CWIS: Anti-foamAgent added (18A)
	Stormwater	Wet	129,030 gpd							

Outfall No.	Operation		Original Permit exp 1993 Feb-90	Original Permit exp 1993 Daily Flow Limitation (MGD)	Monitoring Requirements Limits O&G	VOC	pH	Temp	Other	Notes
019 [1,2,3,4,5]	Steam condensate return from steam users (intermittent) Emergency steam condensate from small engine component testing Boiler filter backwash, ion exchange regeneration & backwash (intermittent) Condensate from steam heating and air conditioning systems (seasonal) Dry weather flows are directed to CDTS, Outfall 027			0.083 Avg. Mo.			Weekly 6.5-8.5	Weekly/88.4 Avg. Mo.: 90 Max. day	Momthly Report on Silver and Mercury	Silver and Mercury monitoring no longer requ's (EPA Letter 1/15/98) ACO eliminated Dry Weather Flow Limitations and Monitoring requirements
	Stormwater	Wet	18,700 gpd	None	Quarterly wet Weather/10 mg/l Avg. Mo		Quarterly 6.5-8.5			
020	Unused NCCW from power generation equipment (river water bypass) Steam Condensate Total Dry Weather	Dry	16.9 mgd 25,000 gpd 16.93 mgd	16.90Avg. Mo.			Weekly 6.5-8.5			NOT AN OUTFALL - BYPASS ONLY; Dry and wet weather flow discontinued June 2000, only unused river water discharges - no monitoring required (EPA LETTER 6/21/04)
	Stormwater	Wet	12,155 gpd	None	Quarterly wet Weather/10 mg/l Avg. Mo		Quarterly 6.5-8.5			Storm water rerouted to Outfall 027 (EPA Letter 4/25/2000) Dry and wet weathewr flow discontinued June 2000, only unused river water discharges - no monitoring required (EPAletter 6/21/04
021	NCCW from power generation equipment Cellar drainange from steam turbine balancing operation Total Dry Weather	Dry	7.2 mgd 500 gpd 7.2 mgd							CLOSED: Outfall Eliminated
	Stormwater	Wet	4,675 gpd							
027 [2,3,4,5,6]	Dry weather flows from 001 and 007 Dry weather flows from 010 Dry weather flows from 019 Dry weather flows from 028 and 030 Dry weather flows from 031 Bldg 64-A sump (intermittent) Steam condensate return from steam users (intermittent) Oil Cooler Cooling Water (intermittent) Air Vacuum Cooling Water (intermittent) Steam Conduit Water Cooling tower blowdown Rain water collected in secondary containment dikes and truck loading areas Dry weather flows are directed to CDTS and treated before discharge Total Dry Weather	Dry	8,000 gpd 8,000 gpd	0.3 Avg. Mo. 0.83 Max. Day	Weekly 10mg/l Avg. Mo. 15mg/l Max Day		Weekly 6.50-8.5	Weekly/85 Avg. Mo.:90 Max. Day	Monthly Benzene 5 ug/l BTEX 100 ug/l PCB's BDL	ACO permits 0.05 mgd Avg. Mo. & 1.0 MGD Max. Day Building 64 treatment system rerouted to City Sewer
	Stormwater	Wet	1.35+0.046 mgd	None	Quarterly wet Weather/10 mg/l Avg. Mo		Weekly 6.50-8.5			Wet weather at 027 includes redirected Wet Weather from Outfall 020.
028 [1,2,3,4,5]	Steam Condensate (seasonal) Emergency Non-Contact Cooling Water (NCCW) from Nitriding/Carburizing process Dry weather flows are directed to 030 then to CDTS, Outfall 027 Total Dry Weather	Dry	5,000 gpd 5,000 gpd	0.0036 Avg. Mo. 0.0048 Max. Day		Monthly Report	Weekly 6.50-8.5	Weekly/85 Avg. Mo.:90 Max. Day		PUMPS TO 030; Dry Weather Limits Discontinued; ACO eliminated Dry Flow Limitations and Momitoring requirements
	Stormwater	Wet	632,060 gpd	None	Quarterly wet Weather/10 mg/l Avg. Mo		Quarterly 6.5-8.5			
029	NCCW (river water) and steam condensate from production test equipment.	Dry	42.0 mgd	28.8 Avg. Mo. 54.7 Max. Day			Weekly 6.5-8.5	Weekly/90 Avg. Mo.:95 Max. Day	Monthly Report on Cadmium & Chromium	GEAR PLANT CWIS; OUT OF SERVICE; Condensate rerouted to 028 (EPA letter 4/25/2000) Cadmium and Chromium monitoring no longer req's (EPA Letter 1/5/98)

Outfall Flow History and Detail
General Electric Aircraft Engines
NPDES Permit Application Amendment

Outfall No.	Operation		Original Permit exp 1993 Feb-90	Daily Flow Limitation (MGD)	Monitoring Requirements Limits O&G	VOC	pH	Temp	Other	Notes
030 [1,2,3,4,5]	028 dry weather flows Non-Contact cooling water from heat exchangers. Dry weather flows are directed to CDTS Total Dry Weather	Dry	50,000 gpd **50,000 gpd**							Dry Weather Limits Discontinued Receives Dry Weather from 028
	Stormwater	Wet	**529,210 gpd**	None	**Quarterly wet Weather/10 mg/l Avg. Mo**		**Quarterly 6.5-8.5**			
031 [1,2,3,4,5]	Steam conduit discharge Cooling tower blowdown Test cell washdown water (intermittent) Condensate from air receivers Dry weather flows aredirected to CDTS Total Dry Weather	Dry	8,000 gpd 350,000 gpd 700 gpd **358,700 gpd**	**0.762 Avg. Mo. 2.2 Max Day**		**Monthly Report**	**Weekly 6.5-8.5**	**Weekly/90 Avg. Mo.:90 Max. day**		ACO eliminated Dry Weather Flow Limitations and Monitoring requirements
	Stormwater	Wet	**2.7 mgd**	None	**Quarterly wet Weather/10 mg/l Avg. Mo.**		**Quarterly 6.5-8.5**			
032	Stormwater Collection in Fuel Farm Contaiment Dikes	Wet	**33,335 gpd**	None			**Weekly 6.5-8.5**			Corrected to quarterly pH (EPA Letter 4/14/97) Discharge from outfall eliminated 2/8/02: storm water now pumped for treatment and discharge through 027

[1] Discharge to outfall only when drain flow exceeds pumping capacity during storm events and/or maintenance activities and power failures.

[2] This drain is subject to groundwater infiltration. Also, when catch basins and manholes are cleaned out and sediment is removed, water is poured back into drain system.

[3] Hydrant testing: Approximately 1,000 gallons per hydrant; 90 hydrants facility-wide.

[4] Sprinkler (fire protection) system testing for each building results in city water discharge; volume depends upon size of system.

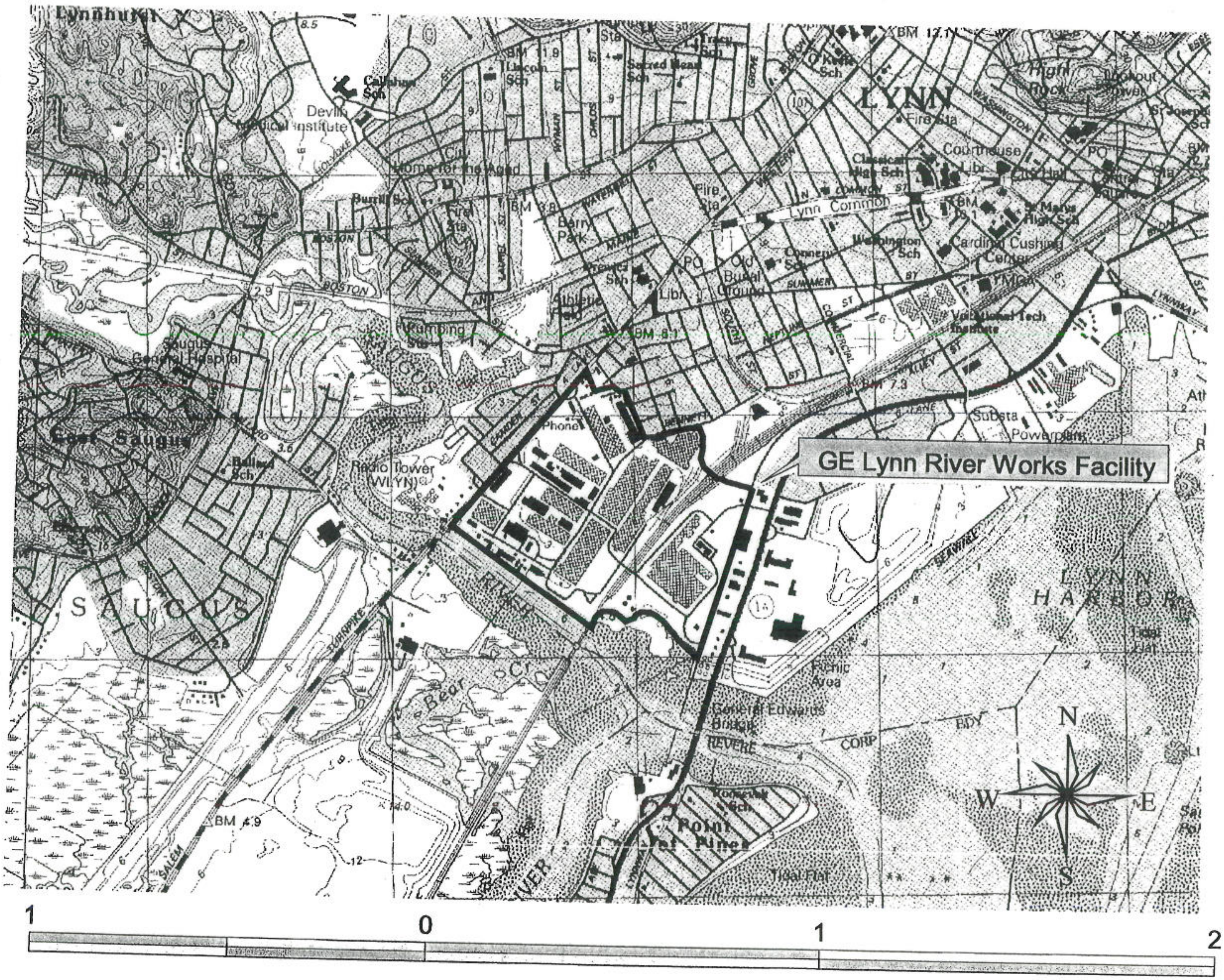
[5] When non-contact cooling water systems fail, city water is used during repairs to continue operations; discharge is intermittent, infrequent, emergency only.

[6] Once the consolidated drains treatment system is on line, Outfalls 001, 007, 010, 019, 028, 030, and 031 will have slide gates closed, and dry weather flow from these drains (with the exception of leakage around the gate seals) will be pumped to the treatment system . The design average discharge through Outfall 027 is 300 gpm, and the max flow of 500 gpm is based on the EQ tank pump rating (assuming that is the only treatment).

Shaded areas indicate drain systems that are pumped to the CDTS.

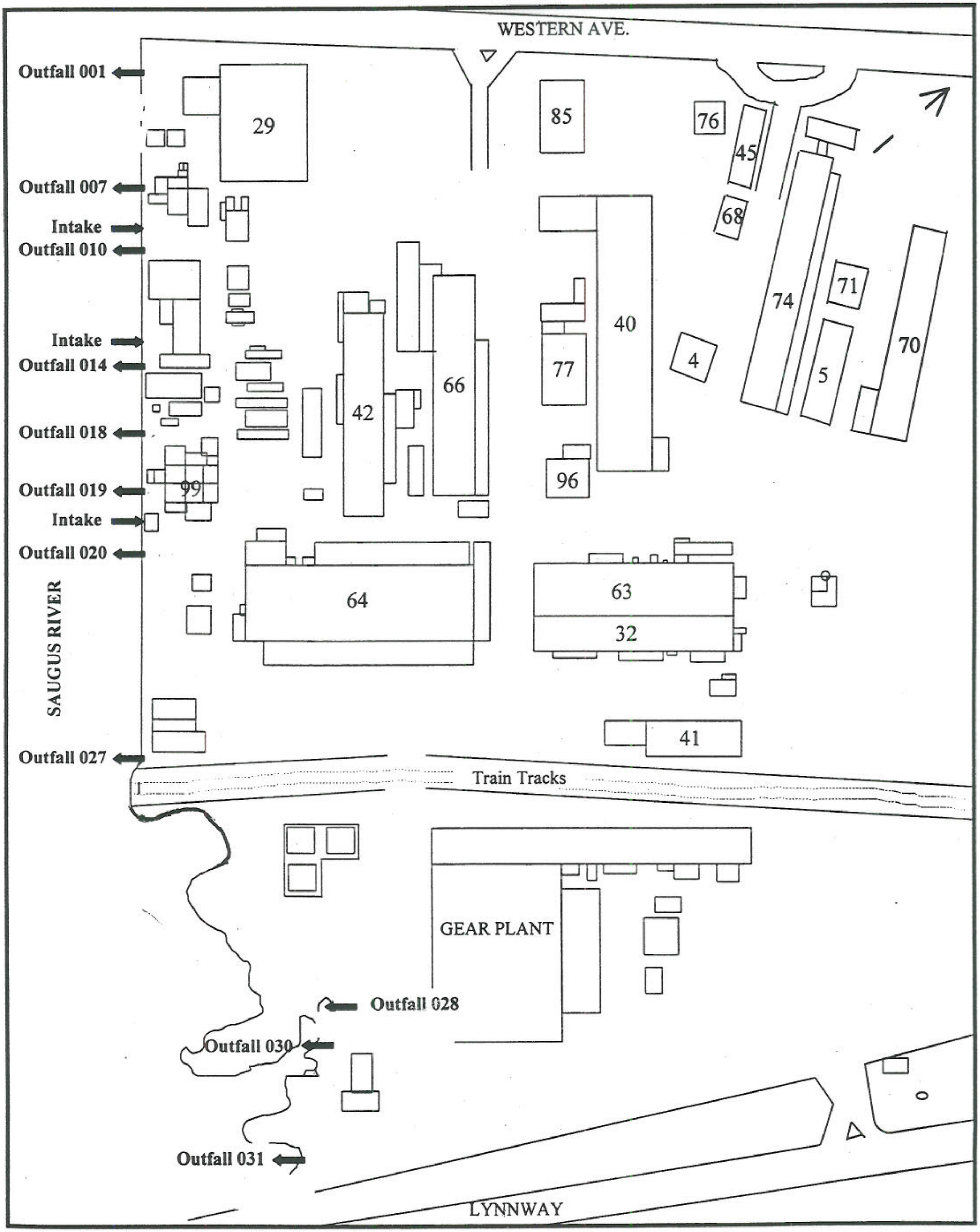
Attachment B

Location of GE Lynn River Works Facility



Attachment C

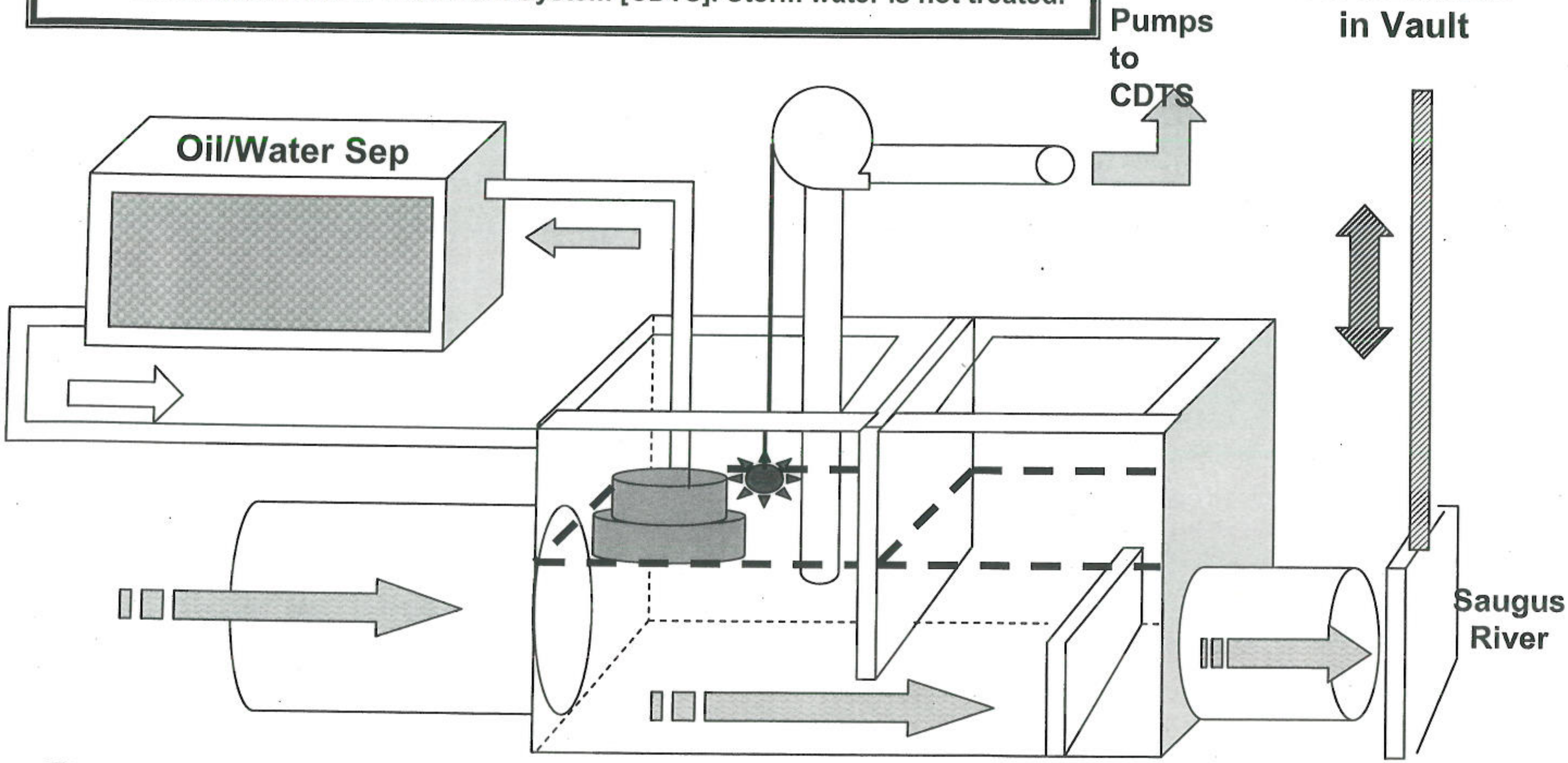
River Works NPDES Outfalls/Intakes Map



Attachment D

GE Aviation Lynn, Massachusetts
Typical Outfall on the Saugus River

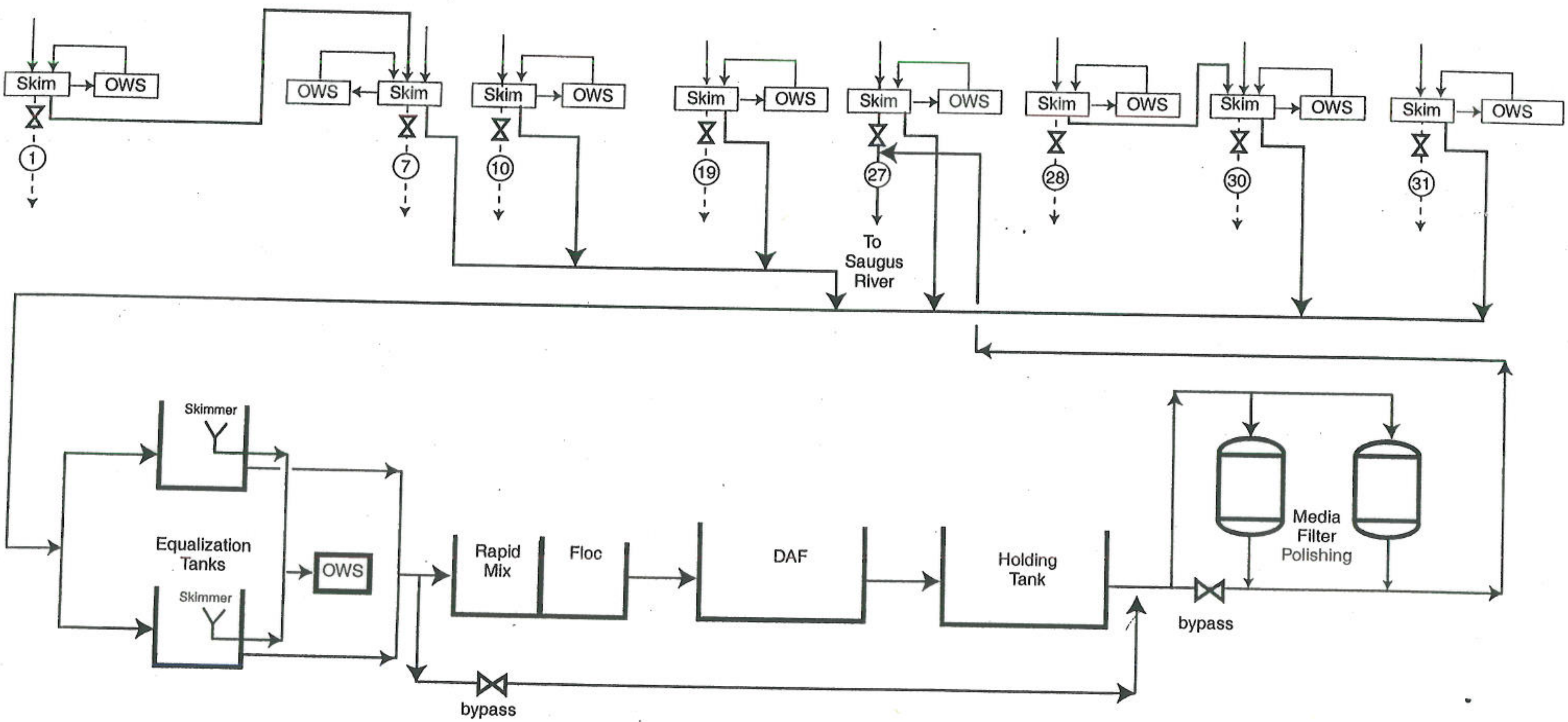
This Sketch assumes the Outfall handles both Storm and Dry Weather Flows Typical Dry Weather Flows consist of Non-Contact Cooling (City) Water; Groundwater Infiltration; Steam Condensate. Dry Weather flows are treated at the Consolidated Drains Treatment System [CDTS]. Storm water is not treated.



imagination at work

Attachment E

Process Flow Diagram
GEAE River Works Facility - Lynn
Consolidated Drains Treatment System



Attachment F

EXHIBIT 2-2
Water Treatment Chemicals Potentially Discharged to Storm Drains
General Electric Aircraft Engines
NPDES Permit Application Amendment

Application	G E BetzProduct	G E Betz Product Information	Dosing As Applied	Alternatives Products	Alternative Product Information
Sulfite Oxygen Scavenger	IS3000	Sodium Sulfite 33% Active	20 – 80 ppm as SO_3	1720 Protec 32	Sodium Sulfite 25% Active
Caustic pH Adjustment	ADJ560	44% Active Potassium Hydroxide, Sodium Hydroxide	200 – 400 p-Alkalinity; Target Boiler Water pH of 11.0 to 12.0	8735 BL409LF	44% Potassium Hydroxide, Sodium Hydroxide
Polymer	APO500	30% Active Polymerthacyrate Polymer	30 – 100 ppm as Active	Transport Plus 7204	22% Active PA
Steam Treatment	NAO540	40.5 % Active Cyclohexylamine, Morpholine Blend	5 to 10 ppm as Active in Boiler Blowdown	Ultramine 130	41% Active Cyclohexylamine, Morpholine Blend
Boiler Antifoam	ADJ575	30% Active (Double Strength)	3 to 13 ppm as Active in Boiler Blowdown	750 Antifoam (C-1)	15% Active Antifoam
River Antifoam	AF3351	Fatty Alcohol	1 to 15 ppm active	7465	Fatty alcohol
River Antifoam	AF2290	Silicone Based Defoamer	1 to 15 ppm active		
Polymer	Optisperse AP302	29.5% Polymethacrylate with 0.5% Sodium Molybdate	30 – 100 ppm Active Polymethacrylate, 0.5 to 2.0 ppm as MoO_4	Transport Plus 7205	Polyacyrate dispersing polymer
Prevents Scaling (Keeps Ca, Mg, Fe in solution)	Optisperse CL360	32.0% Active EDTA, NTA chelant	3 to 6 ppm as Active in Boiler Blowdown	BoilerGUARD ST BoilerGUARD 4520	EDTA chelant
Coagulants and Flocculants Chemical treat at B35 CDTS	Klaraid IC1172 Polyfloc AE1138 Polyfloc AP1138	Sodium Sulfite 33% Active	20 – 80 ppm as SO_3	1720 Protec 32	Sodium Sulfite 25% Active
Corrosion Inhibitor	Dianodic DN310	Phosphate, HRAzole blend	12 to 120 ppm as Active	XLP170 LCS 59	Phosphate based corrosion inhibitor
Corrosion Inhibitor	Continuum AT201	Phosphonate, polymer with molybdate tracer	12 to 120 ppm as active 0.5 to 2 ppm as MoO_4	XLT 170	Phosphonate based inhibitor
Bromine-based Bactericide	Stabrom 909	6.7% active bromine	2 to 8 ppm as active	XLP170 LCS 59	Phosphate based corrosion inhibitor
Oxidizing Biocide	Spectrus OX107, OX108	Bromine- chlorine pucks and powder	1 to 5 ppm as free CL_2 active		Phosphonate based inhibitor
Non oxidizing biocide	Spectrus NX114	iso-bronopol blend	10 to 20 ppm as active	Stabrex ST-10 Stabrex ST-20	6.2% active bromine
Non ox biocide	Spectrus NX112	Gluteraldehyde biocide	40 to 100 ppm as active	Calgon H-640 H-900	Bromine- chlorine pucks and powder
Closed water loop	Inhibitor AZ660	Azole copper corrosion agent	5 to 20 ppm as active	Not available	
Closed water loop	Corrshield NT402	Nitrite blended inhibitor	20 to1,000 ppm active	Nalco 2839	15%gluteraldehyde
Closed water loop	Corrshield MD405	molybdenum blend	20 to 300 ppm active	Not available	
Corrosion Inhibitor For B-35 tower	Continuum AT901	Phosphonate, phosphate polymer with molybdate tracer in unique dry solid	3 to 12 ppm as active 0.5 to 2 ppm as MoO_4	none	
Non ox idizing biocide for B-35	Spectrus OX903	DBNPA in unique solid form	1 to 10 ppm as active	Not available	

Attachment G

General Electric, Lynn - DMR Data Summary 1/09

001W

		O&G	pH	
		10 mg/L	6.5 SU	8.5 SU
MP Date	Rec'd Date	MO AVG	MINIMUM	MAXIMUM
10/31/1998	11/16/1998	5	7.68	7.68
1/31/1999	2/16/1999	5	7.9	7.9
4/30/1999	5/13/1999	5	7.2	7.2
7/31/1999	8/16/1999	5	7	7
10/31/1999	11/15/1999	5	7.5	7.7
1/31/2000	2/15/2000	5	7.4	7.4
4/30/2000	5/15/2000	5	6.6	6.6
7/31/2000	8/14/2000	5	7.2	7.2
10/31/2000	11/13/2000	5	7.4	7.4
1/31/2001	2/14/2001	5	5.3	5.3
4/30/2001	5/9/2001	5	5.3	5.3
7/31/2001	8/9/2001	5	7.1	7.1
10/31/2001	11/14/2001	5	6.9	6.9
1/31/2002	2/14/2002	5	7.6	7.6
4/30/2002	5/14/2002	5	5.8	5.8
7/31/2002	8/14/2002	5	6.6	6.6
10/31/2002	11/14/2002	5	6.9	6.9
1/31/2003	2/12/2003	5.2	7.3	7.3
4/30/2003	5/13/2003	5	7.4	7.4
7/31/2003	8/14/2003	5	7.2	7.2
10/31/2003	11/12/2003	5	7.6	7.6
1/31/2004	2/13/2004	5	7.52	7.52
4/30/2004	5/17/2004	5	7.84	7.84
7/31/2004	8/10/2004	5	7.9	7.9
10/31/2004	11/15/2004	5	7.59	7.59
1/31/2005	2/14/2005	5	7.13	7.13
4/30/2005	5/18/2005	5	6.23	6.23
7/31/2005	8/19/2005	5	7.71	7.71
10/31/2005	11/15/2005	5	7.52	7.52
1/31/2006	2/14/2006	5	6.98	6.98
4/30/2006	5/15/2006	5	7.27	7.27
7/31/2006	8/7/2006	5	6.71	6.71
10/31/2006	11/15/2006	5	6.77	6.77
1/31/2007	2/14/2007	5	5.9	5.9
4/30/2007	5/16/2007	5	6.9	6.9
7/31/2007	7/13/2007	5	6.79	6.79
10/31/2007	11/14/2007	5	7.47	7.47
1/31/2008	2/15/2008	9	6.95	6.95
4/30/2008	5/7/2008	5	7.08	7.08
7/31/2008	8/11/2008	5	7.01	7.01
10/31/2008	11/12/2008	5	7.11	7.11

001W

		O&G	pH	
		10 mg/L	6.5 SU	8.5 SU
		MO AVG	MINIMUM	MAXIMUM
	Ave	5.1	7.1	7.1
	max	9	7.9	7.9
	min	5	5.3	5.3
	exceedence	0	5	0

007D

		Flow		pH		Temperature	
		.024 Mgal/d	.024 Mgal/d	6.5 SU	8.5 SU	90 deg F	90 deg F
MP Date	Rec'd Date	MO AVG	DAILY MX	MINIMUM	MAXIMUM	MO AVG	DAILY MX
10/31/1998	11/16/1998	0.024	0.024			58	62.4
11/30/1998	12/16/1998	0.024	0.024			51	52
12/31/1998	1/19/1999	0.024	0.024			50.3	55
1/31/1999	2/16/1999	0.024	0.024	6.9	7.9	44.7	47
2/28/1999	3/16/1999	0.024	0.024	6.7	7.8	46.1	50
3/31/1999	4/16/1999	0.024	0.024	7.4	7.8	44.7	46.8
4/30/1999	5/13/1999	0.024	0.024	7.2	7.3	51.4	53
5/31/1999	6/16/1999	0.024	0.024	7.1	7.8	58	63
6/30/1999	7/14/1999	0.024	0.024	7.1	7.2	66.3	68.6
7/31/1999	8/16/1999	0.024	0.024	7	7.2	72.5	73.8
8/31/1999	9/17/1999	0.024	0.024	7.2	7.2	72.5	74.3
9/30/1999	10/18/1999	0.024	0.024	7	7.2	71.8	77
10/31/1999	11/15/1999	0.024	0.024	6.9	7.9	63	64
11/30/1999	12/15/1999	0.024	0.024	6.8	7.5	57	63
12/31/1999	1/14/2000	0.024	0.024	6.8	7.8	50	54
1/31/2000	2/15/2000	0.024	0.024	6.6	7.4	45	49
2/29/2000	3/15/2000	0.024	0.024	7	7.1	45	47
3/31/2000	4/12/2000	0.024	0.024	6.9	7.1	48	51
4/30/2000	5/15/2000	0.024	0.024	6.7	7.1	51	52
5/31/2000	6/13/2000	0.024	0.024	6.6	7.2	57	60
6/30/2000	7/14/2000	0.024	0.024	6.8	7.4	65	68
7/31/2000	8/14/2000	0.005	0.024	7	7	69	69
8/31/2000	9/13/2000	C	C	C	C	C	C
9/30/2000	10/12/2000	C	C	C	C	C	C
10/31/2000	11/13/2000	C	C	C	C	C	C
11/30/2000	12/11/2000	C	C	C	C	C	C
12/31/2000	1/10/2001	C	C	C	C	C	C
1/31/2001	2/14/2001	C	C	C	C	C	C
2/28/2001	3/15/2001	C	C	C	C	C	C
3/31/2001	4/12/2001	C	C	C	C	C	C
4/30/2001	5/9/2001	C	C	C	C	C	C
5/31/2001	6/11/2001	C	C	C	C	C	C
6/30/2001	7/12/2001	C	C	C	C	C	C
7/31/2001	8/9/2001	C	C	C	C	C	C
8/31/2001	9/14/2001	C	C	C	C	C	C
9/30/2001	10/10/2001	C	C	C	C	C	C
10/31/2001	11/14/2001	C	C	C	C	C	C
11/30/2001	12/12/2001	C	C	C	C	C	C
12/31/2001	1/14/2002	C	C	C	C	C	C
1/31/2002	2/14/2002	C	C	C	C	C	C
2/28/2002	3/12/2002	C	C	C	C	C	C
3/31/2002	4/15/2002	C	C	C	C	C	C
4/30/2002	5/14/2002	C	C	C	C	C	C
5/31/2002	6/13/2002	C	C	C	C	C	C
6/30/2002	7/10/2002	C	C	C	C	C	C
7/31/2002	8/14/2002	C	C	C	C	C	C
8/31/2002	9/16/2002	C	C	C	C	C	C
9/30/2002	10/11/2002	C	C	C	C	C	C
10/31/2002	11/14/2002	C	C	C	C	C	C
11/30/2002	12/13/2002	C	C	C	C	C	C
12/31/2002	1/15/2003	C	C	C	C	C	C
1/31/2003	2/12/2003	C	C	C	C	C	C
2/28/2003	3/31/2003	C	C	C	C	C	C
3/31/2003	4/10/2003	C	C	C	C	C	C
4/30/2003	5/13/2003	C	C	C	C	C	C
5/31/2003	6/12/2003	C	C	C	C	C	C
6/30/2003	7/11/2003	C	C	C	C	C	C
7/31/2003	8/14/2003	C	C	C	C	C	C
8/31/2003	9/12/2003	C	C	C	C	C	C
9/30/2003	10/14/2003	C	C	C	C	C	C
10/31/2003	11/12/2003	C	C	C	C	C	C
11/30/2003	12/10/2003	C	C	C	C	C	C
12/31/2003	1/13/2004	C	C	C	C	C	C
1/31/2004	2/13/2004	C	C	C	C	C	C

2/29/2004	3/15/2004	C	C	C	C	C	C
3/31/2004	4/18/2004	C	C	C	C	C	C
4/30/2004	5/17/2004	C	C	C	C	C	C
5/31/2004	6/14/2004	C	C	C	C	C	C
6/30/2004	7/12/2004	C	C	C	C	C	C
7/31/2004	8/10/2004	C	C	C	C	C	C
8/31/2004	9/13/2004	C	C	C	C	C	C
9/30/2004	10/15/2004	C	C	C	C	C	C
10/31/2004	11/15/2004	C	C	C	C	C	C
11/30/2004	12/9/2004	C	C	C	C	C	C
12/31/2004	1/13/2005	C	C	C	C	C	C
1/31/2005	2/14/2005	C	C	C	C	C	C
2/28/2005	3/14/2005	C	C	C	C	C	C
3/31/2005	4/15/2005	C	C	C	C	C	C
4/30/2005	5/18/2005	C	C	C	C	C	C
5/31/2005	6/13/2005	C	C	C	C	C	C
6/30/2005	7/14/2005	C	C	C	C	C	C
7/31/2005	8/17/2005	C	C	C	C	C	C
8/31/2005	9/12/2005	C	C	C	C	C	C
9/30/2005	10/17/2005	C	C	C	C	C	C
10/31/2005	11/15/2005	C	C	C	C	C	C
11/30/2005	12/13/2005	C	C	C	C	C	C
12/31/2005	1/13/2006	C	C	C	C	C	C
1/31/2006	2/14/2006	C	C	C	C	C	C
2/28/2006	3/13/2006	C	C	C	C	C	C
3/31/2006	4/14/2006	C	C	C	C	C	C
4/30/2006	5/15/2006	C	C	C	C	C	C
5/31/2006	6/14/2006	C	C	C	C	C	C
6/30/2006	7/13/2006	C	C	C	C	C	C
7/31/2006	8/7/2006	C	C	C	C	C	C
8/31/2006	9/18/2006	C	C	C	C	C	C
9/30/2006	10/16/2006	C	C	C	C	C	C
10/31/2006	11/15/2006	C	C	C	C	C	C
11/30/2006	12/15/2006	C	C	C	C	C	C
12/31/2006	1/11/2007	C	C	C	C	C	C
1/31/2007	2/14/2007	C	C	C	C	C	C
2/28/2007	3/14/2007	C	C	C	C	C	C
3/31/2007	4/16/2007	C	C	C	C	C	C
4/30/2007	5/16/2007	C	C	C	C	C	C
5/31/2007	6/14/2007	C	C	C	C	C	C
6/30/2007	7/13/2007	C	C	C	C	C	C
7/31/2007	8/15/2007	C	C	C	C	C	C
8/31/2007	9/13/2007	C	C	C	C	C	C
9/30/2007	10/12/2007	C	C	C	C	C	C
10/31/2007	11/14/2007	C	C	C	C	C	C
11/30/2007	12/12/2007	C	C	C	C	C	C
12/31/2007	1/14/2008	C	C	C	C	C	C
1/31/2008	2/15/2008	C	C	C	C	C	C
2/29/2008	3/14/2008	C	C	C	C	C	C
3/31/2008	4/11/2008	C	C	C	C	C	C
4/30/2008	5/7/2008	C	C	C	C	C	C
5/31/2008	6/13/2008	C	C	C	C	C	C
6/30/2008	7/11/2008	C	C	C	C	C	C
7/31/2008	8/11/2008	C	C	C	C	C	C
8/31/2008	9/10/2008	C	C	C	C	C	C
9/30/2008	10/10/2008	C	C	C	C	C	C
10/31/2008	11/12/2008	C	C	C	C	C	C
11/30/2008							
12/31/2008							
007D		Flow		pH		Temperature	
		.024 Mgal/d	.024 Mgal/d	6.5 SU	8.5 SU	90 deg F	90 deg F
		MO AVG	DAILY MX	MINIMUM	MAXIMUM	MO AVG	DAILY MX
	Ave	0.023	0.024	6.9	7.4	56.2	59.1
	max	0.024	0.024	7.4	7.9	72.5	77
	min	0.005	0.024	6.6	7	44.7	46.8
	exceedence	0	0	0	0	0	0

*C: NODI code which refers to "no discharge"

007W

MP Date	Rec'd Date	O&G 10 mg/L MO AVG	pH 6.5 SU MINIMUM	pH 8.5 SU MAXIMUM
10/31/1998	11/16/1998	5	7.9	7.9
1/31/1999	2/16/1999	5	7.4	7.4
4/30/1999	5/13/1999	5	7.2	7.2
7/31/1999	8/16/1999	5	6.9	6.9
10/31/1999	11/15/1999	5	7.2	7.3
1/31/2000	2/15/2000	5	7.4	7.4
4/30/2000	5/15/2000	5	6.6	6.6
7/31/2000	8/14/2000	5	7.1	7.1
10/31/2000	11/13/2000			
1/31/2001	2/14/2001	5	6.6	6.6
4/30/2001	5/9/2001	5	5.7	5.7
7/31/2001	8/9/2001	5	6.7	6.7
10/31/2001	11/14/2001	5	6.8	6.8
1/31/2002	2/14/2002	5	6.8	6.8
4/30/2002	5/14/2002	5	6.2	6.2
7/31/2002	8/14/2002	5	6.3	6.3
10/31/2002	11/14/2002	5	6.8	6.8
1/31/2003	2/12/2003	5.2	7.5	7.5
4/30/2003	5/13/2003	5	7.4	7.4
7/31/2003	8/14/2003	5	6.6	6.6
10/31/2003	11/12/2003	5	7.58	7.58
1/31/2004	2/13/2004	5	7.63	7.63
4/30/2004	5/17/2004	5	6.96	6.96
7/31/2004	8/10/2004	5	7.81	7.81
10/31/2004	11/15/2004	5	7.21	7.21
1/31/2005	2/14/2005	5	7.21	7.21
4/30/2005	5/18/2005	5	6.87	6.87
7/31/2005	8/17/2005	5	7.92	7.92
10/31/2005	11/15/2005	5	7.58	7.58
1/31/2006	2/14/2006	5	7.27	7.27
4/30/2006	5/15/2006	5	7.11	7.11
7/31/2006	8/7/2006	5	6.9	6.9
10/31/2006	11/15/2006	5	6.91	6.91
1/31/2007	2/14/2007	5	6.2	6.2
4/30/2007	5/16/2007	5	7.05	7.02
7/31/2007	7/13/2007	5	7.02	7.02
10/31/2007	11/14/2007	5	7.21	7.21
1/31/2008	2/15/2008	8.4	7.22	7.22
4/30/2008	5/7/2008	5	6.92	6.92
7/31/2008	8/11/2008	5	6.95	6.95
10/31/2008	11/12/2008	5	6.95	6.95

007W

		O&G	pH	
		10 mg/L	6.5 SU	8.5 SU
		MO AVG	MINIMUM	MAXIMUM
	Ave:	5.1	7.04	7.04
	max	8.4	7.92	7.92
	min	5	5.7	5.7
	exceedence	0	4	0

010D

		Flow		Mercury	pH		Silver	Temperature	
		5.36 Mgal/d	7.18 Mgal/d	Req. Mon. mg/L	6.5 SU	8.5 SU	Req. Mon. mg/L	85.2 deg F	90 deg F
MP Date	Rec'd Date	MO AVG	DAILY MX	DAILY MX	MINIMUM	MAXIMUM	DAILY MX	MO AVG	DAILY MX
10/31/1998	11/16/1998	5.36	7.18					58.3	60.8
11/30/1998	12/16/1998	5.36	7.18					50	52
12/31/1998	1/19/1999	5.36	7.18					50.2	58
1/31/1999	2/16/1999	5.36	7.18		6.9	7.7		44.6	47
2/28/1999	3/16/1999	5.36	7.18		6.7	7.2		47.2	50
3/31/1999	4/16/1999	5.36	7.18		6.7	7.8		45.5	46.6
4/30/1999	5/13/1999	5.36	7.18		7.1	7.3		50.2	51.5
5/31/1999	6/16/1999	5.36	7.18		7.1	7.6		57.6	63
6/30/1999	7/14/1999	5.36	7.18		7.1	7.8		65.6	69.4
7/31/1999	8/16/1999	5.36	7.18		7.1	7.2		69.8	71.8
8/31/1999	9/17/1999	5.36	7.18		7.1	7.5		71.5	73.4
9/30/1999	10/18/1999	5.36	7.28		7	7.3		69.8	74
10/31/1999	11/15/1999	5.36	7.18		6.9	7.5		61.4	63
11/30/1999	12/15/1999	5.36	7.18		6.8	7.6		55	61
12/31/1999	1/14/2000	5.36	7.18		6.8	7.5		49	52
1/31/2000	2/15/2000	5.36	7.18		6.9	7.4		43	47
2/29/2000	3/15/2000	5.36	7.18		6.8	7.3		42	47
3/31/2000	4/12/2000	5.36	7.18		6.9	7.1		47	49
4/30/2000	5/15/2000	5.36	7.18		7.2	7.3		51	52
5/31/2000	6/13/2000	5.36	7.18		6.7	7.3		57	60
6/30/2000	7/14/2000	5.36	7.18		6.9	7.4		64	67
7/31/2000	8/14/2000	1.07	7.18		7.2	7.2		65	65
8/31/2000	9/18/2000	C	C		C	C		C	C
9/30/2000	10/12/2000	C	C		C	C		C	C
10/31/2000	11/13/2000	C	C		C	C		C	C
11/30/2000	12/11/2000	C	C		C	C		C	C
12/31/2000	1/10/2001	C	C		C	C		C	C
1/31/2001	2/14/2001	C	C		C	C		C	C
2/28/2001	3/15/2001	C	C		C	C		C	C
3/31/2001	4/12/2001	C	C		C	C		C	C
4/30/2001	5/9/2001	C	C		C	C		C	C
5/31/2001	6/11/2001	C	C		C	C		C	C
6/30/2001	7/12/2001	C	C		C	C		C	C
7/31/2001	8/9/2001	C	C		C	C		C	C
8/31/2001	9/14/2001	C	C		C	C		C	C
9/30/2001	10/10/2001	C	C		C	C		C	C
10/31/2001	11/14/2001	C	C		C	C		C	C
11/30/2001	12/12/2001	C	C		C	C		C	C
12/31/2001	1/14/2002	C	C		C	C		C	C
1/31/2002	2/14/2002	C	C		C	C		C	C
2/28/2002	3/12/2002	C	C		C	C		C	C
3/31/2002	4/15/2002	C	C		C	C		C	C
4/30/2002	5/14/2002	C	C		C	C		C	C
5/31/2002	6/13/2002	C	C		C	C		C	C
6/30/2002	7/10/2002	C	C		C	C		C	C
7/31/2002	8/14/2002	C	C		C	C		C	C
8/31/2002	9/16/2002	C	C		C	C		C	C
9/30/2002	10/11/2002	C	C		C	C		C	C
10/31/2002	11/14/2002	C	C		C	C		C	C
11/30/2002	12/13/2002	C	C		C	C		C	C
12/31/2002	1/15/2003	C	C		C	C		C	C
1/31/2003	2/12/2003	C	C		C	C		C	C
2/28/2003	3/31/2003	C	C		C	C		C	C
3/31/2003	4/10/2003	C	C		C	C		C	C
4/30/2003	5/13/2003	C	C		C	C		C	C
5/31/2003	6/12/2003	C	C		C	C		C	C
6/30/2003	7/11/2003	C	C		C	C		C	C
7/31/2003	8/14/2003	C	C		C	C		C	C
8/31/2003	9/12/2003	C	C		C	C		C	C
9/30/2003	10/14/2003	C	C		C	C		C	C
10/31/2003	11/12/2003	C	C		C	C		C	C
11/30/2003	12/10/2003	C	C		C	C		C	C
12/31/2003	1/13/2004	C	C		C	C		C	C
1/31/2004	2/13/2004	C	C		C	C		C	C
2/29/2004	3/15/2004	C	C		C	C		C	C
3/31/2004	4/18/2004	C	C		C	C		C	C
4/30/2004	5/17/2004	C	C		C	C		C	C
5/31/2004	6/14/2004	C	C		C	C		C	C
6/30/2004	7/12/2004	C	C		C	C		C	C
7/31/2004	8/10/2004	C	C		C	C		C	C
8/31/2004	9/13/2004	C	C		C	C		C	C
9/30/2004	10/15/2004	C	C		C	C		C	C
10/31/2004	11/15/2004	C	C		C	C		C	C
11/30/2004	12/9/2004	C	C		C	C		C	C
12/31/2004	1/13/2005	C	C		C	C		C	C
1/31/2005	2/14/2005	C	C		C	C		C	C
2/28/2005	3/14/2005	C	C		C	C		C	C
3/31/2005	4/15/2005	C	C		C	C		C	C
4/30/2005	5/18/2005	C	C		C	C		C	C

5/31/2005	6/13/2005	C	C		C	C		C	C
6/30/2005	7/14/2005	C	C		C	C		C	C
7/31/2005	8/17/2005	C	C		C	C		C	C
8/31/2005	9/12/2005	C	C		C	C		C	C
9/30/2005	10/17/2005	C	C		C	C		C	C
10/31/2005	11/15/2005	C	C		C	C		C	C
11/30/2005	12/13/2005	C	C		C	C		C	C
12/31/2005	1/13/2006	C	C		C	C		C	C
1/31/2006	2/14/2006	C	C		C	C		C	C
2/28/2006	3/13/2006	C	C		C	C		C	C
3/31/2006	4/14/2006	C	C		C	C		C	C
4/30/2006	5/15/2006	C	C		C	C		C	C
5/31/2006	6/14/2006	C	C		C	C		C	C
6/30/2006	7/13/2006	C	C		C	C		C	C
7/31/2006	8/7/2006	C	C		C	C		C	C
8/31/2006	9/19/2006	C	C		C	C		C	C
9/30/2006	10/16/2006	C	C		C	C		C	C
10/31/2006	11/15/2006	C	C		C	C		C	C
11/30/2006	12/15/2006	C	C		C	C		C	C
12/31/2006	1/11/2007	C	C		C	C		C	C
1/31/2007	2/14/2007	C	C		C	C		C	C
2/28/2007	3/14/2007	C	C		C	C		C	C
3/31/2007	4/16/2007	C	C		C	C		C	C
4/30/2007	5/16/2007	C	C		C	C		C	C
5/31/2007	6/14/2007	C	C		C	C		C	C
6/30/2007	7/13/2007	C	C		C	C		C	C
7/31/2007	8/15/2007	C	C		C	C		C	C
8/31/2007	9/13/2007	C	C		C	C		C	C
9/30/2007	10/12/2007	C	C		C	C		C	C
10/31/2007	11/14/2007	C	C		C	C		C	C
11/30/2007	12/12/2007	C	C		C	C		C	C
12/31/2007	1/14/2008	C	C		C	C		C	C
1/31/2008	2/15/2008	C	C		C	C		C	C
2/29/2008	3/14/2008	C	C		C	C		C	C
3/31/2008	4/11/2008	C	C		C	C		C	C
4/30/2008	5/7/2008	C	C		C	C		C	C
5/31/2008	6/13/2008	C	C		C	C		C	C
6/30/2008	7/11/2008	C	C		C	C		C	C
7/31/2008	8/11/2008	C	C		C	C		C	C
8/31/2008	9/10/2008	C	C		C	C		C	C
9/30/2008	10/10/2008	C	C		C	C		C	C
10/31/2008	11/12/2008	C	C		C	C		C	C
11/30/2008									
12/31/2008									
010D		Flow		Mercury	pH		Silver	Temperature	
		5.36 Mgal/d	7.18 Mgal/d	Req. Mon. mg/L	6.5 SU	8.5 SU	Req. Mon. mg/L	85.2 deg F	90 deg F
		MO AVG	DAILY MX	DAILY MX	MINIMUM	MAXIMUM	DAILY MX	MO AVG	DAILY MX
	Ave	5.17	7.18	0	6.9	7.4	0	55.2	58.2
	max	5.36	7.28	0	7.2	7.8	0	71.5	74
	min	1.07	7.18	0	6.7	7.1	0	42	46.6
	exceedence	0	1	NA	0	0	NA	0	0

*C: NODI code which refers to "no discharge"

010W

		O&G	pH	
		10 mg/L	6.5 SU	8.5 SU
MP Date	Rec'd Date	MO AVG	MINIMUM	MAXIMUM
10/31/1998	11/16/1998	5	7.6	7.6
1/31/1999	2/16/1999	5	7.4	7.4
4/30/1999	5/13/1999	5	7.1	7.1
7/31/1999	8/16/1999	5	6.9	6.9
10/31/1999	11/15/1999	5	7.1	7.1
1/31/2000	2/15/2000	5	7.5	7.5
4/30/2000	5/15/2000	5	6.3	6.3
7/31/2000	8/14/2000	5	6.5	6.5
10/31/2000	11/13/2000	5	6.8	6.8
1/31/2001	2/14/2001	5	5.9	5.9
4/30/2001	5/9/2001	5	7.6	7.6
7/31/2001	8/9/2001	5	6.5	6.5
10/31/2001	11/14/2001	5	6.8	6.8
1/31/2002	2/14/2002	5	7.6	7.6
4/30/2002	5/14/2002	5	6.8	6.8
7/31/2002	8/14/2002	5	6.2	6.2
10/31/2002	11/14/2002	5	7.2	7.2
1/31/2003	2/12/2003	5.2	7	7
4/30/2003	5/13/2003	8.1	7.5	7.5
7/31/2003	8/14/2003	5	7.9	7.9
10/31/2003	11/12/2003	5	7.63	7.63
1/31/2004	2/13/2004	5	7.68	7.68
4/30/2004	5/17/2004	5	6.81	6.81
7/31/2004	8/10/2004	5	7.76	7.76
10/31/2004	11/15/2004	5	7.45	7.45
1/31/2005	2/14/2005	5	7.13	7.13
4/30/2005	5/18/2005	5	6.52	6.52
7/31/2005	8/17/2005	5	7.4	7.4
10/31/2005	11/15/2005	5	7.42	7.42
1/31/2006	2/14/2006	5	7.11	7.11
4/30/2006	5/15/2006	5	7.13	7.13
7/31/2006	8/7/2006	5	6.86	6.86
10/31/2006	11/15/2006	5	6.87	6.87
1/31/2007	2/14/2007	5	5.9	5.9
4/30/2007	5/16/2007	5	6.91	6.91
7/31/2007	7/13/2007	5	6.87	6.87
10/31/2007	11/14/2007	5	7.18	7.18
1/31/2008	2/15/2008	5	7.93	7.93
4/30/2008	5/7/2008	5	6.88	6.88
7/31/2008	8/11/2008	5	6.79	6.79
10/31/2008	11/12/2008	5	6.9	6.9

010W

		O&G	pH	
		10 mg/L	6.5 SU	8.5 SU
		MO AVG	MINIMUM	MAXIMUM
	Ave	5.08	7.06	7.06
	max	8.1	7.93	7.93
	min	5	5.9	5.9
	exceedence	0	4	0

014A

		Flow		pH		Temperature	
		27 Mgal/d	45 Mgal/d	6.5 SU	8.5 SU	90 deg F	95 deg F
MP Date	Rec'd Date	MO AVG	DAILY MX	MINIMUM	MAXIMUM	MO AVG	DAILY MX
10/31/1998	11/16/1998	1.19	34	7.9	8.1	60.3	69.8
11/30/1998	12/16/1998	1.26	34	7.7	8.1	50	53
12/31/1998	1/19/1999						
1/31/1999	2/16/1999	0.89	34	7.1	7.6	40.2	42
2/28/1999	3/16/1999	0.00014	34	7.2	7.5	41.8	46
3/31/1999	4/16/1999	0.000024	0.000748	7.7	8.1	40.6	43.2
4/30/1999	5/13/1999	0.026	0.79	8.1	8.2	48.5	49.6
5/31/1999	6/16/1999	0.136	4.1	8	8.1	57.3	63
6/30/1999	7/14/1999	1.16	34	7.1	8.2	65.7	70.2
7/31/1999	8/16/1999	6.5	34	7.7	7.9	69.8	73.4
8/31/1999	9/17/1999	3.8	34	7.2	8.1	72.4	76
9/30/1999	10/18/1999	0.987	29	7.5	7.5	70	70
10/31/1999	11/15/1999	0.0008	0.026				
11/30/1999	12/15/1999	4.45	34	8	8.1	50	52
12/31/1999	1/14/2000	0.0002	0.007				
1/31/2000	2/15/2000	3	34	7.2	7.4	48	51
2/29/2000	3/15/2000	0.024	0.712	7.6	7.6	35	35
3/31/2000	4/12/2000	3.05	40	7.6	8.2	51	55
4/30/2000	5/15/2000	0.066	1.99	6.5	8.4	48	55
5/31/2000	6/13/2000	2.83	40	7.6	8.1	62	70
6/30/2000	7/14/2000	0.23	6.9	7.6	7.6	71	71
7/31/2000	8/14/2000	6.7	40	7.7	7.8	84	86
8/31/2000	9/13/2000	2.3	40	7.8	7.8	70	70
9/30/2000	10/12/2000	2.7	40	7.5	7.9	67	82
10/31/2000	11/13/2000	1.7	40	7.4	7.7	62	63
11/30/2000	12/11/2000	0.5	16	7.8	8	58	60
12/31/2000	1/10/2001	0.7	20.3	7.7	7.7	51	53
1/31/2001	2/14/2001						
2/28/2001	3/15/2001	0.01	0.18				
3/31/2001	4/12/2001	0.25	7.35	7.9	7.9	38	38
4/30/2001	5/9/2001	9.3	40	8	8.1	54	55
5/31/2001	6/11/2001	0.24	7.4	7.9	7.9	61	61
6/30/2001	7/12/2001	0.09	2.8	8.1	8.1	74	74
7/31/2001	8/9/2001	0.14	4.1	7.9	7.9	76	76
8/31/2001	9/14/2001	0.03	0.83	8	8	76	76
9/30/2001	10/10/2001	0.21	6.4	8.2	8.2	68	68
10/31/2001	11/14/2001	5.51	40	8	8.1	66	67
11/30/2001	12/12/2001	3.6	40	7.9	8.2	61	63
12/31/2001	1/14/2002	0.45	40	7.8	7.8	55	55
1/31/2002	2/14/2002	0.11	0.11				
2/28/2002	3/12/2002	0.52	40	7.9	7.9	50	59
3/31/2002	4/15/2002						
4/30/2002	5/14/2002	8.96	40	8	8.1	54	59
5/31/2002	6/13/2002	0.23	40				
6/30/2002	7/10/2002						
7/31/2002	8/14/2002						
8/31/2002	9/16/2002						
9/30/2002	10/11/2002						
10/31/2002	11/14/2002	0.27	40	7.7	8	56	58
11/30/2002	12/13/2002	1.01	40	7.8	8.2	50	52
12/31/2002	1/15/2003	0.0004	40	8.3	8.3	37	37
1/31/2003	2/12/2003	3	40	8	8.1	40	40
2/28/2003	3/31/2003	2.64	40	8.14	8.14	41.78	41.78
3/31/2003	4/10/2003	2.4	40	8.1	8.3	48.2	61
4/30/2003	5/13/2003	0.65	19.4	8	8	45	45
5/31/2003	6/12/2003	0.46	14.4	8.2	8.2	64.1	64.1
6/30/2003	7/11/2003	0.006	0.19				
7/31/2003	8/14/2003	0.005	0.16				
8/31/2003	9/12/2003	0.008	0.24				
9/30/2003	10/14/2003	3.04	40	8.26	8.26	75.6	75.6
10/31/2003	11/12/2003	3.53	40	8.12	8.12	66.76	66.76
11/30/2003	12/10/2003	0.02	0.58	8.08	8.08	48.01	48.01
12/31/2003	1/13/2004	1.61	40	8.13	8.44	44.35	48.14
1/31/2004	2/13/2004	0.01	0.31	8.11	8.15	37.5	42.25

2/29/2004	3/15/2004	2.67	40	8.22	8.24	39.8	41.4
3/31/2004	4/18/2004	0.009	0.286				
4/30/2004	5/17/2004	0.22	6.56	8.26	8.26	46.5	46.5
5/31/2004	6/14/2004	8	40	8.29	8.42	62.2	68.6
6/30/2004	7/12/2004	0.0009	0.028	8.24	8.46	62.6	65.3
7/31/2004	8/10/2004	0.006	0.0002	8.37	8.37	61.31	61.31
8/31/2004	9/13/2004	0.41	12.8	8.33	8.4	69.43	72.82
9/30/2004	10/15/2004	0.002	0.049				
10/31/2004	11/15/2004	9.06	40	8.03	8.46	65.14	70.75
11/30/2004	12/9/2004						
12/31/2004	1/13/2005	0.021	0.66	8.31	8.31	37.16	37.16
1/31/2005	2/14/2005						
2/28/2005	3/14/2005						
3/31/2005	4/15/2005	0.006	0.18	8.39	8.39	41.42	41.42
4/30/2005	5/18/2005	0.19	5.7	8.48	8.57	52.52	53.15
5/31/2005	6/13/2005	0.09	0.92	8.54	8.54	55.5	55.5
6/30/2005	7/14/2005						
7/31/2005	8/17/2005	0.1	2.77	8.58	8.58	66.35	66.35
8/31/2005	9/12/2005						
9/30/2005	10/17/2005	7.02	40.3	7.99	8.18	69.7	76.8
10/31/2005	11/15/2005	2.33	22.94	7.84	8.35	66.6	71
11/30/2005	12/13/2005	0.0006	0.0008				
12/31/2005	1/13/2006	0.001	0.01				
1/31/2006	2/14/2006	0.17	1.43	8.27	8.56	45.5	48.6
2/28/2006	3/13/2006	0.05	0.25	8.23	8.35	41.3	44.1
3/31/2006	4/14/2006	1.98	36.21	8.33	8.33	35.2	35.2
4/30/2006	5/15/2006	0.0005	0.0006				
5/31/2006	6/14/2006	0.0005	0.006	8.21	8.21	50.2	50.2
6/30/2006	7/13/2006	0.28	8.31	8.09	8.09	68.34	68.34
7/31/2006	8/7/2006	0.0004	0.001				
8/31/2006	9/19/2006	0.65	12.39	7.99	8.28	71.14	76.42
9/30/2006	10/16/2006	2.23	30.6				
10/31/2006	11/15/2006	0.3	9.34	8.01	8.37	65.3	74.2
11/30/2006	12/15/2006	0.002	0.04	8.07	8.07	46.4	46.4
12/31/2006	1/11/2007	0.0003	0.002				
1/31/2007	2/14/2007						
2/28/2007	3/14/2007	0.47	13.13	8.08	8.18	32.1	35
3/31/2007	4/16/2007						
4/30/2007	5/16/2007						
5/31/2007	6/14/2007						
6/30/2007	7/13/2007	0.12	3.63	7.9	7.9	68.1	68.1
7/31/2007	8/13/2007						
8/31/2007	9/13/2007	0.89	13.16	7.85	8.03	79.4	80.6
9/30/2007	10/12/2007	2.41	29.31	7.66	7.9	70.4	71.9
10/31/2007	11/14/2007	0.02	0.49	7.87	7.87	57.3	57.3
11/30/2007	12/12/2007	0.16	0.66	7.87	7.95	51.4	53.6
12/31/2007	1/14/2008	0.1	1.29	7.89	8.14	41.1	41.1
1/31/2008	2/15/2008	0.08	0.65	7.98	8.08	45.13	48.4
2/29/2008	3/14/2008						
3/31/2008	4/11/2008						
4/30/2008	5/7/2008	9.09	35.28	7.78	8.02	58.9	62.4
5/31/2008	6/13/2008	1.61	25.78	7.8	7.93	62.7	63.8
6/30/2008	7/11/2008	5.92	26.84	7.69	7.91	72.1	80.7
7/31/2008	8/11/2008	0.0003	0.0081	7.72	7.72	74.4	74.4
8/31/2008	9/10/2008						
9/30/2008	10/10/2008						
10/31/2008							
11/30/2008							
12/31/2008							
014A		Flow		pH		Temperature	
		27 Mgal/d	45 Mgal/d	6.5 SU	8.5 SU	90 deg F	95 deg F
MP Date	Rec'd Date	MO AVG	DAILY MX	MINIMUM	MAXIMUM	MO AVG	DAILY MX
	Ave:	1.51	18.10	7.91	8.09	56.55	59.02
	max	9.3	40.3	8.58	8.58	84	86
	min	0.000024	0.0002	6.5	7.4	32.1	35
	exceedence	0	0	0	4	0	0

018A

		Flow		ph		Temperature	
		35.6 Mgal/d	35.6 Mgal/d	6.5 SU	8.5 SU	90 deg F	95 deg F
MP Date	Rec'd Date	MO AVG	DAILY MX	MINIMUM	MAXIMUM	MO AVG	DAILY MX
10/31/1998	11/16/1998	29.6	34.9	7.6	8.2	67.2	70.1
11/30/1998	12/16/1998	30.7	34.9	7.6	7.9	59	61
12/31/1998	1/19/1999	29.7	34.9	7.6	8.2	56.4	59
1/31/1999	2/16/1999	29.3	34.9	7.5	7.6	48.2	51.8
2/28/1999	3/16/1999	28.1	34.9	7.4	8.1	49.3	56
3/31/1999	4/16/1999	28.6	34.9	7.7	8.1	55.7	71
4/30/1999	5/13/1999	27.7	34.9	7.9	8.1	64.8	77
5/31/1999	6/16/1999	28.8	34.9	7.9	8	76	91
6/30/1999	7/14/1999	28.8	28.8	7.7	8.1	84	95
7/31/1999	8/16/1999	30.7	34.9	7.6	7.7	85	95
8/31/1999	9/17/1999	29.3	34.9	7.3	7.7	85	95
9/30/1999	10/18/1999	28.1	34.9	7.3	7.7	81.5	94
10/31/1999	11/15/1999	28.9	34.9	7.5	7.7	70	83
11/30/1999	12/15/1999	28.1	34.9	7.6	8	63	76
12/31/1999	1/14/2000	28	34.9	7.3	7.9	53	67
1/31/2000	2/15/2000	27.8	34.9	7.5	7.8	46	62
2/29/2000	3/15/2000	27.6	34.9	7.6	7.8	49	63
3/31/2000	4/12/2000	28.2	34.9	7.8	7.9	59	73
4/30/2000	5/15/2000	25.7	34.9	7.5	8.1	64	79
5/31/2000	6/13/2000	21.8	34.9	7.2	7.7	78	91
6/30/2000	7/14/2000	21.9	34.9	7.4	7.7	83	93
7/31/2000	8/14/2000	23.9	34.9	7.3	7.6	84	93
8/31/2000	9/13/2000	29.9	34.9	7.6	7.8	86	95
9/30/2000	10/12/2000	22.5	34.9	7.5	7.8	81	93
10/31/2000	11/13/2000	27.2	34.9	7.5	7.8	73	88
11/30/2000	12/11/2000	29.8	34.9	7.6	7.7	62	74
12/31/2000	1/10/2001	29.5	34.9	7.7	7.8	53	67
1/31/2001	2/14/2001	30	34.9	7.8	8.1	48	60
2/28/2001	3/15/2001	26.4	34.9	7.7	7.9	52	71
3/31/2001	4/12/2001	28.3	34.9	7.9	8	56	66
4/30/2001	5/9/2001	28	34.9	7.8	7.9	63	82
5/31/2001	6/11/2001	25	34.9	7.8	8.1	74	91
6/30/2001	7/12/2001	28.8	34.9	7.7	7.8	81	93
7/31/2001	8/9/2001	28.8	34.9	7.5	7.9	82	94
8/31/2001	9/14/2001	31	34.9	7.3	7.8	86	95
9/30/2001	10/10/2001	28.9	34.9	7.6	7.8	81	92
10/31/2001	11/14/2001	29.4	34.9	7.8	8	73	88
11/30/2001	12/12/2001	30.4	34.9	7.9	8	62	73
12/31/2001	1/14/2002	31.7	34.9	7.8	7.9	56	69
1/31/2002	2/14/2002	30.6	34.9	7.8	7.9	51.4	64
2/28/2002	3/12/2002	30.8	34.9	7.8	7.9	56	67
3/31/2002	4/15/2002	30.4	34.9	7.7	7.9	59.5	69
4/30/2002	5/14/2002	26.2	34.9	7.8	7.9	67.3	83
5/31/2002	6/13/2002	22.8	34.9	7.9	8	73.5	91
6/30/2002	7/10/2002	22.8	34.9	7.8	8	80.2	94
7/31/2002	8/14/2002	30.2	34.9	7.7	8	84	94
8/31/2002	9/16/2002	32.1	34.9	7.7	7.8	86.4	90.5
9/30/2002	10/11/2002	30.5	34.9	7.6	7.8	83.3	89
10/31/2002	11/14/2002	30.3	34.9	7.6	7.9	71.2	84
11/30/2002	12/13/2002	29.7	34.9	7.9	8.1	60	70.5
12/31/2002	1/15/2003	30.9	34.9	7.8	8.1	49.8	55.5
1/31/2003	2/12/2003	29.3	34.9	7.8	8.1	46.9	53
2/28/2003	3/31/2003	27.7	34.9	7.7	8.1	45.7	50
3/31/2003	4/10/2003	25.6	34.9	7.3	8.2	50.7	64
4/30/2003	5/13/2003	26.4	34.9	7.9	8.2	57.8	69.5
5/31/2003	6/12/2003	24.6	34.9	7.6	7.9	57.8	69.5
6/30/2003	7/11/2003	28.3	34.9	7.42	7.87	75.9	86
7/31/2003	8/14/2003	30.52	34.9	7.5	7.9	80.9	87.5
8/31/2003	9/12/2003	29.92	34.9	7.5	7.9	81.6	88.5
9/30/2003	10/14/2003	28.3	34.9	7.39	7.93	79.7	85.5
10/31/2003	11/12/2003	23.01	34.9	7.47	7.98	70.2	76.5
11/30/2003	12/10/2003	25.2	34.9	8.07	8.18	61.4	70
12/31/2003	1/13/2004	27.6	34.9	8.08	8.23	51.6	57.1
1/31/2004	2/13/2004	21.17	34.9	7.11	8.35	47.5	57.5

2/29/2004	3/15/2004	21.3	34.9	7.94	8.22	49.35	52.5
3/31/2004	4/18/2004	29.74	34.9	8.07	8.34	53.5	58
4/30/2004	5/17/2004	30.67	34.9	8.15	8.38	59.4	68.5
5/31/2004	6/14/2004	30.2	34.9	7.96	8.1	71.2	77.5
6/30/2004	7/12/2004	27.94	34.9	7.39	7.94	76.8	83.5
7/31/2004	8/10/2004	27.6	34.9	7.79	7.79	84.2	88
8/31/2004	9/13/2004	30.76	34.9	7.8	7.91	83.8	88
9/30/2004	10/15/2004	29.3	34.9	7.85	8.33	81.5	86
10/31/2004	11/15/2004	25.3	32.28	8.05	8.8	72	81
11/30/2004	12/9/2004	25.62	32.04	7.96	8.31	62.4	67.5
12/31/2004	1/13/2005	22.24	30.6	8.07	8.13	58.2	69
1/31/2005	2/14/2005	23.22	30.6	8.03	8.27	50.2	63.5
2/28/2005	3/14/2005	21.1	21.9	8.06	8.28	49.8	59
3/31/2005	4/15/2005	20.9	23.31	7.93	8.36	53.9	60
4/30/2005	5/18/2005	23.43	30.6	7.96	8.2	59.1	67.5
5/31/2005	6/13/2005	20.94	21.36	7.96	8.27	70.65	78
6/30/2005	7/14/2005	21.25	24.35	7.02	7.96	80.7	88
7/31/2005	8/19/2005	26.84	34.68	7.58	7.93	83.3	88.5
8/31/2005	9/12/2005	31.05	34.05	7.96	8.08	83.7	89.5
9/30/2005	10/17/2005	22	30.6	7.92	8.13	81.25	84.5
10/31/2005	11/15/2005	20.91	25.34	8.03	8.08	72.3	82.5
11/30/2005	12/13/2005	20.97	31.08	8.05	8.17	65.7	73
12/31/2005	1/13/2006	21.5	27.36	8.02	8.12	54.98	67.5
1/31/2006	2/14/2006	25.09	30.78	8.06	8.09	55.2	60
2/28/2006	3/13/2006	29.5	31.08	8.01	8.11	51.7	57.5
3/31/2006	4/14/2006	28.9	30.6	8.05	8.1	55.9	62.5
4/30/2006	5/15/2006	21.36	30.6	8.06	8.11	69.1	74.5
5/31/2006	6/14/2006	21.4	25.7	7.98	8.11	73.6	83.5
6/30/2006	7/13/2006	27.64	33.93	7.98	8.07	80.1	86
7/31/2006	8/7/2006	30.1	35.06	7.69	8.16	83.6	88
8/31/2006	9/19/2006	29.27	35.01	7.96	8.03	83.5	88
9/30/2006	10/16/2006	28.13	33.6	7.97	8.05	79.8	85.5
10/31/2006	11/15/2006	24.8	30.6	7.97	8.14	72.2	79
11/30/2006	12/15/2006	27.5	30.6	7.91	8.06	65.2	71
12/31/2006	1/11/2007	26.7	30.6	8.02	8.08	57.8	69
1/31/2007	2/14/2007	28.1	30.6	8.01	8.06	52.5	59.5
2/28/2007	3/14/2007	28.83	31.08	8	8.07	47.4	55
3/31/2007	4/16/2007	28.4	30.6	7.99	8.05	54.9	65
4/30/2007	5/16/2007	27.4	30.6	7.99	8.07	70.5	60
5/31/2007	6/14/2007	24.8	31.6	8	8.08	71	79
6/30/2007	7/13/2007	24.8	28.4	7.94	8.07	78.6	84
7/31/2007	8/15/2007	29.7	35.5	8.04	8.07	79.3	86.5
8/31/2007	9/13/2007	30.9	34.9	8.02	8.12	80.7	85.5
9/30/2007	10/12/2007	30.2	33.8	7.96	8.06	77	83
10/31/2007	11/14/2007	27.8	33	7.96	8.09	70.4	84
11/30/2007	12/12/2007	27.6	31.6	7.91	8.21	56.8	65
12/31/2007	1/14/2008	25.65	31.08	8	8.12	47.3	55
1/31/2008	2/15/2008	28.92	30.78	7.98	8.07	43.7	51
2/29/2008	3/14/2008	28.8	30.6	8.03	8.09	44	51.5
3/31/2008	4/11/2008	27.83	30.75	8	8.11	44.2	51
4/30/2008	5/7/2008	27.6	31.8	7.96	8.04	55.9	64.5
5/31/2008	6/13/2008	26.49	30.78	7.97	8.02	66.5	74.5
6/30/2008	7/11/2008	29.88	33.48	7.88	8.07	76.4	81.5
7/31/2008	8/11/2008	29.09	33.48	7.89	8.11	81.2	85.5
8/31/2008	9/10/2008	27.84	33.48	8	8.02	81.2	84.5
9/30/2008	10/10/2008	29.2	32.8	8	8.07	76	83.5
10/31/2008	11/12/2008	26.7	32	8	8	67.1	74
11/30/2008							
12/31/2008							
018A		Flow		pH		Temperature	
		35.6 Mgal/d	35.6 Mgal/d	6.5 SU	8.5 SU	90 deg F	95 deg F
		MO AVG	DAILY MX	MINIMUM	MAXIMUM	MO AVG	DAILY MX
	Ave:	27.3	33.2	7.8	8.0	66.7	75.5
	max	32.1	35.5	8.15	8.8	86.4	95
	min	20.9	21.36	7.02	7.6	43.7	50
	exceedence	0	0	0	1	0	0

019D

		Flow	Mercury	O&G		pH		Silver	Temperature	
		.083 Mgal/d	Req. Mon. mg/L	10 mg/L	15 mg/L	6.5 SU	8.5 SU	Req. Mon. mg/L	88.4 deg F	90 deg F
MP Date	Rec'd Date	MO AVG	DAILY MX	MO AVG	DAILY MX	MINIMUM	MAXIMUM	DAILY MX	MO AVG	DAILY MX
10/31/1998	11/16/1998	0.083		5	5				65.7	70.5
11/30/1998	12/16/1998	0.083		5	5				53	55
12/31/1998	1/19/1999	0.083		5	5				51.6	55
1/31/1999	2/16/1999	0.083		5	5	6.8	7.4		45.4	48
2/28/1999	3/16/1999	0.083		5	5	7.1	7.6		47	51
3/31/1999	4/16/1999	0.083		5	5	7.3	7.3		47.3	48.2
4/30/1999	5/13/1999	0.083		5	5	7.6	7.8		53.6	55
5/31/1999	6/16/1999	0.083		5	5	7.5	7.9		59.6	66
6/30/1999	7/14/1999	0.083		5	5	7.4	8.5		67.1	71
7/31/1999	8/16/1999	0.083		5	5	7.5	7.5		71.1	73.4
8/31/1999	9/17/1999	0.083		5	5	7.3	7.6		71.8	75
9/30/1999	10/18/1999	0.083		5	5	7.3	7.6		70.9	74
10/31/1999	11/15/1999	0.083		5	5	7.5	8.9		64.4	68
11/30/1999	12/15/1999	0.083		5	5	7.4	7.8		55	63
12/31/1999	1/14/2000	0.083		5	5	7.3	7.8		50	55
1/31/2000	2/15/2000	0.083		5	5	6.9	8.1		47	57
2/29/2000	3/15/2000	0.083		5	5	7.5	7.7		45	48
3/31/2000	4/12/2000	0.083		5	5	7.6	7.6		48	51
4/30/2000	5/15/2000	0.083		5	5	7.3	8		52	53
5/31/2000	6/13/2000	0.083		5	5	7.3	7.8		58	61
6/30/2000	7/14/2000	0.083		5	5	7.2	7.8		65	68
7/31/2000	8/14/2000	0.017		6	6	7.4	7.4		67	67
8/31/2000	9/13/2000	c		c	c	c	c		c	c
9/30/2000	10/12/2000	c		c	c	c	c		c	c
10/31/2000	11/13/2000	c		c	c	c	c		c	c
11/30/2000	12/11/2000	c		c	c	c	c		c	c
12/31/2000	1/10/2001	c		c	c	c	c		c	c
1/31/2001	2/14/2001	c		c	c	c	c		c	c
2/28/2001	3/15/2001	c		c	c	c	c		c	c
3/31/2001	4/12/2001	c		c	c	c	c		c	c
4/30/2001	5/9/2001	c		c	c	c	c		c	c
5/31/2001	6/11/2001	c		c	c	c	c		c	c
6/30/2001	7/12/2001	c		c	c	c	c		c	c
7/31/2001	8/9/2001	c		c	c	c	c		c	c
8/31/2001	9/14/2001	c		c	c	c	c		c	c
9/30/2001	10/10/2001	c		c	c	c	c		c	c
10/31/2001	11/14/2001	c		c	c	c	c		c	c
11/30/2001	12/12/2001	c		c	c	c	c		c	c
12/31/2001	1/14/2002	c		c	c	c	c		c	c
1/31/2002	2/14/2002	c		c	c	c	c		c	c
2/28/2002	3/12/2002	c		c	c	c	c		c	c
3/31/2002	4/15/2002	c		c	c	c	c		c	c
4/30/2002	5/14/2002	c		c	c	c	c		c	c
5/31/2002	6/13/2002	c		c	c	c	c		c	c
6/30/2002	7/10/2002	c		c	c	c	c		c	c
7/31/2002	8/14/2002	c		c	c	c	c		c	c
8/31/2002	9/16/2002	c		c	c	c	c		c	c
9/30/2002	10/11/2002	c		c	c	c	c		c	c
10/31/2002	11/14/2002	c		c	c	c	c		c	c
11/30/2002	12/13/2002	c		c	c	c	c		c	c
12/31/2002	1/15/2003	c		c	c	c	c		c	c
1/31/2003	2/12/2003	c		c	c	c	c		c	c
2/28/2003	3/31/2003	c		c	c	c	c		c	c
3/31/2003	4/10/2003	c		c	c	c	c		c	c
4/30/2003	5/13/2003	c		c	c	c	c		c	c
5/31/2003	6/12/2003	c		c	c	c	c		c	c
6/30/2003	7/11/2003	c		c	c	c	c		c	c
7/31/2003	8/14/2003	c		c	c	c	c		c	c
8/31/2003	9/12/2003	c		c	c	c	c		c	c
9/30/2003	10/14/2003	c		c	c	c	c		c	c
10/31/2003	11/12/2003	c		c	c	c	c		c	c
11/30/2003	12/10/2003	c		c	c	c	c		c	c
12/31/2003	1/13/2004	c		c	c	c	c		c	c
1/31/2004	2/13/2004	c		c	c	c	c		c	c
2/29/2004	3/15/2004	c		c	c	c	c		c	c
3/31/2004	4/18/2004	c		c	c	c	c		c	c
4/30/2004	5/17/2004	c		c	c	c	c		c	c
5/31/2004	6/14/2004	c		c	c	c	c		c	c
6/30/2004	7/12/2004	c		c	c	c	c		c	c
7/31/2004	8/10/2004	c		c	c	c	c		c	c
8/31/2004	9/13/2004	c		c	c	c	c		c	c
9/30/2004	10/15/2004	c		c	c	c	c		c	c
10/31/2004	11/15/2004	c		c	c	c	c		c	c
11/30/2004	12/9/2004	c		c	c	c	c		c	c
12/31/2004	1/13/2005	c		c	c	c	c		c	c
1/31/2005	2/14/2005	c		c	c	c	c		c	c
2/28/2005	3/14/2005	c		c	c	c	c		c	c
3/31/2005	4/15/2005	c		c	c	c	c		c	c
4/30/2005	5/18/2005	c		c	c	c	c		c	c
5/31/2005	6/13/2005	c		c	c	c	c		c	c
6/30/2005	7/14/2005	c		c	c	c	c		c	c
7/31/2005	8/19/2005	c		c	c	c	c		c	c
8/31/2005	9/12/2005	c		c	c	c	c		c	c
9/30/2005	10/17/2005	c		c	c	c	c		c	c
10/31/2005	11/15/2005	c		c	c	c	c		c	c
11/30/2005	12/14/2005	c		c	c	c	c		c	c
12/31/2005	1/13/2006	c		c	c	c	c		c	c
1/31/2006	2/14/2006	c		c	c	c	c		c	c
2/28/2006	3/13/2006	c		c	c	c	c		c	c
3/31/2006	4/14/2006	c		c	c	c	c		c	c
4/30/2006	5/15/2006	c		c	c	c	c		c	c
5/31/2006	6/14/2006	c		c	c	c	c		c	c
6/30/2006	7/13/2006	c		c	c	c	c		c	c
7/31/2006	8/7/2006	c		c	c	c	c		c	c

8/31/2006	9/19/2006	C		C	C	C	C		C	C
9/30/2006	10/16/2006	C		C	C	C	C		C	C
10/31/2006	11/15/2006	C		C	C	C	C		C	C
11/30/2006	12/15/2006	C		C	C	C	C		C	C
12/31/2006	1/11/2007	C		C	C	C	C		C	C
1/31/2007	2/14/2007	C		C	C	C	C		C	C
2/28/2007	3/14/2007	C		C	C	C	C		C	C
3/31/2007	4/16/2007	C		C	C	C	C		C	C
4/30/2007	5/16/2007	C		C	C	C	C		C	C
5/31/2007	6/14/2007	C		C	C	C	C		C	C
6/30/2007	7/13/2007	C		C	C	C	C		C	C
7/31/2007	8/15/2007	C		C	C	C	C		C	C
8/31/2007	9/13/2007	C		C	C	C	C		C	C
9/30/2007	10/12/2007	C		C	C	C	C		C	C
10/31/2007	11/14/2007	C		C	C	C	C		C	C
11/30/2007	12/12/2007	C		C	C	C	C		C	C
12/31/2007	1/14/2008	C		C	C	C	C		C	C
1/31/2008	2/15/2008	C		C	C	C	C		C	C
2/29/2008	3/14/2008	C		C	C	C	C		C	C
3/31/2008	4/11/2008	C		C	C	C	C		C	C
4/30/2008	5/7/2008	C		C	C	C	C		C	C
5/31/2008	6/13/2008	C		C	C	C	C		C	C
6/30/2008	7/11/2008	C		C	C	C	C		C	C
7/31/2008	8/11/2008	C		C	C	C	C		C	C
8/31/2008	9/10/2008	C		C	C	C	C		C	C
9/30/2008	10/10/2008	C		C	C	C	C		C	C
10/31/2008	11/12/2008	C		C	C	C	C		C	C
11/30/2008										
12/31/2008										
019D		Flow	Mercury	O&G		pH		Silver	Temperature	
		.083 Mgal/d	Req. Mon. mg/L	10 mg/L	15 mg/L	6.5 SU	8.5 SU	Req. Mon. mg/L	88.4 deg F	90 deg F
		MO AVG	DAILY MX	MO AVG	DAILY MX	MINIMUM	MAXIMUM	DAILY MX	MO AVG	DAILY MX
	Ave	0.08	0.00	5.05	5.05	7.33	7.79	0.00	57.07	60.60
	max	0.083	0	6	6	7.6	8.9	0	71.8	75
	min	0.017	0	5	5	6.8	7.3	0	45	48
	exceedence	0	NA	0	0	0	1	NA	0	0

*C: NODI code which refers to "no discharge"

019W		O&G	pH	
		10 mg/L	6.5 SU	8.5 SU
MP Date	Rec'd Date	MO AVG	MINIMUM	MAXIMUM
10/31/1998	11/16/1998	5	8.5	8.5
1/31/1999	2/16/1999	5	7.4	7.4
4/30/1999	5/13/1999	5	7.9	7.9
7/31/1999	8/16/1999	5	7.4	7.4
10/31/1999	11/15/1999	5	7.3	7.5
1/31/2000	2/15/2000	5	7.4	7.4
4/30/2000	5/15/2000	5	6.7	6.7
7/31/2000	8/14/2000	5	7.3	7.3
10/31/2000	11/13/2000	10	6.9	6.9
1/31/2001	2/14/2001	5	6.4	6.4
4/30/2001	5/9/2001	5	7.1	7.1
7/31/2001	8/9/2001	5	7.8	7.8
10/31/2001	11/14/2001	5	6.9	6.9
1/31/2002	2/14/2002	5	6.8	6.8
4/30/2002	5/14/2002	5	7.4	7.4
7/31/2002	8/14/2002	5	6.9	6.9
10/31/2002	11/14/2002	5	7.4	7.4
1/31/2003	2/12/2003	5.2	7.2	7.2
4/30/2003	5/13/2003	8.1	7.5	7.5
7/31/2003	8/14/2003	5	6.8	6.8
10/31/2003	11/12/2003	5	7.8	7.8
1/31/2004	2/13/2004	5	7.66	7.66
4/30/2004	5/17/2004	5	7.01	7.01
7/31/2004	8/10/2004	5	7.78	7.78
10/31/2004	11/15/2004	5	8.13	8.13
1/31/2005	2/14/2005	5	7.09	7.09
4/30/2005	5/18/2005	5	6.67	6.67
7/31/2005	8/19/2005	5	7.78	7.78
10/31/2005	11/15/2005	5	7.52	7.52
1/31/2006	2/14/2006	5	7.43	7.43
4/30/2006	5/15/2006	5	7.28	7.28
7/31/2006	8/7/2006	5	7.08	7.08
10/31/2006	11/15/2006	5	6.9	6.9
1/31/2007	2/14/2007	5	5.4	5.4
4/30/2007	5/16/2007	5	6.93	6.93
7/31/2007	7/13/2007	5	6.9	6.9
10/31/2007	11/14/2007	5	7.27	7.27
1/31/2008	2/15/2008	5	7.78	7.78
4/30/2008	5/10/2008	5	6.9	6.9
7/31/2008	8/11/2008	5	6.92	6.92
10/31/2008	11/12/2008	5	6.96	6.96

019W		O&G	pH	
		10 mg/L	6.5 SU	8.5 SU
		MO AVG	MINIMUM	MAXIMUM
	Ave	5.2	7.2	7.2
	max	10	8.5	8.5
	min	5	5.4	5.4
	exceedence	0	2	0

020D

		Flow	pH	
		16.9 Mgal/d	6.5 SU	8.5 SU
MP Date	Rec'd Date	MO AVG	MINIMUM	MAXIMUM
10/31/1998	11/16/1998	16.9	7.7	8
11/30/1998	12/16/1998	16.9	7.6	7.7
12/31/1998	1/19/1999	16.9	7.2	7.9
1/31/1999	2/16/1999	16.9	7	7.9
2/28/1999	3/16/1999	16.9	7.2	7.5
3/31/1999	4/16/1999	16.9	7.1	8
4/30/1999	5/13/1999	16.9	7.9	8
5/31/1999	6/16/1999	16.9	7.9	8.1
6/30/1999	7/14/1999	16.9	7.4	8.1
7/31/1999	8/16/1999	16.9	7.6	7.8
8/31/1999	9/17/1999	16.9	7.5	7.9
9/30/1999	10/18/1999	16.9	7.4	7.6
10/31/1999	11/15/1999	16.9	7.6	7.9
11/30/1999	12/15/1999	16.9	7.7	8
12/31/1999	1/14/2000	16.9	7.7	7.8
1/31/2000	2/15/2000	16.9	6.9	7.9
2/29/2000	3/15/2000	16.9	7.6	7.9
3/31/2000	4/12/2000	16.9	7.8	8
4/30/2000	5/15/2000	16.9	7.6	7.7
5/31/2000	6/13/2000	16.9	7.3	7.8
6/30/2000	7/14/2000	16.9	7.5	7.8
7/31/2000	8/14/2000	16.9	7.7	7.7
8/31/2000	9/13/2000	16.9	7.5	8
9/30/2000	10/12/2000	16.9	7.6	7.8
10/31/2000	11/13/2000	16.9	7.6	8
11/30/2000	12/11/2000	16.9	7.6	7.7
12/31/2000	1/10/2001	16.9	7.7	7.8
1/31/2001	2/14/2001	16.9	7.7	8
2/28/2001	3/15/2001	16.9	7.5	7.8
3/31/2001	4/12/2001	16.9	7.9	8
4/30/2001	5/9/2001	16.9	7.8	8.1
5/31/2001	6/11/2001	16.9	7.8	8.2
6/30/2001	7/12/2001	16.9	7.8	7.9
7/31/2001	8/9/2001	16.9	7.5	7.8
8/31/2001	9/14/2001	16.9	7.4	7.8
9/30/2001	10/10/2001	16.9	7.7	7.8
10/31/2001	11/14/2001	16.9	7.9	8.1
11/30/2001	12/12/2001	16.9	7.8	8.1
12/31/2001	1/14/2002	16.9	7.8	8
1/31/2002	2/14/2002	16.9	7.9	8
2/28/2002	3/12/2002	16.9	7.8	7.9
3/31/2002	4/15/2002	16.9	7.8	8
4/30/2002	5/14/2002	16.9	7.8	7.9
5/31/2002	6/13/2002	16.9	7.8	8.1
6/30/2002	7/10/2002	16.9	7.9	8
7/31/2002	8/14/2002	16.9	7.8	8
8/31/2002	9/16/2002	16.9	7.7	8
9/30/2002	10/11/2002	16.9	7.7	8
10/31/2002	11/14/2002	16.9	7.7	7.9
11/30/2002	12/13/2002	16.9	7.8	8.1
12/31/2002	1/15/2003	16.9	7.8	8
1/31/2003	2/12/2003	16.9	7.7	8.1
2/28/2003	3/31/2003	16.9	7.9	8.1
3/31/2003	4/10/2003	16.9	7.8	8.3
4/30/2003	5/13/2003	16.9	7.4	8.3
5/31/2003	6/12/2003	16.9	6.8	8
6/30/2003	7/11/2003	16.9	7.59	7.95
7/31/2003	8/14/2003	16.9	7.8	8.1
8/31/2003	9/12/2003	16.9	7.6	8
9/30/2003	10/14/2003	16.9	7.56	8.16
10/31/2003	11/12/2003	16.9	7.63	8.07
11/30/2003	12/10/2003	16.9	8.19	8.32
12/31/2003	1/13/2004	16.9	8.11	8.49
1/31/2004	2/13/2004	16.9	7.96	8.45

2/29/2004	3/15/2004	16.9	8.15	8.45
3/31/2004	4/18/2004	16.9	8.19	8.49
4/30/2004	5/17/2004	C	C	C
5/31/2004	6/14/2004	C	C	C
6/30/2004	7/12/2004	C	C	C
7/31/2004	8/10/2004	C	C	C
8/31/2004	9/13/2004	C	C	C
9/30/2004	10/15/2004	C	C	C
10/31/2004	11/15/2004	C	C	C
11/30/2004	12/9/2004	C	C	C
12/31/2004	1/13/2005	C	C	C
1/31/2005	2/14/2005	C	C	C
2/28/2005	3/14/2005	C	C	C
3/31/2005	4/15/2005	C	C	C
4/30/2005	5/18/2005	C	C	C
5/31/2005	6/13/2005	C	C	C
6/30/2005	7/14/2005	C	C	C
7/31/2005	8/19/2005	C	C	C
8/31/2005	9/12/2005	C	C	C
9/30/2005	10/17/2005	C	C	C
10/31/2005	11/15/2005	C	C	C
11/30/2005	12/13/2005	C	C	C
12/31/2005	1/13/2006	C	C	C
1/31/2006	2/14/2006	C	C	C
2/28/2006	3/13/2006	C	C	C
3/31/2006	4/14/2006	C	C	C
4/30/2006	5/15/2006	C	C	C
5/31/2006	6/14/2006	C	C	C
6/30/2006	7/13/2006	C	C	C
7/31/2006	8/7/2006	C	C	C
8/31/2006	9/19/2006	C	C	C
9/30/2006	10/16/2006	C	C	C
10/31/2006	11/15/2006	C	C	C
11/30/2006	12/15/2006	C	C	C
12/31/2006	1/11/2007	C	C	C
1/31/2007	2/14/2007	C	C	C
2/28/2007	3/14/2007	C	C	C
3/31/2007	4/16/2007	C	C	C
4/30/2007	5/16/2007	C	C	C
5/31/2007	6/14/2007	C	C	C
6/30/2007	7/13/2007	C	C	C
7/31/2007	8/15/2007	C	C	C
8/31/2007	9/13/2007	C	C	C
9/30/2007	10/12/2007	C	C	C
10/31/2007	11/14/2007	C	C	C
11/30/2007	12/12/2007	C	C	C
12/31/2007	1/14/2008	C	C	C
1/31/2008	2/15/2008	C	C	C
2/29/2008	3/14/2008	C	C	C
3/31/2008	4/11/2008	C	C	C
4/30/2008	5/7/2008	C	C	C
5/31/2008	6/13/2008	C	C	C
6/30/2008	7/11/2008	C	C	C
7/31/2008	8/11/2008	C	C	C
8/31/2008	9/10/2008	C	C	C
9/30/2008	10/10/2008	C	C	C
10/31/2008	11/12/2008	C	C	C
11/30/2008				
12/31/2008				
020D		Flow	pH	
		16.9 Mgal/d	6.5 SU	8.5 SU
		MO AVG	MINIMUM	MAXIMUM
	Ave	16.90	7.66	7.99
	max	16.9	8.19	8.49
	min	16.9	6.8	7.5
	exceedence	0	0	0

*C: NODI code which refers to "no discharge"

020W

		O&G	pH	
		10 mg/L	6.5 SU	8.5 SU
MP Date	Rec'd Date	MO AVG	MINIMUM	MAXIMUM
10/31/1998	11/16/1998	5	7.9	7.9
1/31/1999	2/16/1999	7	7.7	7.7
4/30/1999	5/13/1999	5	8.2	8.2
7/31/1999	8/16/1999	5	7.6	7.6
10/31/1999	11/15/1999	5	7.7	7.8
1/31/2000	2/15/2000	5	7.8	7.8
4/30/2000	5/15/2000	5	8	8
7/31/2000	8/14/2000	5	7.8	7.8
10/31/2000	11/13/2000	5	7.7	7.7
1/31/2001	2/14/2001	5	7.5	7.5
4/30/2001	5/9/2001	5	7.7	7.7
7/31/2001	8/9/2001	5	8.1	8.1
10/31/2001	11/14/2001	5	7.9	7.9
1/31/2002	2/14/2002	5	7.5	7.5
4/30/2002	5/14/2002	5	7.7	7.7
7/31/2002	8/14/2002	5	7.9	7.9
10/31/2002	11/14/2002	5	7.7	7.7
1/31/2003	2/12/2003	5.2	7.9	7.9
4/30/2003	5/13/2003	5	8	8
7/31/2003	8/14/2003	5	7.2	7.2

020W

		O&G	pH	
		10 mg/L	6.5 SU	8.5 SU
		MO AVG	MINIMUM	MAXIMUM
	Ave	5.1	7.8	7.8
	max	7	8.2	8.2
	min	5	7.2	7.2
	exceedence	0	0	0

027D

		Benzene	Ethylbenzene	Flow, in conduit or through treatment plant				Methyl tert-butyl ether
		5 ug/L	Req. Mon. ug/L	.3 Mgal/d	.83 Mgal/d	.5 Mgal/d	1 Mgal/d	100 ug/L
MP Date	Rec'd Date	MO AVG	MO AVG	MO AVG	DAILY MX	MO AVG	DAILY MX	MO AVG
10/31/1998	11/16/1998	1	1	0.3	0.83			2
11/30/1998	12/16/1998	1	1	0.3	0.83			2
12/31/1998	1/19/1999	1	1	0.3	0.83			2
1/31/1999	2/16/1999	1	1	0.3	0.83			2
2/28/1999	3/16/1999	1	1			0.3	0.83	2
3/31/1999	4/16/1999	1	1			0.3	0.83	2
4/30/1999	5/13/1999	1	1			0.3	0.83	2
5/31/1999	6/16/1999	C	C			0.3	0.83	C
6/30/1999	7/14/1999	C	C			0.3	0.83	C
7/31/1999	8/16/1999	C	C			0.3	0.83	C
8/31/1999	9/17/1999	C	C			0.3	0.83	C
9/30/1999	10/18/1999	C	C			0.3	0.83	C
10/31/1999	11/15/1999	C	C			0.3	0.83	C
11/30/1999	12/15/1999	C	C			0.3	0.83	C
12/31/1999	1/14/2000	C	C			0.3	0.83	C
1/31/2000	2/15/2000	C	C			0.3	0.83	C
2/29/2000	3/15/2000	C	C			0.3	0.83	C
3/31/2000	4/12/2000	C	C			0.3	0.83	C
4/30/2000	5/15/2000	C	C			0.3	0.83	C
5/31/2000	6/13/2000	C	C			0.3	0.83	C
6/30/2000	7/14/2000	C	C			0.3	0.83	C
7/31/2000	8/14/2000	C	C			0.38	0.43	C
8/31/2000	9/13/2000	C	C			0.3	0.43	C
9/30/2000	10/12/2000	C	C					C
10/31/2000	11/13/2000	C	C					C
11/30/2000	12/11/2000	C	C			0.3	0.43	C
12/31/2000	1/10/2001	C	C			0.25	0.43	C
1/31/2001	2/14/2001	C	C			0.22	0.39	C
2/28/2001	3/15/2001	C	C			0.35	0.4	C
3/31/2001	4/12/2001	C	C			0.39	0.48	C
4/30/2001	5/9/2001	C	C			0.4	0.42	C
5/31/2001	6/11/2001	C	C			0.33	0.41	C
6/30/2001	7/12/2001	C	C			0.33	0.42	C
7/31/2001	8/9/2001	C	C			0.3	0.4	C
8/31/2001	9/14/2001	C	C			0.32	0.38	C
9/30/2001	10/10/2001	C	C			0.27	0.38	C
10/31/2001	11/14/2001	C	C			0.17	0.37	C
11/30/2001	12/12/2001	C	C			0.2	0.39	C
12/31/2001	1/14/2002	C	C			0.29	0.38	C
1/31/2002	2/14/2002	C	C	0.31	0.36			C
2/28/2002	3/12/2002	C	C	0.34	0.35			C
3/31/2002	4/15/2002	C	C	0.33	0.35			C
4/30/2002	5/14/2002	C	C	0.33	0.35			C
5/31/2002	6/13/2002	C	C	0.31	0.34			C
6/30/2002	7/10/2002	C	C	0.33	0.34			C
7/31/2002	8/14/2002	C	C	0.24	0.33			C
8/31/2002	9/16/2002	C	C	0.21	0.34			C
9/30/2002	10/11/2002	C	C	0.25	0.34			C
10/31/2002	11/14/2002	C	C	0.23	0.34			C
11/30/2002	12/13/2002	C	C	0.25	0.35			C
12/31/2002	1/15/2003	C	C	0.27	0.35			C
1/31/2003	2/12/2003	C	C	0.26	0.35			C
2/28/2003	3/31/2003	C	C	0.27	0.39			C
3/31/2003	4/10/2003	C	C	0.27	0.55			C
4/30/2003	5/13/2003	C	C	0.28	0.33			C
5/31/2003	6/12/2003	C	C	0.24	0.29			C
6/30/2003	7/11/2003	C	C	0.24	0.38			C
7/31/2003	8/14/2003	C	C	0.21	0.33			C
8/31/2003	9/12/2003	C	C	0.23	0.3			C
9/30/2003	10/14/2003	C	C	0.22	0.41			C
10/31/2003	11/12/2003	C	C	0.17	0.24			C
11/30/2003	12/10/2003	C	C	0.2	0.28			C
12/31/2003	1/13/2004	C	C	0.16	0.25			C
1/31/2004	2/13/2004	C	C	0.2	0.43			C
2/29/2004	3/15/2004	C	C	0.21	0.23			C
3/31/2004	4/18/2004	C	C	0.2	0.29			C
4/30/2004	5/17/2004	C	C	0.23	0.34			C
5/31/2004	6/14/2004	C	C	0.16	0.25			C

6/30/2004	7/12/2004	C	C	0.16	0.21			C
7/31/2004	8/10/2004	C	C	0.14	0.29			C
8/31/2004	9/13/2004	C	C	0.18	0.31			C
9/30/2004	10/15/2004	C	C	0.17	0.24			C
10/31/2004	11/15/2004	C	C	0.16	0.27			C
11/30/2004	12/9/2004	C	C	0.18	0.28			C
12/31/2004	1/13/2005	C	C	0.18	0.3			C
1/31/2005	2/14/2005	C	C	0.21	0.38			C
2/28/2005	3/14/2005	C	C	0.23	0.3			C
3/31/2005	4/15/2005	C	C	0.22	0.31			C
4/30/2005	5/18/2005	C	C	0.21	0.26			C
5/31/2005	6/13/2005	C	C	0.15	0.22			C
6/30/2005	7/14/2005	C	C	0.2	0.3			C
7/31/2005	8/19/2005	C	C	0.21	0.29			C
8/31/2005	9/12/2005	C	C					C
9/30/2005	10/17/2005	C	C	0.23	0.27			C
10/31/2005	11/15/2005	C	C	0.22	0.29			C
11/30/2005	12/13/2005	C	C	0.18	0.3			C
12/31/2005	1/13/2006	C	C	0.21	0.28			C
1/31/2006	2/14/2006	C	C	0.15	0.29			C
2/28/2006	3/13/2006	C	C	0.09	0.27			C
3/31/2006	4/14/2006	C	C	0.15	0.29			C
4/30/2006	5/15/2006	C	C	0.15	0.3			C
5/31/2006	6/14/2006	C	C	0.22	0.31			C
6/30/2006	7/13/2006	C	C	0.19	0.27			C
7/31/2006	8/7/2006	C	C	0.15	0.24			C
8/31/2006	9/19/2006	C	C	0.15	0.25			C
9/30/2006	10/16/2006	C	C	0.15	0.26			C
10/31/2006	11/15/2006	C	C	0.21	0.22			C
11/30/2006	12/15/2006	C	C	0.16	0.28			C
12/31/2006	1/11/2007	C	C	0.14	0.29			C
1/31/2007	2/14/2007	C	C	0.18	0.29			C
2/28/2007	3/14/2007	C	C	0.19	0.23			C
3/31/2007	4/16/2007	C	C	0.23	0.3			C
4/30/2007	5/16/2007	C	C	0.2	0.28			C
5/31/2007	6/14/2007	C	C	0.16	0.37			C
6/30/2007	7/13/2007	C	C	0.12	0.18			C
7/31/2007	8/15/2007	C	C	0.11	0.2			C
8/31/2007	9/13/2007	C	C	0.18	0.25			C
9/30/2007	10/12/2007	C	C	0.14	0.25			C
10/31/2007	11/14/2007	C	C	0.15	0.26			C
11/30/2007	12/12/2007	C	C	0.12	0.18			C
12/31/2007	1/14/2008	C	C	0.15	0.28			C
1/31/2008	2/15/2008	C	C	0.15	0.26			C
2/29/2008	3/14/2008	C	C	0.14	0.17			C
3/31/2008	4/11/2008	C	C	0.12	0.2			C
4/30/2008	5/7/2008	C	C	0.13	0.17			C
5/31/2008	6/13/2008	C	C	0.14	0.21			C
6/30/2008	7/11/2008	C	C	0.11	0.24			C
7/31/2008	8/11/2008	C	C	0.16	0.22			C
8/31/2008	9/10/2008	C	C	0.21	0.26			C
9/30/2008	10/10/2008	C	C	0.19	0.24			C
10/31/2008	11/12/2008	C	C	0.11	0.22			C
11/30/2008								
12/31/2008								
027D		Benzene	Ethylbenzene	Flow				Methyl tert-butyl ether
		5 ug/L	Req. Mon. ug/L	.3 Mgal/d	.83 Mgal/d	.5 Mgal/d	1 Mgal/d	100 ug/L
		MO AVG	MO AVG	MO AVG	DAILY MX	MO AVG	DAILY MX	MO AVG
	Ave	1.00	1.00	0.20	0.31	0.30	0.63	2.00
	max	1	1	0.34	0.83	0.4	0.83	2
	min	1	1	0.09	0.17	0.17	0.37	2
	exceedence	0	NA	6	0	0	0	0

*C: NODI code which refers to "no discharge"

027D (continued)		O&G		pH		PCBs	Temperature		Toluene	Xylene	BTEX
		10 mg/L	15 mg/L	6.5 SU	8.5 SU	Req. Mon. ug/L	85 deg F	90 deg F	Req. Mon. ug/	Req. Mon. ug/L	100ug/L
MP Date	Rec'd Date	MO AVG	DAILY MX	MINIMUM	MAXIMUM	MO AVG	MO AVG	DAILY MX	MO AVG	MO AVG	MO AVG
10/31/1998	11/16/1998	5	5	6.7	7	1	62.5	63.5	1	1	4
11/30/1998	12/16/1998	5	5	6.8	7.1	1	56	58	2	1	5
12/31/1998	1/19/1999	5	5	6.8	7.3	1	55	57	1	1	4
1/31/1999	2/16/1999	5	5	6.6	7.2	1	48.2	51.8	1	1	4
2/28/1999	3/16/1999	5	5	6.8	6.9	1	49.8	53	1	1	4
3/31/1999	4/16/1999	5	5	6.4	7.1	1	46.5	47.5	1	1	4
4/30/1999	5/13/1999	5	5	7.1	7.3	1	50.7	52.6	1	1	4
5/31/1999	6/16/1999	5	5	7.2	7.6	C	57.3	62	C	C	C
6/30/1999	7/14/1999	5	5	7.3	7.7	C	65.2	68.8	C	C	C
7/31/1999	8/16/1999	5	5	7.2	7.3	C	70.4	71.6	C	C	C
8/31/1999	9/17/1999	5	5	7.1	7.4	C	72.3	77	C	C	C
9/30/1999	10/18/1999	5	5	6.9	7.3	C	70.2	75	C	C	C
10/31/1999	11/15/1999	5	5	7	7.8	C	61.6	63.5	C	C	C
11/30/1999	12/15/1999	5	5	7.1	7.3	C	55	62	C	C	C
12/31/1999	1/14/2000	5	5	7.2	7.6	C	50	57	C	C	C
1/31/2000	2/15/2000	5	5	6.8	7.4	C	47	61	C	C	C
2/29/2000	3/15/2000	5	5	7.2	7.5	C	43	46	C	C	C
3/31/2000	4/12/2000	5	5	6.9	7.4	C	48	52	C	C	C
4/30/2000	5/15/2000	5	5	6.5	7.6	C	51	53	C	C	C
5/31/2000	6/13/2000	5	5	6.6	7.4	C	57	59	C	C	C
6/30/2000	7/14/2000	5	5	6.9	7.8	C	64	68	C	C	C
7/31/2000	8/14/2000	6	6	6.9	7.5	C	68	71	C	C	C
8/31/2000	9/13/2000	5	5	6.8	7	C	70	73	C	C	C
9/30/2000	10/12/2000	5	5	6.8	7.1	C	68	70	C	C	C
10/31/2000	11/13/2000					C			C	C	C
11/30/2000	12/11/2000	5	5	6.8	7.2	C	57	59	C	C	C
12/31/2000	1/10/2001	5	5	6.7	6.9	C	57	63	C	C	C
1/31/2001	2/14/2001	5	5	6.9	7.1	C	53	58	C	C	C
2/28/2001	3/15/2001	5	5	6.6	7.1	C	53	57	C	C	C
3/31/2001	4/12/2001	5	5	6.8	7	C	50	51	C	C	C
4/30/2001	5/9/2001	5	5	7	7.1	C	54	58	C	C	C
5/31/2001	6/11/2001	5	5	6.9	7.1	C	59	61	C	C	C
6/30/2001	7/12/2001	5	5	6.7	7.1	C	66	70	C	C	C
7/31/2001	8/9/2001	5	5	6.6	7.2	C	70	74	C	C	C
8/31/2001	9/14/2001	5	5	6.7	7.2	C	71	72	C	C	C
9/30/2001	10/10/2001	5	5	6.8	7.2	C	69	71	C	C	C
10/31/2001	11/14/2001	5	5	7.2	7.4	C	65	66	C	C	C
11/30/2001	12/12/2001	5	5	7.1	7.4	C	62	64	C	C	C
12/31/2001	1/14/2002	5	5	7.3	7.4	C	57	62	C	C	C
1/31/2002	2/14/2002	5	5	7.1	7.4	C	54	61	C	C	C
2/28/2002	3/12/2002	5	5	7.1	7.2	C	53	54	C	C	C
3/31/2002	4/15/2002	5	5	7	7.2	C	56	58	C	C	C
4/30/2002	5/14/2002	5	5	7	7.1	C	57	59	C	C	C
5/31/2002	6/13/2002	5	5	6.9	7.4	C	57	58	C	C	C
6/30/2002	7/10/2002	5	5	6.9	7.2	C	61	68	C	C	C
7/31/2002	8/14/2002	6	6	6.7	7.2	C	71	72	C	C	C
8/31/2002	9/16/2002	5	5	6.7	7.4	C	74	76	C	C	C
9/30/2002	10/11/2002	5	5	7.1	7.2	C	71	73	C	C	C
10/31/2002	11/14/2002	5.1	5.1	7.2	7.4	C	66	70	C	C	C
11/30/2002	12/13/2002	5.2	5.2	7.3	7.5	C	61	64	C	C	C
12/31/2002	1/15/2003	5.2	5.2	7.4	7.5	C	59	62	C	C	C
1/31/2003	2/12/2003	5.2	5.2	7.1	7.5	C	52	54	C	C	C
2/28/2003	3/31/2003	5	5	6.9	7.3	C	50.3	56.6	C	C	C
3/31/2003	4/10/2003	4	10.8	7	7.4	C	55.2	63.5	C	C	C
4/30/2003	5/13/2003	5	5	7.1	7.2	C	53	58.4	C	C	C
5/31/2003	6/12/2003	6.2	9.6	6.7	7.2	C	59.6	66.8	C	C	C
6/30/2003	7/11/2003	5	5	6.6	7.1	C	61.8	63.5	C	C	C
7/31/2003	8/14/2003	5	5	6.6	7	C	68.6	71.9	C	C	C
8/31/2003	9/12/2003	5	5	6.6	6.8	C	71.3	72.5	C	C	C
9/30/2003	10/14/2003	5	5	6.72	7.32	C	68.9	69.8	C	C	C
10/31/2003	11/12/2003	5	5	6.89	7.19	C	64.68	66.5	C	C	C
11/30/2003	12/10/2003	5	5	7.21	7.35	C	61.55	62.4	C	C	C
12/31/2003	1/13/2004	5	5	7.23	7.57	C	57.6	59.9	C	C	C
1/31/2004	2/13/2004	5	5	6.98	7.42	C	52.4	53.2	C	C	C
2/29/2004	3/15/2004	5	5	6.93	7.38	C	50.7	52.7	C	C	C
3/31/2004	4/18/2004	5	5	7.09	7.18	C	56.24	60.8	C	C	C
4/30/2004	5/17/2004	5	5	6.93	7.32	C	56.43	58.2	C	C	C
5/31/2004	6/14/2004	5	5	7.15	7.29	C	61.7	63.3	C	C	C
6/30/2004	7/12/2004	5	5	7.08	7.28	C	65.2	69.8	C	C	C
7/31/2004	8/10/2004	5	5	6.97	7.41	C	69.1	70.1	C	C	C
8/31/2004	9/13/2004	5	5	7.01	7.13	C	70.52	72.1	C	C	C
9/30/2004	10/15/2004	5	5	7.11	7.49	C	70	71.2	C	C	C
10/31/2004	11/15/2004	5	5	6.89	7.19	C	64.38	66	C	C	C
11/30/2004	12/9/2004	5	5	7.12	7.21	C	58.1	62.2	C	C	C
12/31/2004	1/13/2005	5	5	6.99	7.36	C	54.9	58.8	C	C	C
1/31/2005	2/14/2005	5	5	7.06	7.33	C	52.2	53.9	C	C	C

2/28/2005	3/14/2005	5	5	7.1	7.53	C	50.86	55.9	C	C	C
3/31/2005	4/15/2005	5	5	7.08	7.22	C	49.5	51.8	C	C	C
4/30/2005	5/18/2005	5	5	7.05	7.21	C	53.8	55.7	C	C	C
5/31/2005	6/13/2005	5	5	7.03	7.19	C	56.2	56.6	C	C	C
6/30/2005	7/14/2005	5	5	7	7.07	C	64	67.1	C	C	C
7/31/2005	8/19/2005	5	5	6.85	7	C	71.35	74.3	C	C	C
8/31/2005	9/12/2005	5	5	6.92	7.33	C	72.5	73.5	C	C	C
9/30/2005	10/17/2005	5	5	7.27	7.52	C	69.8	71.2	C	C	C
10/31/2005	11/15/2005	5	5	7.07	7.38	C	61.4	64.4	C	C	C
11/30/2005	12/13/2005	5	5	7.04	7.31	C	58	60.2	C	C	C
12/31/2005	1/13/2006	5	5	7.06	7.28	C	51.7	57.9	C	C	C
1/31/2006	2/14/2006	5	5	6.98	7.14	C	52.5	54.8	C	C	C
2/28/2006	3/13/2006	5	5	7.09	7.16	C	50.3	52.1	C	C	C
3/31/2006	4/14/2006	5	12.7	6.97	7.32	C	49.2	50.5	C	C	C
4/30/2006	5/15/2006	5	5	7.11	7.36	C	53.1	55.2	C	C	C
5/31/2006	6/14/2006	5	5	6.89	7.39	C	56.2	62.2	C	C	C
6/30/2006	7/13/2006	5	5	6.86	6.95	C	65.7	69.2	C	C	C
7/31/2006	8/7/2006	5	5	6.84	7.09	C	70.8	72.5	C	C	C
8/31/2006	9/19/2006	5	5	6.96	7.14	C	71.8	73.9	C	C	C
9/30/2006	10/16/2006	5	5	6.94	7.11	C	68.3	68.8	C	C	C
10/31/2006	11/15/2006	5	5	6.92	7.05	C	62.8	68	C	C	C
11/30/2006	12/15/2006	5	5	7.02	7.07	C	55.7	59.1	C	C	C
12/31/2006	1/11/2007	5	5	6.96	7.14	C	55.5	57.1	C	C	C
1/31/2007	2/14/2007	5	5	7.01	7.25	C	52.6	56.4	C	C	C
2/28/2007	3/14/2007	5	5	7.02	7.15	C	47.3	53.2	C	C	C
3/31/2007	4/16/2007	5	5	6.92	7.08	C	47.2	49.1	C	C	C
4/30/2007	5/16/2007	5	5	6.9	7.08	C	53.5	54.9	C	C	C
5/31/2007	6/14/2007	5	5	6.98	7.18	C	59.7	63.6	C	C	C
6/30/2007	7/13/2007	5	5	6.95	7.08	C	65.6	68.4	C	C	C
7/31/2007	8/15/2007	5	5	6.93	7.04	C	68.7	71.1	C	C	C
8/31/2007	9/13/2007	5	5	6.93	7.15	C	72.2	73.6	C	C	C
9/30/2007	10/12/2007	5	5	6.96	7.08	C	70.35	71.9	C	C	C
10/31/2007	11/14/2007	5	5	7.02	7.07	C	67.06	70.1	C	C	C
11/30/2007	12/12/2007	5	5	6.98	7.03	C	59	60.2	C	C	C
12/31/2007	1/14/2008	5	5	7.04	7.08	C	58.4	61	C	C	C
1/31/2008	2/15/2008	5	5	7.02	7.21	C	53.3	57.2	C	C	C
2/29/2008	3/14/2008	5	5	7.01	7.07	C	49.3	50.8	C	C	C
3/31/2008	4/11/2008	5	5	6.91	7.09	C	50.8	53.4	C	C	C
4/30/2008	5/7/2008	5	5	6.84	7.08	C	54.42	59.6	C	C	C
5/31/2008	6/13/2008	5	5	6.96	7.04	C	58.35	64.4	C	C	C
6/30/2008	7/11/2008	5	5	6.84	7.08	C	66.7	70.3	C	C	C
7/31/2008	8/11/2008	5	5	6.9	6.99	C	71.6	73	C	C	C
8/31/2008	9/10/2008	5	5	6.85	7.01	C	70.3	70.8	C	C	C
9/30/2008	10/10/2008	5	5	6.88	7.12	C	67.8	70.1	C	C	C
10/31/2008	11/12/2008	5	5	6.97	7.09	C	60.8	65.6	C	C	C
11/30/2008											
12/31/2008											
027D		O&G		pH		PCBs	Temperature		Toluene	Xylene	BTEX
		10 mg/L	15 mg/L	6.5 SU	8.5 SU	etectable limit (ug	85 deg F	90 deg F	Req. Mon. ug/	Req. Mon. ug/L	100ug/L
		MO AVG	DAILY MX	MINIMUM	MAXIMUM	MO AVG	MO AVG	DAILY MX	MO AVG	MO AVG	MO AVG
	Ave	5.02	5.17	6.95	7.24	1.00	59.77	62.78	1.14	1.00	4.14
	max	6.2	12.7	7.4	7.8	1	74	77	2	1	5
	min	4	5	6.4	6.8	1	43	46	1	1	4
	exceedence	0	0	1	0	7	0	0	NA	NA	0

*C: NODI code which ref *C: NODI code which refers to "no discharge"

027W

		O&G	pH	
		10 mg/L	6.5 SU	8.5 SU
MP Date	Rec'd Date	MO AVG	MINIMUM	MAXIMUM
10/31/1998	11/16/1998	5	7.1	7.1
1/31/1999	2/16/1999	5	7.8	7.8
4/30/1999	5/13/1999	5	7.7	7.7
7/31/1999	8/16/1999	5	6.6	6.6
10/31/1999	11/15/1999	5	7.3	7.6
1/31/2000	2/15/2000	5	7.5	7.5
4/30/2000	5/15/2000	5	6.3	6.3
7/31/2000	8/14/2000	5	6.8	6.8
10/31/2000	11/13/2000	5	7	7
1/31/2001	2/14/2001	5	6.9	6.9
4/30/2001	5/9/2001	5	6.9	6.9
7/31/2001	8/9/2001	5	7.4	7.4
10/31/2001	11/14/2001	5	7.1	7.1
1/31/2002	2/14/2002	5	7.3	7.3
4/30/2002	5/14/2002	5	6.9	6.9
7/31/2002	8/14/2002	5	7.1	7.1
10/31/2002	11/14/2002	5	7.3	7.3
1/31/2003	2/12/2003	5.2	7.6	7.6
4/30/2003	5/13/2003	5	7.8	7.8
7/31/2003	8/14/2003	5	6.9	6.9
10/31/2003	11/12/2003	5	7.4	7.4
1/31/2004	2/13/2004	5	7.33	7.33
4/30/2004	5/17/2004	5	6.79	6.79
7/31/2004	8/10/2004	5	7.72	7.72
10/31/2004	11/15/2004	5	7.29	7.29
1/31/2005	2/14/2005	5	7.12	7.12
4/30/2005	5/18/2005	5	6.74	6.74
7/31/2005	8/19/2005	5	7.92	7.92
10/31/2005	11/15/2005	5	7.28	7.28
1/31/2006	2/14/2006	5	6.99	6.99
4/30/2006	5/15/2006	5	7.39	7.39
7/31/2006	8/7/2006	5	7.19	7.19
10/31/2006	11/15/2006	5	7.1	7.1
1/31/2007	2/14/2007	5	6.9	6.9
4/30/2007	5/16/2007	5	6.95	6.95
7/31/2007	7/13/2007	5	6.98	6.98
10/31/2007	11/14/2007	5	7.11	7.11
1/31/2008	2/15/2008	5	7.8	7.8
4/30/2008	5/10/2008	5	7.12	7.12
7/31/2008	8/11/2008	5	7.02	7.02
10/31/2008	11/12/2008	5	7.12	7.12

027W

		O&G	pH	
		10 mg/L	6.5 SU	8.5 SU
		MO AVG	MINIMUM	MAXIMUM
	Ave	5.0	7.2	7.2
	max	5.2	7.92	7.92
	min	5	6.3	6.3
	exceedence	0	1	0

028D

		Flow		pH		Temperature		Volatile Compounds (GC/MS)
		.0036 Mgal/d	.0048 Mgal/d	6.5 SU	8.5 SU	85 deg F	90 deg F	Req. Mon. ug/L
MP Date	Rec'd Date	MO AVG	DAILY MX	MINIMUM	MAXIMUM	MO AVG	DAILY MX	MO AVG
10/31/1998	11/16/1998	0.0036	0.0048	6.8	6.9	62.9	64.2	87
11/30/1998	12/16/1998	0.0036	0.0048	6.6	6.8	50	58	78
12/31/1998	1/19/1999	0.0036	0.0048	6.6	7.2	53.4	55	89
1/31/1999	2/16/1999	0.0036	0.0048	6.6	7.3	48.2	51	235
2/28/1999	3/16/1999	0.0036	0.0048	6.6	6.9	49.1	52	64
3/31/1999	4/16/1999	0.0036	0.0048	6.3	7.1	47.4	48.4	95
4/30/1999	5/13/1999	0.0036	0.0048	7	7	50.2	52	71
5/31/1999	6/16/1999	0.0036	0.0048	6.8	7.3	56.5	62	37.6
6/30/1999	7/14/1999	0.0036	0.0048	6.8	7.1	64	67.6	50.8
7/31/1999	8/16/1999	0.0036	0.0048	6.8	6.9	70.1	71.6	63.7
8/31/1999	9/17/1999	0.0036	0.0048	6.8	6.9	70.7	73.4	100
9/30/1999	10/18/1999	0.0036	0.0048	6.7	7	69.7	73	101
10/31/1999	11/15/1999	0.0036	0.0048	6.6	7	63.5	66.2	39
11/30/1999	12/15/1999	0.0036	0.0048	6.8	6.9	56	63	40
12/31/1999	1/14/2000	0.0036	0.0048	6.8	7.2	50	54	10
1/31/2000	2/15/2000	0.0036	0.0048	6.6	7	45	49	35
2/29/2000	3/15/2000	0.0036	0.0048	6.8	7.1	43	47	40
3/31/2000	4/12/2000	0.0036	0.0048	6.9	7.1	60	65	30.1
4/30/2000	5/15/2000	0.0036	0.0048	6.7	7.4	58	64	26
5/31/2000	6/13/2000	0.0036	0.0048	6.5	7.1	61	64	24
6/30/2000	7/14/2000	0.0036	0.0048	6.9	6.9	64	69	29.9
7/31/2000	8/14/2000	0.007	0.048	6.9	6.9	69	69	
8/31/2000	9/13/2000	C	C	C	C	C	C	C
9/30/2000	10/12/2000	C	C	C	C	C	C	C
10/31/2000	11/13/2000	C	C	C	C	C	C	C
11/30/2000	12/11/2000	C	C	C	C	C	C	C
12/31/2000	1/10/2001	C	C	C	C	C	C	C
1/31/2001	2/14/2001	C	C	C	C	C	C	C
2/28/2001	3/15/2001	C	C	C	C	C	C	C
3/31/2001	4/12/2001	C	C	C	C	C	C	C
4/30/2001	5/9/2001	C	C	C	C	C	C	C
5/31/2001	6/11/2001	C	C	C	C	C	C	C
6/30/2001	7/12/2001	C	C	C	C	C	C	C
7/31/2001	8/9/2001	C	C	C	C	C	C	C
8/31/2001	9/14/2001	C	C	C	C	C	C	C
9/30/2001	10/10/2001	C	C	C	C	C	C	C
10/31/2001	11/14/2001	C	C	C	C	C	C	C
11/30/2001	12/12/2001	C	C	C	C	C	C	C
12/31/2001	1/14/2002	C	C	C	C	C	C	C
1/31/2002	2/14/2002	C	C	C	C	C	C	C
2/28/2002	3/12/2002	C	C	C	C	C	C	C
3/31/2002	4/15/2002	C	C	C	C	C	C	C
4/30/2002	5/14/2002	C	C	C	C	C	C	C
5/31/2002	6/13/2002	C	C	C	C	C	C	C
6/30/2002	7/10/2002	C	C	C	C	C	C	C
7/31/2002	8/14/2002	C	C	C	C	C	C	C
8/31/2002	9/16/2002	C	C	C	C	C	C	C
9/30/2002	10/11/2002	C	C	C	C	C	C	C
10/31/2002	11/14/2002	C	C	C	C	C	C	C
11/30/2002	12/13/2002	C	C	C	C	C	C	C
12/31/2002	1/15/2003	C	C	C	C	C	C	C
1/31/2003	2/12/2003	C	C	C	C	C	C	C
2/28/2003	3/31/2003	C	C	C	C	C	C	C
3/31/2003	4/10/2003	C	C	C	C	C	C	C
4/30/2003	5/13/2003	C	C	C	C	C	C	C
5/31/2003	6/12/2003	C	C	C	C	C	C	C
6/30/2003	7/11/2003	C	C	C	C	C	C	C
7/31/2003	8/14/2003	C	C	C	C	C	C	C
8/31/2003	9/12/2003	C	C	C	C	C	C	C
9/30/2003	10/14/2003	C	C	C	C	C	C	C
10/31/2003	11/12/2003	C	C	C	C	C	C	C
11/30/2003	12/10/2003	C	C	C	C	C	C	C
12/31/2003	1/13/2004	C	C	C	C	C	C	C
1/31/2004	2/13/2004	C	C	C	C	C	C	C
2/29/2004	3/25/2004	C	C	C	C	C	C	C
3/31/2004	4/18/2004	C	C	C	C	C	C	C
4/30/2004	5/17/2004	C	C	C	C	C	C	C
5/31/2004	6/14/2004	C	C	C	C	C	C	C

6/30/2004	7/12/2004	C	C	C	C	C	C	C
7/31/2004	8/10/2004	C	C	C	C	C	C	C
8/31/2004	9/13/2004	C	C	C	C	C	C	C
9/30/2004	10/15/2004	C	C	C	C	C	C	C
10/31/2004	11/15/2004	C	C	C	C	C	C	C
11/30/2004	12/9/2004	C	C	C	C	C	C	C
12/31/2004	1/13/2005	C	C	C	C	C	C	C
1/31/2005	2/14/2005	C	C	C	C	C	C	C
2/28/2005	3/14/2005	C	C	C	C	C	C	C
3/31/2005	4/15/2005	C	C	C	C	C	C	C
4/30/2005	5/18/2005	C	C	C	C	C	C	C
5/31/2005	6/13/2005	C	C	C	C	C	C	C
6/30/2005	7/14/2005	C	C	C	C	C	C	C
7/31/2005	8/19/2005	C	C	C	C	C	C	C
8/31/2005	9/12/2005	C	C	C	C	C	C	C
9/30/2005	10/17/2005	C	C	C	C	C	C	C
10/31/2005	11/5/2005	C	C	C	C	C	C	C
11/30/2005	12/13/2005	C	C	C	C	C	C	C
12/31/2005	1/13/2006	C	C	C	C	C	C	C
1/31/2006	2/14/2006	C	C	C	C	C	C	C
2/28/2006	3/13/2006	C	C	C	C	C	C	C
3/31/2006	4/14/2006	C	C	C	C	C	C	C
4/30/2006	5/15/2006	C	C	C	C	C	C	C
5/31/2006	6/14/2006	C	C	C	C	C	C	C
6/30/2006	7/13/2006	C	C	C	C	C	C	C
7/31/2006	8/7/2006	C	C	C	C	C	C	C
8/31/2006	9/19/2006	C	C	C	C	C	C	C
9/30/2006	10/16/2006	C	C	C	C	C	C	C
10/31/2006	11/15/2006	C	C	C	C	C	C	C
11/30/2006	12/15/2006	C	C	C	C	C	C	C
12/31/2006	1/11/2007	C	C	C	C	C	C	C
1/31/2007	2/14/2007	C	C	C	C	C	C	C
2/28/2007	3/14/2007	C	C	C	C	C	C	C
3/31/2007	4/16/2007	C	C	C	C	C	C	C
4/30/2007	5/16/2007	C	C	C	C	C	C	C
5/31/2007	6/14/2007	C	C	C	C	C	C	C
6/30/2007	7/13/2007	C	C	C	C	C	C	C
7/31/2007	8/15/2007	C	C	C	C	C	C	C
8/31/2007	9/13/2007	C	C	C	C	C	C	C
9/30/2007	10/12/2007	C	C	C	C	C	C	C
10/31/2007	11/14/2007	C	C	C	C	C	C	C
11/30/2007	12/12/2007	C	C	C	C	C	C	C
12/31/2007	1/14/2008	C	C	C	C	C	C	C
1/31/2008	2/15/2008	C	C	C	C	C	C	C
2/29/2008	3/14/2008	C	C	C	C	C	C	C
3/31/2008	4/11/2008	C	C	C	C	C	C	C
4/30/2008	5/7/2008	C	C	C	C	C	C	C
5/31/2008	6/13/2008	C	C	C	C	C	C	C
6/30/2008	7/11/2008	C	C	C	C	C	C	C
7/31/2008	8/11/2008	C	C	C	C	C	C	C
8/31/2008	9/10/2008	C	C	C	C	C	C	C
9/30/2008	10/10/2008	C	C	C	C	C	C	C
10/31/2008	11/12/2008	C	C	C	C	C	C	C
11/30/2008								
12/31/2008								
028D		Flow		pH		Temperature		Volatile Compounds (GC/MS)
		.0036 Mgal/d	.0048 Mgal/d	6.5 SU	8.5 SU	85 deg F	90 deg F	Req. Mon. ug/L
		MO AVG	DAILY MX	MINIMUM	MAXIMUM	MO AVG	DAILY MX	MO AVG
	Ave:	0.00	0.01	6.72	7.05	57.35	60.84	64.10
	max	0.007	0.048	7	7.4	70.7	73.4	235
	min	0.0036	0.0048	6.3	6.8	43	47	10
	exceedence	1	1	1	0	0	0	NA

*C: NODI code which refers to "no discharge"

028W

		O&G	pH	
		10 mg/L	6.5 SU	8.5 SU
MP Date	Rec'd Date	MO AVG	MINIMUM	MAXIMUM
10/31/1998	11/16/1998	5	6.8	6.8
1/31/1999	2/16/1999	5	7.3	7.3
4/30/1999	5/13/1999	5	7.3	7.3
7/31/1999	8/16/1999	5	6.8	6.8
10/31/1999	11/15/1999	5	6.8	6.8
1/31/2000	2/15/2000	5	7.1	7.1
4/30/2000	5/15/2000	5	7.1	7.1
7/31/2000	8/14/2000	5	6.6	6.6
10/31/2000	11/13/2000	5	6.7	6.7
1/31/2001	2/14/2001	5	5.8	5.8
4/30/2001	5/9/2001	5	8	8
7/31/2001	8/9/2001	5	7.7	7.7
10/31/2001	11/14/2001	5	7	7
1/31/2002	2/14/2002	5	6.9	6.9
4/30/2002	5/14/2002	5	6.9	6.9
7/31/2002	8/14/2002	5	7.2	7.2
10/31/2002	11/14/2002	5	7.1	7.1
1/31/2003	2/12/2003	5.2	6.9	6.9
4/30/2003	5/13/2003	5	7	7
7/31/2003	8/14/2003	5	7.4	7.4
10/31/2003	11/12/2003	5	7.6	7.6
1/31/2004	2/13/2004	5	7.47	7.47
4/30/2004	5/17/2004	5	6.67	6.67
7/31/2004	8/10/2004	5	7.55	7.55
10/31/2004	11/15/2004	5	7.19	7.19
1/31/2005	2/14/2005	5	6.79	6.79
4/30/2005	5/18/2005	5	6.57	6.57
7/31/2005	8/19/2005	5	7.49	7.49
10/31/2005	11/15/2005	5	7.38	7.38
1/31/2006	2/14/2006	5	6.87	6.87
4/30/2006	5/15/2006	5	7.24	7.24
7/31/2006	8/7/2006	5	7.28	7.28
10/31/2006	11/15/2006	5	7	7
1/31/2007	2/14/2007	5.1	6.3	6.3
4/30/2007	5/16/2007	5	7.08	7.08
7/31/2007	7/13/2007	5	6.86	6.86
10/31/2007	11/14/2007	5	6.93	6.93
1/31/2008	2/15/2008	5	7.42	7.42
4/30/2008	5/10/2008	0.5	7.04	7.04
7/31/2008	8/11/2008	5	6.95	6.95
10/31/2008	11/12/2008	5	7.04	7.04

028W

		O&G	pH	
		10 mg/L	6.5 SU	8.5 SU
MP Date	Rec'd Date	MO AVG	MINIMUM	MAXIMUM
	Ave	4.9	7.1	7.1
	max	5.2	8	8
	min	0.5	5.8	5.8
	exceedence	0	2	0

029A

		Cadmium	Chromium	Flow		pH		Temperature	
		Req. Mon. mg/L	Req. Mon. mg/L	28.8 Mgal/d	54.7 Mgal/d	6.5 SU	8.5 SU	90 deg F	95 deg F
MP Date	Rec'd Date	DAILY MX	DAILY MX	MO AVG	DAILY MX	MINIMUM	MAXIMUM	MO AVG	DAILY MX
10/31/1998	11/16/1998			0.0045	0.14				
11/30/1998	12/16/1998								
12/31/1998	1/19/1999								
1/31/1999	2/16/1999								
2/28/1999	3/16/1999								
3/31/1999	4/16/1999								
4/30/1999	5/13/1999								
5/31/1999	6/16/1999								
6/30/1999	7/14/1999								
7/31/1999	8/16/1999								
8/31/1999	9/17/1999								
9/30/1999	10/18/1999								
10/31/1999	11/15/1999								
11/30/1999	12/15/1999								
12/31/1999	1/14/2000								
1/31/2000	2/15/2000								
2/29/2000	3/15/2000								
3/31/2000	4/12/2000								
4/30/2000	5/15/2000								
5/31/2000	6/13/2000			0.015	0.465	7.5	7.5	54	54
6/30/2000	7/14/2000								
7/31/2000	8/14/2000								
8/31/2000	9/13/2000								
9/30/2000	10/12/2000								
10/31/2000	11/13/2000								
11/30/2000	12/11/2000								
12/31/2000	1/10/2001								
1/31/2001	2/14/2001								
2/28/2001	3/15/2001								
3/31/2001	4/15/2001								
4/30/2001	5/9/2001								
5/31/2001	6/11/2001								
6/30/2001	7/12/2001								
7/31/2001	8/9/2001								
8/31/2001	9/14/2001								
9/30/2001	10/10/2001								
10/31/2001	11/14/2001								
11/30/2001	12/12/2001								
12/31/2001	1/14/2002								
1/31/2002	2/14/2002								
2/28/2002	3/12/2002								
3/31/2002	4/15/2002								
4/30/2002	5/14/2002								
5/31/2002	6/13/2002								
6/30/2002	7/10/2002								
7/31/2002	8/14/2002								
8/31/2002	9/16/2002								
9/30/2002	10/11/2002								
10/31/2002	11/14/2002								
11/30/2002	12/13/2002								
12/31/2002	1/15/2003								
1/31/2003	2/12/2003								
2/28/2003	3/31/2003								
3/31/2003	4/10/2003								
4/30/2003	5/13/2003								
5/31/2003	6/12/2003								
6/30/2003	7/11/2003								
7/31/2003	8/14/2003								
8/31/2003	9/12/2003								
9/30/2003	10/14/2003								
10/31/2003	11/12/2003								
11/30/2003	12/10/2003								
12/31/2003	1/13/2004								
1/31/2004	2/13/2004								
2/29/2004	3/15/2004								
3/31/2004	4/18/2004								
4/30/2004	5/17/2004								
5/31/2004	6/14/2004								
6/30/2004	7/12/2004								
7/31/2004	8/10/2004								
8/31/2004	9/13/2004								
9/30/2004	10/15/2004								
10/31/2004	11/15/2004								
11/30/2004	12/9/2004								
12/31/2004	1/13/2005								
1/31/2005	2/14/2005								
2/28/2005	3/14/2005								
3/31/2005	4/15/2005								
4/30/2005	5/18/2005								

5/31/2005	6/13/2005								
6/30/2005	7/14/2005								
7/31/2005	8/19/2005								
8/31/2005	9/12/2005								
9/30/2005	10/17/2005								
10/31/2005	11/15/2005								
11/30/2005	12/13/2005								
12/31/2005	1/13/2006								
1/31/2006	2/14/2006								
2/28/2006	3/13/2006								
3/31/2006	4/14/2006								
4/30/2006	5/15/2006								
5/31/2006	6/14/2006								
6/30/2006	7/13/2006								
7/31/2006	8/7/2006								
8/31/2006	9/19/2006								
9/30/2006	10/16/2006								
10/31/2006	11/15/2006								
11/30/2006	12/15/2006								
12/31/2006	1/11/2007								
1/31/2007	2/14/2007								
2/28/2007	3/14/2007								
3/31/2007	4/16/2007								
4/30/2007	5/16/2007								
5/31/2007	6/14/2007								
6/30/2007	7/13/2007								
7/31/2007	8/15/2007								
8/31/2007	9/13/2007								
9/30/2007	10/12/2007								
10/31/2007	11/14/2007								
11/30/2007	12/12/2007								
12/31/2007	1/14/2008								
1/31/2008	2/15/2008								
2/29/2008	3/14/2008								
3/31/2008	4/11/2008								
4/30/2008	5/7/2008								
5/31/2008	6/13/2008								
6/30/2008	7/11/2008								
7/31/2008	8/11/2008								
8/31/2008	9/10/2008								
9/30/2008	10/10/2008								
10/31/2008	11/12/2008								
11/30/2008									
12/31/2008									
029A		Cadmium	Chromium	Flow		pH		Temperature	
		Req. Mon. mg/L	Req. Mon. mg/L	28.8 Mgal/d	54.7 Mgal/d	6.5 SU	8.5 SU	90 deg F	95 deg F
		DAILY MX	DAILY MX	MO AVG	DAILY MX	MINIMUM	MAXIMUM	MO AVG	DAILY MX
	Ave:	0	0	0.010	0.303	7.5	7.5	54	54
	max	0	0	0.015	0.465	7.5	7.5	54	54
	min	0	0	0.0045	0.14	7.5	7.5	54	54
	exceedence	NA	NA	0	0	0	0	0	0

030W

		O&G	pH	
		10 mg/L	6.5 SU	8.5 SU
MP Date	Rec'd Date	MO AVG	MINIMUM	MAXIMUM
10/31/1998	11/16/1998	5	7.2	7.2
1/31/1999	2/16/1999	5	7.2	7.2
4/30/1999	5/13/1999	8	6.9	6.9
7/31/1999	8/16/1999	5	6.8	6.8
10/31/1999	11/15/1999	5	6.9	6.9
1/31/2000	2/15/2000	5	7.5	7.5
4/30/2000	5/15/2000	5	7	7
7/31/2000	8/14/2000	6.8	6.9	6.9
10/31/2000	11/13/2000	5	6.5	6.5
1/31/2001	2/14/2001	5	6.8	6.8
4/30/2001	5/9/2001	5	7.4	7.4
7/31/2001	8/9/2001	5	7.2	7.2
10/31/2001	11/14/2001	5	7.1	7.1
1/31/2002	2/14/2002	5	6.6	6.6
4/30/2002	5/14/2002	5	6.9	6.9
7/31/2002	8/14/2002	5	7.1	7.1
10/31/2002	11/14/2002	5	7	7
1/31/2003	2/12/2003	5.2	6.8	6.8
4/30/2003	5/13/2003	5	7	7
7/31/2003	8/14/2003	5	7.5	7.5
10/31/2003	11/12/2003	5	7.7	7.7
1/31/2004	2/13/2004	5	7.5	7.5
4/30/2004	5/17/2004	5	6.77	6.77
7/31/2004	8/10/2004	5	7.6	7.6
10/31/2004	11/15/2004	5	7.08	7.08
1/31/2005	2/14/2005	5	7.03	7.03
4/30/2005	5/18/2005	5	6.69	6.69
7/31/2005	8/19/2005	5	7.55	7.55
10/31/2005	11/15/2005	5	7.31	7.31
1/31/2006	2/14/2006	5	7.28	7.28
4/30/2006	5/15/2006	5	7.21	7.21
7/31/2006	8/7/2006	5	7.05	7.05
10/31/2006	11/15/2006	5	7.1	7.1
1/31/2007	2/14/2007	5	7.1	7.1
4/30/2007	5/16/2007	5	7.11	7.11
7/31/2007	7/13/2007	5	6.99	6.99
10/31/2007	11/14/2007	5	6.89	6.89
1/31/2008	2/15/2008	8.5	7.55	7.55
4/30/2008	5/10/2008	0.5	6.9	6.9
7/31/2008	8/11/2008	5	6.88	6.88
10/31/2008	11/12/2008	5	6.99	6.99

030W

		O&G	pH	
		10 mg/L	6.5 SU	8.5 SU
		MO AVG	MINIMUM	MAXIMUM
	Ave	**5.1**	**7.1**	**7.1**
	max	**8.5**	**7.7**	**7.7**
	min	**0.5**	**6.5**	**6.5**
	exceedence	**0**	**0**	**0**

031D		Flow		O&G		pH		Temperature		Volatile fraction organics
		.762 Mgal/d	2.2 Mgal/d	10 mg/L	15 mg/L	6.5 SU	8.5 SU	90 deg F	90 deg F	Req. Mon. mg/L
MP Date	Rec'd Date	MO AVG	DAILY MX	MO AVG	DAILY MX	MINIMUM	MAXIMUM	MO AVG	DAILY MX	DAILY MX
10/31/1998	11/16/1998	0.762	2.2	5	5			63.7	66	147
11/30/1998	12/16/1998	0.762	2.2	5	5			59	60	256.4
12/31/1998	1/19/1999	0.762	2.2	5	5			55	59	62.8
1/31/1999	2/16/1999	0.762	2.2	5	5	6.7	7.2	48	51	0.393
2/28/1999	3/16/1999	0.762	2.2	5	5	6.6	6.9	46.5	53	0.257
3/31/1999	4/16/1999	0.762	2.2	5	5	6.4	6.5	45.8	47.1	0.265
4/30/1999	5/13/1999	0.762	2.2	5	5	6.8	7.4	51.5	52.3	0.538
5/31/1999	6/16/1999	0.762	2.2	5	5	7.1	7.5	56.8	62	0.038
6/30/1999	7/14/1999	0.762	2.2	5	5	6.8	7.1	64.4	66.3	0.281
7/31/1999	8/16/1999	0.762	2.2	5	5	6.9	7	71.2	73.4	0.106
8/31/1999	9/17/1999	0.762	2.2	5	5	7	7.1	71.1	73.4	0.095
9/30/1999	10/18/1999	0.762	2.2	5	5	6.7	7	70	74	0.164
10/31/1999	11/15/1999	0.762	2.2	5	5	6.7	7.1	63.6	66.2	0.049
11/30/1999	12/15/1999	0.762	2.2	5	5	6.8	7.1	56	61	0.162
12/31/1999	1/14/2000	0.762	2.2	5	5	7	7.6	50	53	0.029
1/31/2000	2/15/2000	0.762	2.2	5	5	6.6	7.1	45	48	0.046
2/29/2000	3/15/2000	0.762	2.2	5	5	6.9	7.1	44	47	0.078
3/31/2000	4/12/2000	0.762	2.2	5	5	6.9	7.1	59	51	0.307
4/30/2000	5/15/2000	0.762	2.2	5	5	6.7	7.4	51	52	0.149
5/31/2000	6/13/2000	0.762	2.2	5	5	6.4	7.1	56	61	0.07
6/30/2000	7/14/2000	0.762	2.2	5	5	6.6	6.9	64	67	0.034
7/31/2000	8/14/2000	0.152	2.2	5	5	6.8	6.8	67	67	
8/31/2000	9/13/2000	C	C	C	C	C	C	C	C	C
9/30/2000	10/12/2000	C	C	C	C	C	C	C	C	C
10/31/2000	11/13/2000	C	C	C	C	C	C	C	C	C
11/30/2000	12/11/2000	C	C	C	C	C	C	C	C	C
12/31/2000	1/10/2001	C	C	C	C	C	C	C	C	C
1/31/2001	2/14/2001	C	C	C	C	C	C	C	C	C
2/28/2001	3/15/2001	C	C	C	C	C	C	C	C	C
3/31/2001	4/12/2001	C	C	C	C	C	C	C	C	C
4/30/2001	5/9/2001	C	C	C	C	C	C	C	C	C
5/31/2001	6/11/2001	C	C	C	C	C	C	C	C	C
6/30/2001	7/12/2001	C	C	C	C	C	C	C	C	C
7/31/2001	8/9/2001	C	C	C	C	C	C	C	C	C
8/31/2001	9/14/2001	C	C	C	C	C	C	C	C	C
9/30/2001	10/10/2001	C	C	C	C	C	C	C	C	C
10/31/2001	11/14/2001	C	C	C	C	C	C	C	C	C
11/30/2001	12/12/2001	C	C	C	C	C	C	C	C	C
12/31/2001	1/14/2002	C	C	C	C	C	C	C	C	C
1/31/2002	2/14/2002	C	C	C	C	C	C	C	C	C
2/28/2002	3/12/2002	C	C	C	C	C	C	C	C	C
3/31/2002	4/15/2002	C	C	C	C	C	C	C	C	C
4/30/2002	5/14/2002	C	C	C	C	C	C	C	C	C
5/31/2002	6/13/2002	0.762	2.2	5	5	6.5	7.1	57	61	0.025
6/30/2002	7/10/2002	C	C	C	C	C	C	C	C	C
7/31/2002	8/14/2002	C	C	C	C	C	C	C	C	C
8/31/2002	9/16/2002	C	C	C	C	C	C	C	C	C
9/30/2002	10/11/2002	C	C	C	C	C	C	C	C	C
10/31/2002	11/14/2002	0.762	2.2	5.1	5.1	6.8	7	63	66	0.546
11/30/2002	12/13/2002	C	C	C	C	C	C	C	C	C
12/31/2002	1/15/2003	C	C	C	C	C	C	C	C	C
1/31/2003	2/12/2003	C	C	C	C	C	C	C	C	C
2/28/2003	3/31/2003	C	C	C	C	C	C	C	C	C
3/31/2003	4/10/2003	C	C	C	C	C	C	C	C	C
4/30/2003	5/13/2003	C	C	C	C	C	C	C	C	C
5/31/2003	6/12/2003	C	C	C	C	C	C	C	C	C
6/30/2003	7/11/2003	C	C	C	C	C	C	C	C	C
7/31/2003	8/14/2003	C	C	C	C	C	C	C	C	C
8/31/2003	9/12/2003	C	C	C	C	C	C	C	C	C
9/30/2003	10/14/2003	C	C	C	C	C	C	C	C	C
10/31/2003	11/12/2003	C	C	C	C	C	C	C	C	C
11/30/2003	12/10/2003	C	C	C	C	C	C	C	C	C
12/31/2003	1/13/2004	C	C	C	C	C	C	C	C	C
1/31/2004	2/13/2004	C	C	C	C	C	C	C	C	C
2/29/2004	3/15/2004	C	C	C	C	C	C	C	C	C
3/31/2004	4/18/2004	C	C	C	C	C	C	C	C	C
4/30/2004	5/17/2004	C	C	C	C	C	C	C	C	C
5/31/2004	6/14/2004	C	C	C	C	C	C	C	C	C
6/30/2004	7/12/2004	C	C	C	C	C	C	C	C	C
7/31/2004	8/10/2004	C	C	C	C	C	C	C	C	C
8/31/2004	9/13/2004	C	C	C	C	C	C	C	C	C
9/30/2004	10/15/2004	C	C	C	C	C	C	C	C	C
10/31/2004	11/15/2004	C	C	C	C	C	C	C	C	C
11/30/2004	12/9/2004	C	C	C	C	C	C	C	C	C
12/31/2004	1/13/2005	C	C	C	C	C	C	C	C	C
1/31/2005	2/14/2005	C	C	C	C	C	C	C	C	C
2/28/2005	3/14/2005	C	C	C	C	C	C	C	C	C
3/31/2005	4/15/2005	C	C	C	C	C	C	C	C	C
4/30/2005	5/18/2005	C	C	C	C	C	C	C	C	C
5/31/2005	6/13/2005	C	C	C	C	C	C	C	C	C
6/30/2005	7/14/2005	C	C	C	C	C	C	C	C	C
7/31/2005	8/19/2005	C	C	C	C	C	C	C	C	C
8/31/2005	9/12/2005	C	C	C	C	C	C	C	C	C
9/30/2005	10/17/2005	C	C	C	C	C	C	C	C	C
10/31/2005	11/15/2005	C	C	C	C	C	C	C	C	C
11/30/2005	12/13/2005	C	C	C	C	C	C	C	C	C
12/31/2005	1/13/2006	C	C	C	C	C	C	C	C	C
1/31/2006	2/14/2006	C	C	C	C	C	C	C	C	C
2/28/2006	3/13/2006	C	C	C	C	C	C	C	C	C
3/31/2006	4/14/2006	C	C	C	C	C	C	C	C	C
4/30/2006	5/15/2006	C	C	C	C	C	C	C	C	C
5/31/2006	6/14/2006	C	C	C	C	C	C	C	C	C
6/30/2006	7/13/2006	C	C	C	C	C	C	C	C	C
7/31/2006	8/7/2006	C	C	C	C	C	C	C	C	C

8/31/2006	9/18/2006	C	C	C	C	C	C	C	C	C
9/30/2006	10/16/2006	C	C	C	C	C	C	C	C	C
10/31/2006	11/15/2006	C	C	C	C	C	C	C	C	C
11/30/2006	12/15/2006	C	C	C	C	C	C	C	C	C
12/31/2006	1/11/2007	C	C	C	C	C	C	C	C	C
1/31/2007	2/14/2007	C	C	C	C	C	C	C	C	C
2/28/2007	3/14/2007	C	C	C	C	C	C	C	C	C
3/31/2007	4/16/2007	C	C	C	C	C	C	C	C	C
4/30/2007	5/16/2007	C	C	C	C	C	C	C	C	C
5/31/2007	6/14/2007	C	C	C	C	C	C	C	C	C
6/30/2007	7/13/2007	C	C	C	C	C	C	C	C	C
7/31/2007	8/15/2007	C	C	C	C	C	C	C	C	C
8/31/2007	9/13/2007	C	C	C	C	C	C	C	C	C
9/30/2007	10/12/2007	C	C	C	C	C	C	C	C	C
10/31/2007	11/14/2007	C	C	C	C	C	C	C	C	C
11/30/2007	12/12/2007	C	C	C	C	C	C	C	C	C
12/31/2007	1/14/2008	C	C	C	C	C	C	C	C	C
1/31/2008	2/15/2008	C	C	C	C	C	C	C	C	C
2/29/2008	3/14/2008	C	C	C	C	C	C	C	C	C
3/31/2008	4/11/2008	C	C	C	C	C	C	C	C	C
4/30/2008	5/7/2008	C	C	C	C	C	C	C	C	C
5/31/2008	6/13/2008	C	C	C	C	C	C	C	C	C
6/30/2008	7/11/2008	C	C	C	C	C	C	C	C	C
7/31/2008	8/11/2008	C	C	C	C	C	C	C	C	C
8/31/2008	9/10/2008	C	C	C	C	C	C	C	C	C
9/30/2008	10/10/2008	C	C	C	C	C	C	C	C	C
10/31/2008	11/12/2008	C	C	C	C	C	C	C	C	C
11/30/2008										
12/31/2008										
031D		Flow		O&G		pH		Temperature		VOCs
		.782 Mgal/d	2.2 Mgal/d	10 mg/L	15 mg/L	6.5 SU	8.5 SU	90 deg F	90 deg F	Req. Mon. mg/L
		MO AVG	DAILY MX	MO AVG	DAILY MX	MINIMUM	MAXIMUM	MO AVG	DAILY MX	DAILY MX
	Ave	0.7	2.2	5.0	5.0	6.7	7.1	57.4	59.9	20.4
	max	0.762	2.2	5.1	5.1	7.1	7.6	71.2	74	256.4
	min	0.152	2.2	5	5	6.4	6.5	44	47	0.025
	exceedence	0	0	0	0	2	0	0	0	NA

*C: NODI code which refers to "no discharge"

031W

MP Date	Rec'd Date	O&G 10 mg/L MO AVG	pH 6.5 SU MINIMUM	pH 8.5 SU MAXIMUM
10/31/1998	11/16/1998	5	7.1	7.1
1/31/1999	2/16/1999	5	7.2	7.2
4/30/1999	5/13/1999	5	7.2	7.2
7/31/1999	8/16/1999	5	6.8	6.8
10/31/1999	11/15/1999	5	6.9	7
1/31/2000	2/15/2000	5	7.5	7.5
4/30/2000	5/15/2000	5	6.8	6.8
7/31/2000	8/14/2000	5	6.9	6.9
10/31/2000	11/13/2000	5	6.5	6.5
1/31/2001	2/14/2001	5	6.2	6.2
4/30/2001	5/9/2001	5	7.6	7.6
7/31/2001	8/9/2001	5	7.6	7.6
10/31/2001	11/14/2001	5.3	7	7
1/31/2002	2/14/2002	5	7.2	7.2
4/30/2002	5/14/2002	5	6.3	6.3
7/31/2002	8/14/2002	5	6.7	6.7
10/31/2002	11/14/2002	5	7	7
1/31/2003	2/12/2003	5.2	7.1	7.1
4/30/2003	5/13/2003	5	6.9	6.9
7/31/2003	8/14/2003	5	6.8	6.8
10/31/2003	11/12/2003	5	7.3	7.3
1/31/2004	2/13/2004	5	7.35	7.35
4/30/2004	5/17/2004	5	6.88	6.88
7/31/2004	8/10/2004	5	7.67	7.67
10/31/2004	11/15/2004	5	6.96	6.96
1/31/2005	2/14/2005	5	7.08	7.08
4/30/2005	5/18/2005	5	6.63	6.63
7/31/2005	8/19/2005	5	7.65	7.65
10/31/2005	11/15/2005	5	7.29	7.29
1/31/2006	2/14/2006	5	7.05	7.05
4/30/2006	5/15/2006	5	7.22	7.22
7/31/2006	8/7/2006	5	7.04	7.04
10/31/2006	11/15/2006	5	7.01	7.01
1/31/2007	2/14/2007	5	7.3	7.3
4/30/2007	5/16/2007	5	7.01	7.01
7/31/2007	7/13/2007	5	7.05	7.05
10/31/2007	11/14/2007	5	6.98	6.98
1/31/2008	2/15/2008	5	7.71	7.71
4/30/2008	5/10/2008	0.5	6.85	6.85
7/31/2008	8/11/2008	5	6.92	6.92
10/31/2008	11/12/2008	5	6.87	6.87

031W

		O&G 10 mg/L MO AVG	pH 6.5 SU MINIMUM	pH 8.5 SU MAXIMUM
	Ave	4.90	7.05	7.05
	max	5.3	7.71	7.71
	min	0.5	6.2	6.2
	exceedence	0	2	0

032W

MP Date	Rec'd Date	O&G 10 mg/L MO AVG	pH 6.5 SU MINIMUM	pH 8.5 SU MAXIMUM
10/31/1998	11/16/1998	5	7.1	7.1
1/31/1999	2/16/1999	5	7.4	7.9
4/30/1999	5/13/1999	5	4.8	7.3
7/31/1999	8/16/1999	5	4.9	7.2
10/31/1999	11/15/1999	5	6.3	6.7
1/31/2000	2/15/2000	5	6.1	6.8
4/30/2000	5/15/2000	5	4.9	7.5
7/31/2000	8/14/2000	5	4.6	5.6
10/31/2000	11/13/2000	5	4.9	6.1
1/31/2001	2/14/2001	5	4.6	5.7
4/30/2001	5/9/2001	5	4.4	6.8
7/31/2001	8/9/2001	5	4.6	7.7
10/31/2001	11/14/2001	5	4.6	6.7
1/31/2002	2/14/2002	5	5.4	7.4
4/30/2002	5/14/2002	C	C	C
7/31/2002	8/14/2002	C	C	C
10/31/2002	11/14/2002	C	C	C
1/31/2003	2/12/2003	C	C	C
4/30/2003	5/13/2003	C	C	C
7/31/2003	8/14/2003	C	C	C
10/31/2003	11/12/2003	C	C	C
1/31/2004	2/13/2004	C	C	C
4/30/2004	5/17/2004	C	C	C
7/31/2004	8/10/2004	C	C	C
10/31/2004	11/15/2004	C	C	C
1/31/2005	2/14/2005	C	C	C
4/30/2005	5/18/2005	C	C	C
7/31/2005	8/19/2005	C	C	C
10/31/2005	11/15/2005	C	C	C
1/31/2006	2/14/2006	C	C	C
4/30/2006	5/15/2006	C	C	C
7/31/2006	8/7/2006	C	C	C
10/31/2006	11/15/2006	C	C	C
1/31/2007	2/14/2007	C	C	C
4/30/2007	5/16/2007	C	C	C
7/31/2007	7/13/2007	C	C	C
10/31/2007	11/14/2007	C	C	C
1/31/2008	2/15/2008	C	C	C
4/30/2008	5/10/2008	C	C	C
7/31/2008	8/11/2008	C	C	C
10/31/2008	11/12/2008	C	C	C

032W

MP Date	Rec'd Date	O&G 10 mg/L MO AVG	pH 6.5 SU MINIMUM	pH 8.5 SU MAXIMUM
	Ave:	5.0	5.3	6.9
	max	5	7.4	7.9
	min	5	4.4	5.6
	exceedence	0	12	0

*C: NODI code which refers to "no discharge"

Attachment H
GE Stormwater Sampling Results[1]

Parameter	Outfall 001	Outfall 010	Outfall 007	Outfall 019	Outfall 027	Outfall 028	Outfall 030	Outfall 031	Outfall 032
	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
O&G	ND	ND	ND	ND	2	2	ND	2	ND
BOD	3	ND	40	3	ND	2	ND	ND	ND
COD	162	510	343	321	149	264	113	71	ND
TSS	32	ND	ND	45	54	7.5	39	ND	3
Total Phosphorus	0.63	0.35	0.21	0.89	0.345	0.05	0.2	0.14	0.02
pH	7.5-7.7	7.4-7.6	7.5-7.6	7.3-7.5	7.4-7.6	7.6-7.7	7.3-7.7	7.6-7.6	6.9-7.8
Color	130	60	75	425	205	107.5	52	130	16
Nitrate-Nitrite	0.31	0.31	0.33	0.37	0.305	0.775	0.47	0.3	0.2
Sulfate (as SO4)	1800	1748	558	1500	442	758	490	152	ND
Aluminum	1.29	1	0.477	1.77	1.79	0.48	0.645	0.381	ND
Barium	0.04	0.0238	0.107	0.026	0.0375	0.06165	0.011	0.0556	ND
Cobalt, total	ND	0.11	ND	ND	ND	ND	ND	ND	ND
Iron, total	1.41	0.992	0.935	4.03	3.125	1.825	0.716	1.99	ND
Titanium, total	0.065	0.05235	0.03572	0.096	0.089	0.02668	0.026	0.02401	ND
Antimony, total	0.131	0.144	0.0808	0.111	0.097	0.1045	ND	0.0852	ND
Arsenic, total	ND	ND	ND	ND	ND	ND	ND	ND	ND
Beryllium, total	0.003	0.00732	0.00908	0.002	0.001	0.00604	ND	0.00508	ND
Cadmium, total	0.022	0.04429	0.03213	0.029	0.0105	0.028095	0.006	0.02046	ND
Chromium, total	0.04	0.06387	0.03105	0.04	0.036	0.038645	0.018	0.03156	ND
Copper, total	0.077	0.0967	0.058	0.119	0.0715	0.08105	0.061	0.0475	ND
Lead, total	0.0862	0.79	0.0052	0.137	0.08165	0.0134	0.114	ND	ND
Mercury, total	ND	ND	0.0007	0.002	ND	ND	ND	0.0002	0.0004
Nickel, total	0.065	0.129	0.144	0.078	0.048	0.0942	ND	0.0974	ND
Selenium, total	ND	0.011	ND	ND	ND	ND	ND	ND	ND
Silver, total	0.0019	0.0032	0.0018	0.0031	0.0095	0.00235	0.0004	ND	0.0003
Thallium, Total	ND	ND	ND	ND	ND	ND	ND	ND	ND
Zinc, total	0.389	0.0673	0.0631	0.291	0.1515	0.1305	0.134	0.0676	0.11
Cyanide	0.015	ND	ND	ND	ND	ND	ND	ND	ND
Phenols, total	ND	ND	ND	ND	0.16	ND	0.12	ND	ND
GC/MS Volatiles (VOCs)	0.0068	0.001	0.039	0.002	0.1129	0.109	1.1764	0.483	0.0059
GC/MS Acid Extractables	ND	ND	ND	ND	ND	ND	ND	ND	ND
GC/MS Base/Neutral Extra	0.013	0.01	0.007	0.006	0.014	0.0125	ND	0.02	0.009
GC/MS PCBs	ND	ND	ND	ND	ND	ND	ND	ND	ND

1. NPDES Permit Renewal Application Revision, June 1998, Section 3 - EPA NPDES Form 2F: Storm Water Discharge Information

Attachment I
GE Process Water Sampling Results[1]

Parameter	Outfall 014	Outfall 018	Outfall 020
	mg/L	mg/L	mg/L
O&G		1	1
BOD	2	3	2
COD	163	590	625
TSS	14	9	26
pH	7.73-7.85	7.92	7.89-7.92
Color		39	55
Nitrate-Nitrite		ND	ND
Sulfate (as SO4)	2255	2150	2155
Aluminum	ND	0.62	0.76
Barium	ND	ND	ND
Cobalt, total	ND	0.11	0.24
Iron, total	0.13	0.25	0.54
Titanium, total	ND	0.017	0.03
Antimony, total	ND	ND	0.07
Arsenic, total	ND	0.06	0.07
Beryllium, total	ND	ND	ND
Cadmium, total	ND	0.025	0.03
Chromium, total	0.013	0.032	0.04
Copper, total	ND	0.07	0.06
Lead, total	0.002	0.0057	0.0079
Mercury, total	ND	0.0004	0.0005
Nickel, total	ND	ND	ND
Selenium, total	ND	0.45	0.47
Silver, total	ND	ND	ND
Thallium, Total	ND	ND	ND
Zinc, total	ND	0.06	0.06
Cyanide	ND	ND	ND
Phenols, total	0.2	0.55	ND
Methylene Chloride		1.5 ug/L	1.7 ug/L
Butyl Benzyl Phthalate			2 ug/L
Di-N-Butyl Phthalate	1 ug/L		7 ug/L

1. NPDES Permit Renewal Application Revision, June 1998,
Section 2 - EPA NPDES Form 2C: Wastewater Discharge Information.

Attachment J: Requirements for Cooling Water Intake Structures Under CWA § 316(b)

Table of Contents

1. Introduction

NPDES permit requirements for cooling water intake structures (CWISs) are based on CWA § 316(b), 33 U.S.C. § 1326(b), which requires "that the location, design, construction, and capacity of cooling water intake structures reflect the best technology available for minimizing adverse environmental impact" BTA). The operation of CWISs can cause or contribute to a variety of adverse environmental effects, such as killing or injuring tiny aquatic organisms, including but not limited to fish larvae and eggs, by entraining them in the water withdrawn from a water body and sent through the facility's cooling system, and by killing or injuring larger organisms, including but not limited to juvenile and adult fish, by impinging them against the intake structure's screens, racks, or other structures. Section 316(b) applies if the applicant for a discharge permit seeks to withdraw cooling water from a water of the United States. Therefore, CWA § 316(b) applies to this permit due to the operation of CWISs at the GE Aviation facility.

In the absence of applicable regulations, for many years EPA has made § 316(b) determinations on a case-by-case basis based on best professional judgment (BPJ), for both new and existing facilities with regulated CWISs. In December 2001, EPA promulgated new, final § 316(b) regulations that provide specific technology-based requirements for *new* facilities of any kind with a CWIS with an intake flow greater than two (2) MGD. 66 Fed. Reg. 65255 (Dec. 18, 2001) (Phase I rule). The Phase I rule is in effect but does not apply to this permit because the GE Aviation facility in Lynn, MA, is not a new facility.

In July 2004, EPA published final regulations applying § 316(b) to large, *existing* power plants (Phase II rule), defined in 40 CFR § 125.91 as existing point sources employing CWISs designed to withdraw at least 50 MGD or more and generating and transmitting electric power as their primary activity. Following litigation that resulted in the remand to EPA of many of the rule's provisions, *see Riverkeeper, Inc. v. U.S. EPA*, 475F.3d 83 (2d Cir. 2007); *rev'd in part, Entergy Corp. v. Riverkeeper, Inc.*, ___ U.S. ___, 129 S.Ct. 1498, 1510 (2009), the Agency suspended the Phase II rule in July 2007. 72 FR 37107 (July 9, 2007). The suspension left only 40 CFR § 125.90(b) in effect, which provides that in the absence of applicable categorical standards, BTA determinations are to be made on a case-by-case, BPJ basis.

On June 16, 2006, EPA published the Phase III Rule under § 316(b) of the CWA, which established categorical requirements for new offshore oil and gas extraction facilities that have a design intake flow threshold of greater than 2 MGD, but dictated that the BTA would be determined on a case-by-case, BPJ basis for existing facilities with a design intake flow less than 50 MGD. 71 FR 35006 (June 16, 2006). As with the Phase I and II Rules, the Phase III Rule was challenged in federal court. EPA defended the Phase III Rule's provisions regarding new offshore oil and gas facilities but, following the Supreme Court's 2009 decision in *Entergy*, the Agency sought a voluntary remand of the Phase III Rule to the extent that it addressed existing facilities. EPA explained that it planned to reconsider the Phase III Rule decision with regard to existing facilities in conjunction with its reconsideration of the Phase II Rule. In other words, EPA planned to consider requirements for all existing facilities together. The Fifth Circuit granted EPA's motion, while at the same time affirming the Phase III Rule's provisions pertaining to new offshore oil and gas extraction facilities. *See ConocoPhillips Co. v. EPA*, 612 F.3d 822, 842 (5^{th} Cir. 2010).

EPA is currently considering the development of new regulations to apply CWA § 316(b) to CWISs at existing facilities. The Agency is contemplating, among other things, the possibility of addressing all existing facilities in one rule (i.e., combining what were formerly referred to as Phase II and Phase III facilities).

In any event, there are no effective national categorical standards applying § 316(b) to the CWISs at the GE Aviation facility. As a result, EPA has developed technology-based requirements for the facility's CWISs by applying CWA § 316(b) on a BPJ, site-specific basis.

2. Methodology for the BPJ Application of CWA § 316(b)

Neither the CWA nor EPA regulations dictate a specific methodology for developing BPJ-based limits under § 316(b). As dictated by the text of § 316(b), however, the permit limits must ensure that the design, location, capacity and construction of CWISs reflect the BTA. In addition, the language of § 316(b) directs that the BTA is an "available" technology that is deemed the "best" for "minimizing" adverse environmental impacts.[1] EPA has read CWA § 316(b) to intend that entrainment and impingement be regarded as "adverse impacts" that must be minimized by application of the BTA. This might or might not require complete elimination of such impacts in a given case.

In addition, EPA has looked by analogy to factors considered in the development of effluent limitations under the CWA and EPA regulations for guidance concerning additional factors to consider in making a BTA determination under CWA § 316(b). In setting effluent limitations on either a national categorical basis or a site-specific BPJ basis, EPA considers a number of factors specified in the statute and regulations. *See, e.g.,* 33 U.S.C. §§ 1311(b)(2)(A) and 1314(b)(2); 40 C.F.R. § 125.3(d)(3).[2] These factors

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[1] Thus, a proper determination based on a BPJ analysis results in a valid, facility-specific BTA determination. In *NRDC v. EPA*, 859 F.2d 156, 199 (D.C. Cir. 1988) (industry and environmental group challenge to 1979 revisions to NPDES regulations, including the ban on backsliding from BPJ limits), the court explained:

> [i]n what EPA characterizes as a 'mini-guideline' process, the permit writer, after full consideration of the factors set forth in section 304(b), 33 U.S.C. § 1314(b) (which are the same factors used in establishing effluent guidelines), establishes the permit conditions 'necessary to carry out the provisions of [the CWA].' § 1342(a)(1). These conditions include the appropriate ... BAT effluent limitations for the particular point source. ... [T]he resultant BPJ limitations are as correct and as statutorily supported as permit limits based upon an effluent limitations guideline.

Id. See also Texas Oil & Gas Ass'n v. EPA, 161 F.3d 923, 929 (5th Cir. 1998) ("[For BPJ permits i]ndividual judgments thus take the place of uniform national guidelines, but the technology-based standard remains the same.").

include: (1) the age of the equipment and facilities involved, (2) the process employed, (3) the engineering aspects of applying various control techniques, (4) process changes, (5) cost, and (6) non-water quality environmental impacts (including energy issues). According to 40 C.F.R. § 125.3(c)(2), a BPJ-based BAT analysis also should consider the "appropriate technology for the category of point sources of which the applicant is a member, based on all available information," and "any unique factors relating to the applicant." In addition, the United States Supreme Court recently confirmed that EPA is authorized to consider a comparative assessment of the costs and benefits of technology options in determining the BTA under CWA § 316(b). *See Entergy Corp. v. Riverkeeper, Inc.,* ___ U.S. ___, 129 S.Ct. 1498, 1510 (2009). As indicated above, a permit writer developing permit limits on a site-specific, BPJ basis applies the same performance-based approach to an individual point source that EPA would apply to whole categories and classes of point sources when it develops national categorical standards.[3]

2.1. Best performing technology – Closed-Cycle Cooling

In applying the BAT standard for setting effluent limits, the CWA calls for EPA to look to the single "best" performing plant in the industry (in terms of effluent reduction) as the starting point for determining the "best available" technology for the industry.[4] EPA has also determined that it may look to any viable "transfer technologies"—that is, technology from another industry that can be "transferred" to the industry in question—as well as technologies shown to be viable in research even if not yet implemented at a full-scale facility.[5] Similarly, EPA's regulations for developing BAT-based effluent limits

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[2] *See also NRDC v. EPA*, 863 F.2d at 1425 ("in issuing permits on a case-by-case basis using its 'Best Professional Judgment,' EPA does not have unlimited discretion in establishing permit limitations. EPA's own regulations implementing [CWA § 402(a)(1)] enumerate the statutory factors that must be considered in writing permits.").

[3] *See, e.g., Texas Oil & Gas Ass'n*, 161 F.3d at 929 (under 40 C.F.R. § 125.3, "EPA must determine on a case-by-case basis what effluent limitations represent the BAT level, using its 'best professional judgment.' Individual judgments thus take the place of uniform national guidelines, but the technology-based standard remains the same.") (citation omitted); *NRDC v. EPA*, 859 F.2d at 201('in establishing BPJ limits, EPA considers the same statutory factors used to establish national effluent guidelines. BPJ limits thus represent the level of technology control mandated by the CWA for the particular point source."); *Trustees for Alaska v. EPA*, 749 F.2d 549, 553 (9th Cir. 1984) (EPA must consider statutorily enumerated factors in its BPJ determination of effluent limits); USEPA NPDES Permit Writer's Manual (1996) at 69-70. *See also NRDC v. EPA*, 863 F.2d at 1425 ("courts reviewing permits issued on a BPJ basis hold EPA to the same factors that must be considered in establishing the national effluent limitations" (citations omitted)).

[4] *E.g., Texas Oil & Gas Ass'n v. United States E.P.A.*, 161 F.3d 923, 928 (5th Cir. 1998); *Association of Pacific Fisheries v. Environmental Protection Agency*, 615 F.2d 794, 816-17 (9th Cir. 1980); *American Meat Inst. v. E.P.A.*, 526 F.2d 442, 462-63 (7th Cir. 1975).

[5] These approaches to determining BAT are supported by the CWA's legislative history and have been upheld by the courts. *E.g., Am. Petroleum Inst. v. EPA,* 858 F.2d 261, 264-65 (5th Cir.

under BPJ require EPA to begin by identifying the "appropriate technology for the category of point sources of which the applicant is a member, based on all available information." 40 C.F.R. § 125.3(c)(2). These practices with regard to developing BAT effluent limitations are consistent with EPA's development of BTA standards under § 316(b) and it is logical to apply them to this BPJ development of BTA standards.

Therefore, to ensure that the location, design, construction, and capacity of GE Aviation's CWIS reflect the best technology available for minimizing adverse environmental impacts, EPA's analysis begins with an inquiry into the capabilities of the best-performing CWISs in the same industrial category.[6] Although GE Aviation is a manufacturing facility, the power generating capability at the Power Plant, along with the operation of the CWISs and discharge of NCCW, make GE Aviation similar in important ways to steam electric power plants. Therefore, for the purposes of this discussion and analysis, GE Aviation will be compared directly to power plants whose primary function is the generation and transmission of electricity by means of the steam cycle.

Given that GE Aviation is an existing facility that would require retrofitting to achieve technologically-driven improvements, EPA can look to the *existing* steam electric facilities that have achieved the greatest reductions in adverse environmental impacts from their CWISs through technological retrofits. In addition, EPA can look to technologies shown to be feasible for use at GE Aviation even if not previously used to retrofit an existing facility. For example, in this regard, EPA could look to technologies being used at *new* power plants to determine if they would be feasible for application at GE Aviation.[7]

As a general matter, the best performing facilities in terms of reducing entrainment and impingement by CWISs at existing open-cycle cooling power plants are those facilities that have converted from open-cycle cooling to closed-cycle cooling using some type of "wet" cooling tower technology. Converting to closed-cycle cooling can reduce water withdrawals by more than 90 percent and thereby achieve a corresponding reduction in entrainment and impingement. EPA's research has identified a number of facilities that have made this type of technological improvement. *See Draft Permit Determinations Document for Brayton Point Station NPDES Permit,* at pp. 7-37 to 7-38; *Responses to*

1988); *Pacific Fisheries,* 615 F.2d at 816-17*; BASF Wyandotte Corp. v. Costle,* 614 F.2d 21, 22 (1st Cir. 1980); *Am. Iron & Steel Inst. v. EPA,* 526 F.2d 1027, 1061 (3d Cir. 1975); *Am. Meat Inst.,* 526 F.2d at 462-63.

[6] It is important to emphasize that this is a site-specific determination and is not a finding regarding what would constitute appropriate national, industry category-wide BTA-based requirements under § 316(b).

[7] Thus, one can consider whether a technology used at a *new* power plant could constitute a viable "transfer technology" for use at an *existing* plant.

Comments for Brayton Point Station NPDES Permit, at p. IV-115.[8,9] A facility could also reduce its intake flow without changing technology by simply reducing the volume of its water withdrawals, but achieving significant reductions with this approach would most likely necessitate significant reductions in electrical generation. More modest flow reductions could lessen the effect on electrical generation but would also result in correspondingly more modest reductions in environmental impacts.[10]

EPA concludes that converting to a closed-cycle cooling system using wet cooling towers would *generally* be the best performing technology with regard to reducing the adverse environmental impacts of existing power plants with CWISs. Nevertheless, converting to closed-cycle cooling might not be determined to be the BTA either for a particular facility on a BPJ basis or for an entire category of facilities on a national basis. This could be so for a number of possible reasons. For example, closed-cycle cooling might not be feasible at some plants. This BPJ permit determination for the GE Aviation facility does not, and is not required to, evaluate all of these factors for any other facility or for the entire category of point sources nationally. Thus, a conclusion regarding the best-performing CWIS technology for use as a reference point in the BTA analysis for this permit is not a determination of the BTA for any other facility, much less for the entire category of facilities nationally.

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[8] In the Phase I CWA § 316(b) Rule, EPA determined that entrainment and impingement mortality reductions commensurate with the use of closed-cycle cooling reflect the BTA for *new* facilities with CWISs. *See* 40 C.F.R. Part 125, Subpart I (Phase I CWA § 316(b) Rule).

[9] Although the use of "dry" cooling might achieve an even greater marginal reduction in entrainment and impingement, EPA has not identified a single case of a facility retrofitting from open-cycle cooling to dry cooling. Although EPA is unaware of any technical reason that such a conversion would necessarily be impracticable at all facilities—though it seems likely that it would be infeasible at a larger proportion of existing facilities than would a conversion to wet cooling because of factors such as the greater space needed for dry cooling—it would likely achieve only a small marginal additional reduction over the high end of the reduction range for wet cooling towers and would be significantly more expensive. In the absence of examples of such a conversion ever having been implemented, EPA is not prepared to determine that converting to dry cooling is the required BTA for an existing facility like the GE Aviation plant. It should also be noted that in developing the Phase I Rule, EPA similarly declined to mandate dry cooling as the required BTA for new facilities, while recognizing that dry cooling was a *permissible* technology that would satisfy § 316(b) if a facility chose to install it.

[10] Cutbacks in water withdrawals, despite the resulting cutbacks in generation, have been required in some permits, sometimes on a seasonal basis, in order to reduce adverse CWIS impacts. *See, e.g.*, Bulletin, Marine Resources Advisory Council, Vol. IX, No. 4, "Effects of Power Plants on Hudson River Fish," (requirements for plant included scheduled plant outages); *In the Matter of Fla. Power Corp., Crystal River Power Plant, Units 1, 2, and 3, Citrus County, Florida* (Findings and Determinations Pursuant to 33 U.S.C. § 1326; NPDES Permit No. FL0000159).

2.2. Consideration of site-specific factors

Because a BPJ-based application of CWA § 316(b)'s BTA standard is conducted on a case-by-case, site-specific basis, EPA must evaluate whether the technologies under consideration are practicable (or feasible) for use at the particular facility in question. In other words, although a technology works at one facility, it might not actually be feasible at another plant due to site-specific issues (*e.g.*, space limitations). Thus, a technology that works at another facility but is not feasible at GE Aviation would not be the BTA for this permit. Conversely, a feasible technology for GE Aviation might not be feasible for another facility.

Again turning for guidance to the process for devising BPJ-based effluent limits, EPA regulations direct the Agency to consider "unique factors relating to the applicant." 40 C.F.R. § 125.3(c)(2). This parallels the above-described site-specific evaluation that EPA conducts in its BPJ application of CWA § 316(b).

2.3. Additional Considerations

In addition to considering the location, design, construction and capacity of the CWIS technology options and the extent to which they can reduce the direct adverse environmental impacts of the intake, EPA has also considered various factors that the Agency considers in setting effluent limitations, looking to the effluent limitations development process for guidance for this BTA determination under CWA § 316(b). For example, and as noted earlier, in developing BAT limits on a BPJ basis, EPA considers the six factors set forth in the statute and regulations for developing BAT effluent limitations: (1) the age of the equipment and facilities involved, (2) the process employed, (3) the engineering aspects of applying various control techniques, (4) process changes, (5) cost, and (6) non-water quality environmental impacts (including energy issues). *See* 33 U.S.C. § 1314(b)(2)(B); 40 C.F.R. § 125.3(d)(3). *See also* USEPA NPDES Permit Writer's Manual (1996) at 70.

The CWA sets up a loose framework for assessing these statutory factors in setting BAT limits.[11] It does not require their comparison, merely their consideration.[12] "[I]n enacting

[11] *BP Exploration & Oil, Inc.*, 66 F.3d at 796; *Weyerhauser v. Costle*, 590 F.2d 1011, 1045 (D.C. Cir. 1978) (citing Senator Muskie's remarks on CWA § 304(b)(1) factors during debate on CWA). *See also EPA v. Nat'l Crushed Stone Ass'n*, 449 U.S. 64, 74, 101 S.Ct. 295, 300, 66 L.Ed.2d 268 (1980) (noting with regard to BPT that "[s]imilar directions are given the Administrator for determining effluent reductions attainable from the BAT except that in assessing BAT total cost is no longer to be considered in comparison to effluent reduction benefits").

[12] *Weyerhauser*, 590 F.2d at 1045 (explaining that CWA § 304(b)(2) lists factors for EPA "consideration" in setting BAT limits, while CWA § 304(b)(1) lists both factors for EPA

the CWA, 'Congress did not mandate any particular structure or weight for the many consideration factors. Rather, it left EPA with discretion to decide how to account for the consideration factors, and how much weight to give each factor.'"[13] In sum, when EPA considers the statutory factors in setting BAT limits, it is governed by a standard of reasonableness.[14] It has "considerable discretion in evaluating the relevant factors and determining the weight to be accorded to each in reaching its ultimate BAT determination."[15] One court has succinctly summarized the standard for judging EPA's consideration of the statutory factors in setting BAT effluent limits: "[s]o long as the required technology reduces the discharge of pollutants, our inquiry will be limited to whether the Agency considered the cost of technology, along with other statutory factors, and whether its conclusion is reasonable."[16]

Thus, in determining the BTA for this permit, EPA has the discretion to consider the above-listed factors and to decide how to consider and weigh them in making its decision. Again, the factors from the effluent limitation development process are not strictly applicable as a matter of law to a BTA determination under § 316(b) because they are not specified in § 316(b). Nevertheless, EPA has looked to the effluent limitation development process for guidance and will consider these factors, and perhaps other factors, to the extent the Agency deems them relevant to its determination of the BTA. Ultimately, EPA's determination of the BTA must be reasonable.

Finally, as also indicated above, the United States Supreme Court recently held that EPA is authorized, though not statutorily required, to consider a comparative assessment of an option's costs and benefits in determining the BTA under CWA § 316(b). *Entergy*, 129 S.Ct. 1498, 1508-1510, *rev'g in part, Riverkeeper*, 475F.3d 83. As the Supreme Court explained, in its determination, "EPA sought only to avoid extreme disparities between

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consideration and factors for EPA "comparison" -- *e.g.*, "total cost versus effluent reduction benefits" -- in setting BPT limits).

[13] *BP Exploration & Oil, Inc.*, 66 F.3d at 796; *Weyerhauser v. Costle*, 590 F.2d at 1045.

[14] *BP Exploration & Oil*, 66 F.3d at 796; *Am. Iron & Steel Inst. v. EPA*, 526 F.2d 1027, 1051 (1975), *modified in other part*, 560 F.2d 589 (3d Cir. 1977), *cert. denied*, 435 U.S. 914 (1978).

[15] *Texas Oil & Gas Ass'n*, 161 F.3d at 928; *NRDC v. EPA*, 863 F.2d at 1426. *See also Weyerhauser*, 590 F.2d at 1045 (discussing EPA's discretion in assessing BAT factors, court noted that "[s]o long as EPA pays some attention to the congressionally specified factors, the section [304(b)(2)] on its face lets EPA relate the various factors as it deems necessary").

[16] *Ass'n of Pacific Fisheries v. EPA*, 615 F.2d 794, 818 (9th Cir. 1980) (industry challenge to BAT limitations for seafood processing industry). *See also Chemical Manufacturers Ass'n (CMA) v. EPA*, 870 F.2d 177, 250 n.320 (5th Cir. 1989), *citing* Congressional Research Service, *A Legislative History of the Water Pollution Control Act Amendments of 1972* at 170 (1973) (hereinafter "*1972 Legislative History*") (in determining BAT, "'[t]he Administrator will be bound by a test of reasonableness.'"); *NRDC v. EPA*, 863 F.2d at 1426 (same); *American Iron & Steel Inst.*, 526 F.2d at 1051 (same).

costs and benefits." *Entergy*, 129 S.Ct. at 1509. As the Court also explained, EPA had for decades engaged in this type of cost/benefit comparison using a "wholly disproportionate test" to ensure that costs were not unreasonable when considered in light of environmental benefits.[17] *Id.* at 1509 (citing *In re Public Service Co. of New Hampshire*, 1 E. A. D. 332, 340 (1977); *In re Central Hudson Gas and Electric Corp.*, EPA Decision of the General Counsel, NPDES Permits, No. 63, pp. 371, 381 (July 29, 1977)). In *Public Service*, EPA's Administrator stated that "I do not believe that it is reasonable to interpret Section 316(b) as requiring the use of technology whose cost is wholly disproportionate to the environmental benefit to be gained." In *Central Hudson*, *id.*, EPA's then General Counsel stated that:

> ... EPA must ultimately demonstrate that the present value of the cumulative annual cost of modifications to cooling water intake structures is not wholly out of proportion to the magnitude of the estimated environmental gains (including attainment of the objectives of the Act and § 316(b)) to be derived from the modifications.

The relevant "objectives of the Act and § 316(b)" include the following: minimizing adverse environmental impacts from cooling water intake structures; restoring and maintaining the physical and biological integrity of the Nation's waters; and achieving, wherever attainable, water quality that provides for the protection and propagation of fish, shellfish and wildlife, and provides for recreation, in and on the water. 33 U.S.C. §§ 1251(a)(1) and (2), 1326(b).

2.4. State Water Quality Standards

In addition to satisfying technology-based requirements, NPDES permit limits for CWISs must also satisfy any more stringent provisions of state water quality standards (WQS) or other state legal requirements that may apply, as well as any applicable conditions of a state certification under CWA § 401. *See* CWA §§ 301(b)(1)(C), 401(a)(1), 401(d), 510; 40 C.F.R. §§ 122.4(d), 122.44(d). *See also* 40 C.F.R. § 125.84(e). This means that permit conditions for CWISs must satisfy numeric and narrative water quality criteria and protect designated uses that may apply from the state's WQS.

The CWA authorizes states to apply their WQS to the effects of CWISs and to impose more stringent water pollution control standards than those dictated by federal technology standards.[18] The United States Supreme Court has held that once the CWA § 401 state

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[17] As the Court described, in developing the Phase II Rule, EPA had (for the first time) used a "significantly greater than test." The Court also indicated that either test was permissible under the statute. 129 S.Ct. at 1509.

[18] The regulation governing the development of WQS notes that "[a]s recognized by section 510 of the Clean Water Act, States may develop water quality standards more stringent than required by this regulation." 40 C.F.R. § 131.4(a). The Supreme Court has cited this regulation in support of the view that states could adopt water quality requirements more stringent than federal requirements. *PUD No. 1 of Jefferson County v. Wash. Dep't of Ecology*, 511 U.S. 700, 705

certification process has been triggered by the existence of a discharge, then the certification may impose conditions and limitations on the activity as a whole – not merely on the discharge – to the extent that such conditions are needed to ensure compliance with state WQS or other applicable requirements of state law.[19]

With respect to cooling water withdrawals, both sections 301(b)(1)(C) and 401 authorize the Region to ensure that such withdrawals are consistent with state WQS, because the permit must assure that the overall "activity" associated with a discharge will not violate applicable WQS. *See PUD No. 1*, 511 U.S. at 711-12 (Section 401 certification); *Riverkeeper I,* 358 F.3d at 200-202; *In re Dominion Energy Brayton Point, LLC*, 12 E.A.D. 490, 619-41 (EAB 2006). Therefore, in EPA-issued NPDES permits, limits addressing CWISs must satisfy: (1) the BTA standard of CWA § 316(b); (2) applicable state water quality requirements; and (3) any applicable conditions of a state certification under CWA § 401. The standards that are most stringent ultimately determine the final permit limits.

The Massachusetts Department of Environmental Protection (MassDEP) has designated the Saugus River in the vicinity of this discharge a Class SB, Outstanding Resource Water. Class SB "waters are designated as a habitat for fish [and] other aquatic life." 314 C.M.R. 4.05(2)(b). Massachusetts has indicated that this designated use means that SB waters are intended to provide, at a minimum, a good quality, healthful fish habitat (as opposed to a habitat of only minimal or low quality).[20] SB waters are also designated to provide a recreational fishing resource. Though the standard for Class SB waters does not include any specific numeric criteria that apply to cooling water intakes, it is nevertheless clear that MassDEP must impose the conditions it concludes are necessary to protect the designated uses of the river, including that it provide good quality habitat for fish and other aquatic life and a recreational fishing resource. In addition, 314 C.M.R. Section 4.05(1) of the Massachusetts WQS provides that each water classification "is identified by the most sensitive, and therefore governing, water uses to be achieved and protected." This means that where a classification lists several uses, permit requirements must be sufficient to protect the most sensitive use.

(1994). *See also* 33 U.S.C. § 1370; 40 C.F.R. § 125.80(d). *See also* 40 C.F.R. § 125.80(d); *Riverkeeper, Inc. v. U.S. Environmental Protection Agency,* 358 F.3d 174, 200-201 (2d Cir. 2004) ("*Riverkeeper I*").

[19] *PUD No. 1*, 511 U.S. at 711-12. holds that "in setting discharge conditions to achieve WQS, a state can and should take account of the effects of other aspects of the activity that may affect the discharge conditions that will be needed to attain WQS. The text [of CWA § 401d)] refers to the compliance of the applicant, not the discharge. Section 401(d) thus allows the State to impose "other limitations" on the project in general to assure compliance with various provisions of the Clean Water Act and with "any other appropriate requirement of State law." For example, a state could impose certification conditions related to CWISs on a permit for a facility with a discharge, if those conditions were necessary to assure compliance with a requirement of state law, such as to protect a designated use under state WQS. *See id.* at 713 (holding that § 401 certification may impose conditions necessary to comply with designated uses).

[20] By contrast, the state's WQS require Class SA waters to provide "excellent" quality habitat for fish. 314 C.M.R. 4.05(4)(a).

Massachusetts interprets its WQS as being applicable to cooling water withdrawals. EPA agrees with the Commonwealth's interpretation. First, the Massachusetts Clean Water Act provides that "no person shall engage in any other activity which may reasonably result, directly or indirectly, in the discharge of pollutants to waters of the [state] without a currently valid permit from the Department." M.G.L. ch. 21, § 43(2) and 314 C.M.R. 3.04. MassDEP's position has been that the cooling water withdrawal associated with a once-through cooling water operation is an integral component of the "activity" that directly results in a thermal discharge. Therefore, the GE Aviation facility's cooling water withdrawal is an activity subject to regulation under the permit that MassDEP must issue to authorize the discharge of thermal pollution under the Commonwealth's Clean Water Act. Second, the state's CWA provides that MassDEP water permits may specify "technical controls and other components of treatment works to be constructed or installed . . . which [MassDEP] deems necessary to safeguard the quality of the receiving waters." M.G.L. ch. 21, § 43(7). "Treatment works" is broadly defined to include "any and all devices, processes and properties, real or personal, used in the collection, pumping, transmission . . . recycling . . . or reuse of waterborne pollutants." M.G.L. ch. 21, § 26A and 314 CMR 3.02. MassDEP has concluded that a CWIS constitutes an integral component of a facility's once-through cooling water "treatment works," and therefore, MassDEP has further authority to regulate such structures.

More recently, Massachusetts has amended its WQS to make explicit its interpretation of the implicit meaning of its pre-existing WQS. On December 29, 2006, Massachusetts amended 314 C.M.R. 4.05 to clarify that "in the case of a CWIS regulated by EPA under [CWA § 316(b)], the Department has the authority under [CWA § 401,] M.G.L. c. 21, §§ 26 through 53 and 314 C.M.R. 3.00 to condition the CWIS to assure compliance of the withdrawal activity with 314 C.M.R. 4.00, including, but not limited to, compliance with narrative and numerical criteria and protection of existing and designated uses." 314 C.M.R. 4.05(3)(b)(2)(d). On January 11, 2007, Massachusetts submitted this revision (among others) to EPA for review pursuant to Section 303(c) of the Act. On July 29, 2007, EPA wrote a letter to MassDEP stating that "there is nothing in the CWA that prohibits MassDEP from adopting and enforcing WQS related to CWISs to ensure that water withdrawals are conducted in a manner that protect[s] designated and existing uses and compl[ies] with narrative and numeric criteria." Letter from Stephen S. Perkins, EPA, to Arleen O'Donnell, MassDEP (July 29, 2007), at 3. Litigation has ensued in the state courts regarding the state's amendment to the WQS, but the state's underlying interpretation of the meaning of the pre-existing WQS still stands.

In summary, the Massachusetts WQSs apply to CWISs and the GE permit's requirements must be sufficient to ensure that the facility's CWISs neither cause nor contribute to violations of the WQS and satisfy the terms of the state's water quality certification under CWA § 401. EPA anticipates that the MassDEP will provide this certification before the issuance of the final permit.

3. Biological Impacts of Cooling Water Intake Structures

The principal adverse environmental impacts typically associated with CWISs evaluated by EPA are the *entrainment* of fish eggs, larvae, and other small forms of aquatic life through the plant's cooling system, and the *impingement* of fish and other larger forms of aquatic life on the intake screens. *See* 66 FR at 65292 ("[I]t is reasonable to interpret adverse environmental impact as including impingement and entrainment, diminishment of compensatory reserve, stresses to the population or ecosystem, harm to threatened and endangered species, and impairment of State or authorized Tribal water quality standards."). Entrainment and impingement can kill large numbers of the aforementioned aquatic organisms and contribute to diminished populations of local species of commercial and/or recreational importance, locally important forage species, and local threatened or endangered species. As such, CWISs can have effects across the food web. In effect, CWISs can substantially degrade the quality of aquatic habitat by adding to the ecosystem a significant anthropogenic source of mortality to resident organisms. In addition to considering these adverse impacts directly, their effects as cumulative impacts or stressors in conjunction with other existing stressors on the species should also be considered. Furthermore, losses of particular species could contribute to a decrease in the balance and diversity of the ecosystem's overall assemblage of organisms. *See* 66 FR 65256, 65262-65 (Dec. 18, 2001) (preamble to Final Phase I rule under CWA § 316(b)).

Entrainment of organisms occurs when a facility withdraws water into the CWIS from an adjacent water body. Fish eggs and larvae in the water are typically small enough to pass through intake screens and become entrained along with the cooling water within the facility. As a result, the eggs and larvae are exposed to shear forces from mechanical pumps, physical stress or injury from contact with pipe surfaces, elevated temperatures from waste heat removal, and, in some cases, high concentrations of chlorine or other biocides. 66 FR at 65263. These organisms are typically killed or otherwise harmed as a result of entrainment. The number of organisms entrained is dependent upon the volume and velocity of cooling water flow through the plant and the concentration of organisms in the source water body that are small enough to pass through the screens of CWIS. The extent of entrainment can be affected by the intake structure's location, the biological community in the water body, the characteristics of any intake screening system or other entrainment reduction equipment used by the facility, and by season. 66 FR at 65263.

Impingement of organisms occurs when a facility draws water through its CWIS and organisms too large to pass through the screens, and unable to swim away, become trapped against the screens and other parts of the intake structure. In some cases, contact with screens or other equipment can cause an organism to lose its protective slime and/or scales, or suffer other injuries, which may result in delayed mortality. The quantity of organisms impinged is a function of the intake structure's location and depth, the velocity of water drawn to the entrance of the intake structure (approach velocity) and through the screens (through-screen velocity), the seasonal abundance of various species of fish, and the size of various fish relative to the size of the mesh in any intake barrier system (e.g., screens). 66 FR at 65263. For resident fish in the Saugus River, the CWISs pose multiple threats to single populations in that organisms are exposed to entrainment mortality as eggs and larvae and impingement mortality as juveniles and adults. It should be noted that this discussion focuses on fish because more information is available on CWIS impacts to fish, but CWISs can also harm other types of organisms (*e.g.*, shellfish).

3.1. Local Biology--Common and Notable Species Present

Several impingement and entrainment studies that were conducted in this reach of the Saugus River are available for characterization of local and anadromous fish and shellfish communities (MRI 1988, 1989, 1991, 1997). Impingement and entrainment sampling was conducted at GE's Power Plant CWIS from 1994 to 1996 using the same traveling screens currently in use (MRI 1997). To EPA's knowledge, no studies have been conducted to characterize impingement and entrainment specifically at either the Test Cell or Gear Plant CWISs. Impingement and entrainment sampling was also conducted from 1985 to 1988 across the Saugus River at the Wheelabrator Saugus CWIS and this provides additional data on the ambient biological conditions in the Saugus River. The Wheelabrator Saugus report provides impingement and entrainment rates at Wheelabrator Saugus at the time, though the facility has since updated the intake technology at its CWIS. These studies comprise the most recent impingement and entrainment data available for the Saugus River.

The Saugus River fish assemblage in the vicinity of the facility is composed not only of marine and estuarine species (e.g., winter flounder and Atlantic mackerel), but also freshwater species that can withstand high levels of salinity (e.g., chain pickerel), and anadromous (*e.g.*, alewife and rainbow smelt) and catadromous fish (*e.g.*, American eel). Many of these estuarine species are broadcast spawners that disperse their eggs to the water column. The eggs and larvae of these species float with the currents throughout the water column until they reach their juvenile life stage. Juvenile fishes school in the shallow, protected waters until they mature, at which point they move to deeper water.

Several of the fishes noted in the studies are desired species for recreational and commercial fishermen (e.g., winter flounder, bay anchovy, Atlantic cod, and Atlantic mackerel). In fact, of the 42 species or groups of species recognized as commercial fishery resources by the National Marine Fisheries Service Northeast Fisheries Science Center, at least 20 species are present near the facility according to the 1989 and/or 1997 MRI studies. In addition, 12 of the species sampled during the MRI studies have fishery management plans or restrictions managed by the New England Fishery Management Council. Generally, these fishery management plans are designed to reduce fishing mortality and promote rebuilding of stocks to sustainable biomass levels in response to population declines resulting from overfishing. Several of the species subject to impingement and entrainment, including yellowtail flounder, American plaice, cod, white hake, and haddock, are overfished (meaning that stock biomass remains low compared to maximum sustainable yield biomass) and/or overfishing is currently occurring (meaning fishing mortality remains high compared to maximum sustainable yield). In addition to fishes, several species of invertebrates, including commercially and/or recreationally important species such as the horseshoe crab and American lobster, are present in the Saugus River.

3.2. Entrainment and Impingement

The quantity of organisms entrained and impinged at a CWIS is generally a function of the intake structure's location, design, flow capacity (and resulting intake velocity), frequency of operation (i.e., capacity utilization), and the abundance of organisms within the influence of the cooling water intake current. The productive biological community of the Saugus River near GE's CWISs provides for conditions such as high egg and larval densities, numerous juvenile and adult fish and invertebrates, and anadromous fish migrating to spawning habitat, all of which could potentially lead to high rates of entrainment and impingement. This section discusses the potential for adverse environmental impacts to aquatic organisms as a result of the operation of GE's CWISs.

3.3. Entrainment Impacts

Fish eggs, larvae, and other aquatic organisms small enough to pass through the mesh of intake screens are entrained in water drawn into a facility's cooling system. Organisms carried through the cooling system are exposed to high shear stress and a rapid increase in water temperature as heat is transferred to the cooling water from the facility's condensers. Finally, after being discharged, organisms that survive traveling through the facility's cooling water system may then be exposed to rapid decreases in water temperature as the heated cooling water mixes with the receiving waters. These physical, chemical, and thermal stressors, individually or in combination, can kill or injure the entrained organisms. EPA assumes 100% mortality of entrained organisms in the absence of site-specific analysis of demonstrating some lesser percentage of mortality.

The permittee monitored entrained organisms in the Power Plant discharge stream (Outfall 018) in combination with ichthyoplankton sampling in the Saugus River opposite the intake from November 1994 through October 1996 (MRI 1997). Overall 41 species or groups of species were identified in the samples (4 present as eggs only, 23 present as larvae only, and 14 present as both eggs and larvae). Labrid (tautog/cunner), fourspot/windowpane flounder, and Atlantic mackerel eggs were numerically dominant, as were larval sand lance, cunner, grubby, Atlantic mackerel, Atlantic herring, winter flounder, rock gunnel, and fourbeard rockling. In both years the ichthyoplankton in-river sample and entrainment samples were dominated by eggs (approximately 66% of total sample). MRI (1997) did not provide an estimate of an annual entrainment rate or the total number of organisms entrained during the study period. Based on the permitted flow volume (35.9 MGD) and the geometric mean number of eggs and larvae for the numerically dominant species (3 species of eggs and 8 species of larvae) over the two sampling years, however, EPA calculated that the Power Plant CWIS has the potential to entrain over 69 million eggs and larvae annually.

Densities of eggs and larvae collected at the Power Plant and in the Saugus River exhibit strong seasonal patterns distributed throughout the year; however, there is considerable variability between peak seasons for different species. For instance, Atlantic herring larvae were present from November through May, while cunner larvae were present from June through September. This distribution indicates that entrainment is likely to occur year-round at the Power Plant CWIS. Peak larval densities for all species typically occurred between mid-March and late August, however, suggesting that this is the time period with the highest entrainment potential (see Table 3 of March 2006 TetraTech Report).

Wheelabrator Saugus (WS), located across and upstream from the Power Plant CWIS, conducted entrainment and river ichthyoplankton sampling from February 1984 through May 1988. The WS intakes are located on opposite shores of the Saugus River in distinct habitats, with GE's Power Plant CWIS located in deep water and the WS CWIS located in tidal flats with abundant vegetation. As a result, the two CWISs entrain a different composition of species. WS's entrainment samples, unlike GE Aviation's, were dominated by sculpin, Atlantic silverside, and Atlantic tomcod larvae. However, both facilities entrain large numbers of winter flounder and rock gunnel larvae, as well as labrid and windowpane eggs, suggesting the effects of entrainment at the GE and WS CWISs may have individual and cumulative adverse impacts on local fish communities.

3.4. Impingement Impacts

The impingement of organisms occurs when water is drawn into a facility through GE's CWIS and organisms become trapped against the traveling screens. Impinged fish may suffer from improper gill movement, de-scaling, starvation, exhaustion or other injury while trapped against intake screens. If an organism is returned to the waterbody through a debris return trough, it may suffer further injuries from contact with debris in the trough or the trough itself. Upon being returned to the waterbody, any injured or disoriented organisms may be more susceptible to predation. *See* 66 FR 65263 (Preamble to the Phase I Rule).

Impingement was measured at the GE Power Plant CWIS from November 1994 through October 1996. According to the 1997 MRI Report, a total of 29 finfish species and 10 invertebrate species were impinged during the study. Grubby were the most commonly impinged fish in both years (representing 48% of total) and were most numerous in samples from mid-October to February. Winter flounder were the second most commonly collected fish (26% of total), and were taken at the highest rates in November and January. Cunner, windowpane, shorthorn sculpin, and threespine stickleback were also commonly impinged. GE Aviation estimated an average fish impingement rate of 1,580 fish per billion gallons withdrawn from the Saugus River. Based on average monthly flows at the Power Plant CWIS between October 1998 and October 2008, and the average number of fish impinged per million gallons per month over the 1994-1996 impingement study (from Table 3 of MRI 1997), EPA estimates that GE Aviation impinges as many as 64,000 adult and juvenile fish at the Power Plant CWIS. Most impinged individuals at GE Aviation were young-of-the-year through Age 2 with few adults of any species impinged. Rainbow smelt were impinged on three occasions between October and February. The largest single impingement event occurred in

October 1996, when 2,555 individuals were impinged, including large numbers of grubby, winter flounder, windowpane flounder, and rainbow smelt.

The following four species constituted the vast majority of invertebrates impinged at GE's Power Plant CWIS between 1994 and 1996: green crab (*Carcinus maenas*), sevenspine bay shrimp (*Crangon septemspinosa*), Atlantic rock/jonah crab (*Cancer irroratus/borealis*), and American lobster (*Homarus americanus*). No impingement rate was estimated for total invertebrates; however, observed impingement rates as high as 16,550 per 24 hours for sevenspine bay shrimp, 585 individuals per 24 hours for green crab, and 22 individuals per 24 hours for American lobster were documented.

Commonly impinged species during a study of impingement at WS from 1986 to 1988 were similar to those at GE Aviation. The five most abundant species included winter flounder, grubby, and windowpane. Mummichog and northern pipefish were also impinged in high numbers, which is indicative of the WS CWIS's location in a tidal flat. The impingement rate at WS was substantially lower than at GE Aviation, with approximately 149 fish impinged per billion gallons of water withdrawn.

While it is important to understand an intake structure's potential to impinge organisms, it is also important to assess the capability of the intake system's design and operation to effectively return impinged organisms back to the receiving waters alive and uninjured. At the time of the MRI (1997) study, the impingement rates and initial survival of impinged organisms at the Power Plant CWIS were assessed by catching all materials washed off the collecting screens in a 1/4-inch mesh collecting pen attached to the end of the screenwash sluiceway. The initial reported survival of impinged fish following handling by the collecting screens was 99.7% for grubby and winter flounder, 100% for cunner, windowpane, and shorthorn sculpin, and 82.6% for all remaining species. The study did not address latent (e.g., >24 hours) survival. It is important to observe latent survival in impingement studies because injuries caused from impingement (*e.g.*, loss of protective slime or de-scaling) may cause mortality even in individuals that initially survive.

3.5. Summary of Entrainment and Impingement

The biological monitoring results from studies at GE Aviation indicate that the operation of the facility's CWIS results in adverse environmental impacts through the entrainment of ichthyoplankton (larvae and eggs) and the impingement of fish and invertebrates from the Saugus River. The MRI studies demonstrate that impingement and entrainment is occurring at GE at all times of the year, with peak entrainment occurring from mid-March through August and peak impingement occurring from October through early-March. See MRI 1997 Tables 7 and 8. Operations at GE Aviation impact both resident and migrating fish, including species experiencing population declines and recreationally and commercially important species.

4. Assessment of Cooling Water Intake Structure (CWIS) Technologies and Determination of Best Technology Available (BTA) under Section 316(b)

This section evaluates GE Aviation's existing CWISs and discusses potentially available technological alternatives for ensuring that the location, design, construction, and capacity of each CWIS reflects the BTA for minimizing adverse environmental impacts, as required by CWA § 316(b). This discussion considers engineering, environmental, economic, and other issues related to each alternative (See Section 2 of this Attachment for discussion of the methodology underlying the application of BPJ in this determination), and concludes with EPA's determination of the CWIS BTA for this permit renewal.

As explained in more detail below, there is a range of alternatives for minimizing the adverse environmental impacts of CWISs. Each available alternative has advantages and disadvantages, both inherent to the technology and as applied specifically at GE Aviation, and no one alternative commends itself as perfect, proven, and fully protective of the environment. For this analysis, EPA has considered the permit record, including the many recent submittals made by the permittee, such as GE Aviation's February 2008 Cooling Tower Analysis Technology and Biological Assessment Information and its March 2008 response to EPA' s CWA § 308(a) information request letter.

4.1. Gear Plant CWIS

The Gear Plant CWIS is located at the end of a 700-foot long pier on the southeastern portion of the GE facility (see Figure 1 March 2008 Cooling Water Intake Structure Information Document). The current 1993 permit limits this intake to an average monthly flow of 28.8 mgd and maximum daily flow of 54.7 mgd.

The permittee has recently proposed, however, to permanently retire the Gear Plant CWIS from operation. The MEPA Notification Form, submitted in April 2010, notified the state of GE Aviation's plans to demolish the saltwater intake wharf, close the associated discharge outfall, and install a new electrical line to Building 7 as part of the plan to demolish the Gear Plant. Commencement of this construction work is scheduled for October 1, 2010. Because this CWIS will no longer be operated and will likely be demolished during the next permit cycle, no BTA determination is required for this CWIS.

4.2. Power Plant CWIS

a. <u>Existing Technology</u>

GE Aviation's Power Plant CWIS is located in a pumphouse along the northern shore of the river (*see* Figure 1 March 2008 Cooling Water Intake Structure Information Document). This reach of the river is relatively straight, especially compared to the meandering reaches upstream of the facility, and the northern shoreline is generally relatively deep (19.5 feet at the traveling screens) and does not contain the shallow salt marsh and tidal flat habitat that is prevalent both downstream and on the opposite shore.

The CWIS is located in highly productive tidal waters, which raises concern for the organisms that use this habitat. Tidal rivers and estuaries are among the most productive ecosystems and provide spawning and nursery habitat for many aquatic species, as well as permanent habitat for adult organisms. As stated above, GE Aviation's CWISs are located in a state-designated Area of Critical Environmental Concern (ACEC) that encompasses the Rumney Marsh, one of the most extensive and biologically significant salt marsh systems in the Greater Boston area.

The CWIS consists of three intake bays leading to a single concrete intake equalization basin that supplies non-contact cooling water to the Power Plant. Excess flows from the equalization basin are returned to the river through Outfall 020. The opening to each intake bay (approximately 7 feet wide and 7 feet tall) is submerged, oriented towards the bottom of the structure (about 12 feet below mean low water), and equipped with sliding gates that can isolate the intake bay from the river.

The Power Plant CWIS's three intake bays are each equipped with a conventional single-entry, single-exit vertical traveling screen fitted with 3/8-inch (9.5 mm) wire mesh screen panels. Fixed bar racks (with approximately 7 inches spacing between vertical bars) are attached to a curtain wall, located upstream of these traveling screens, to exclude large debris. The traveling screens are operated continuously when the associated cooling water intake pumps are in operation. Each screen section is washed with a single high-pressure spray supplied by two screen wash pumps that withdraw approximately 1,000 gpm from the equalization basin. No biocides or other chemicals are used at this CWIS. Debris and any impinged organisms washed from the screens are deposited into an enclosed, fiberglass return pipe that discharges to an underwater location in the river approximately 80 feet downstream of the pumphouse.

At each screen, a variable frequency drive[21] (VFD) pump with a design capacity of 40,000 gallons per minute (gpm) withdraws water from the Saugus River, for a total design capacity of 172.8 million gallons per day (MGD). This seawater is fed into the intake equalization basin, which in turn supplies the condenser pumps. The Power Plant is equipped with two 10-megawatt (MW) turbines and one 15-MW turbine. Six condenser cooling pumps (two per unit), each with a design flow of 6,750 gpm, withdraw non-contact cooling water from the equalization basin for a total design capacity of 58.3 MGD. Thus, the CWIS's VFD pumps are capable of withdrawing more water from the river than the condenser pumps are able to withdraw from the equalization basin, which can result in a greater volume of water being withdrawn from the river than can actually

[21] A variable frequency drive (VFD) is an electrical motor that adjusts the power supplied to the pump, thereby changing the speed at which the pump operates. This allows the pump to operate at less than its maximum capacity and more efficiently meet the water needs of the facility. If the VFD is used to reduce the volume of water being pumped from the river, it should result in a proportional reduction in impingement and entrainment.

be used for cooling. The existing permit for this facility, however, limits the volume of non-contact cooling water discharged at Outfall 018 to a maximum daily volume of 35.6 MGD and average monthly volume of 30.0 MGD. According to the permittee, the facility typically meets its cooling water demand by operating three of the six available condenser cooling pumps at a total capacity of 29.2 MGD. One of the six pumps is currently operated with a VFD. Overflow from the concrete equalization basin spills over a stop-log weir and returns to the Saugus River via a concrete channel through Outfall 020.

The permittee currently operates an auxiliary closed-loop cooling system at the Power Plant. This system consists of a once-through non-contact cooling water loop, heat exchangers, and a recirculating freshwater cooling loop. The saltwater cooling loop uses water withdrawn from the intake basin to cool the freshwater loop. The design capacity for the saltwater loop is 4,000 gpm (5.8 MGD), but operates at an annual average of 2,000 gpm (2.9 MGD). The cooling flow required by the saltwater loop is included in the permitted capacity of 35.6 MGD.

A low through-screen velocity (TSV), which describes the velocity through the openings in a screen, tends to minimize impingement by allowing adult and juvenile fish to swim away from the screens, whereas a strong TSV traps fish. EPA recommends a protective TSV of 0.5 fps based on studies cited, and analysis provided, in the preamble to the Phase I Rule. See 65 FR 49087-88 and EPA 2000b. While many species and life stages were able to swim against a TSV as high as 1.0 fps, a more conservative TSV limit of 0.5 fps protected 96 percent of tested fish. Therefore, a lower TSV would protect the largest range of species and juvenile life stages. Moreover, a lower TSV also provides a margin of safety for circumstances in which screens become occluded by debris during the operation of a facility and velocity increases through the portions of a screen that remain clear. In its Cooling Water Intake Structure Information Document submitted March 2008, GE Aviation calculated a TSV of 1.61 fps for each seawater pump at 40,000 gpm. The intake is permitted at 35.6 mgd, which is typically met by operating a single pump. Therefore, at the design capacity (40,000 gpm) the TSV at a single operating pump would be 1.61 fps. At the required intake capacity (approximately 25,000 gpm), the TSV at a single operating seawater pump would be 1 fps.

Based on review of existing technology and biological monitoring data, EPA concludes that under the current conditions the Power Plant CWIS does not minimize adverse environmental impacts due to impingement and entrainment. The existing TSV of 1 to 1.61 fps does not adequately protect juvenile and adult fish from impingement. In addition, the traveling screens do not effectively protect fish that are impinged during transport. Fish are rinsed with a high pressure spray and deposited in the same return trough as debris and both practices could cause physical injury. In addition, a once-through cooling system with 9.5-mm mesh on the existing screens is not adequate to minimize entrainment of fish eggs and larvae. Technologies to improve survival of impinged fish, as well as to minimize impingement and entrainment through either physical exclusion (e.g., screening systems) or intake flow/capacity reductions (from operational or technological measures) are potentially available BTA options.

EPA evaluated several technologies in light of site-specific factors to determine which options would to ensure that the location, design, and capacity of the Power Plant CWIS reflects the BTA for minimizing adverse environmental impacts.

b. <u>Location of CWIS</u>

The location of a CWIS in the waterbody is an important factor influencing its adverse environmental impacts. For example, a CWIS located in the productive littoral zone (i.e., light-penetrating) rather than deeper waters could result in greater entrainment impacts; likewise, a CWIS located in a nearshore marine environment (such as an estuary) has a higher potential for entrainment than an intake located in offshore deeper waters where eggs and larvae are not as prevalent (EPA Technical Development Document for the Phase I Rule, Chapter 5).

EPA evaluated the existing location of the Power Plant CWIS in the waterbody (e.g., proximity to a shoreline), the type of waterbody, and the depth of the intake structure to determine if it meets the requirements of BTA under CWA § 316(b). As noted above, GE is located on the tidally influenced Saugus River, which is not an ideal location for a CWIS. Estuaries, such as the tidal portion of the Saugus River, are highly productive, ecologically critical to other marine systems, and valuable to people. Estuaries maintain hydrologic balance, filter pollutants from water, and provide habitat for birds, mollusks, crustaceans, fish, and other commercially and ecologically important organisms (Millennium Ecosystem Assessment 2005). In developing national standards for § 316(b), EPA recognized that tidal rivers and estuaries are sensitive waterbodies and merit the highest levels of protection, as impacts from both impingement and entrainment are concerns. Estuaries provide foraging habitat and migratory pathways for adult organisms, thereby increasing the abundance of impingeable organisms in the waterbody, as well as spawning and nursery habitat for many species, which increases the abundance of entrainable organisms (e.g., eggs and larvae). *See e.g.*, 67 FR 17140 (April 9, 2002) (preamble to the Proposed Phase II rule).

The depth of the river near GE varies and is subject to significant tidal action. At the Power Plant CWIS and the entrance to the canal leading to the Test Cell CWIS, the river is approximately 19.5 feet deep (at mean low tide) and there is a 9.5 foot differential between the mean water level at low tide and at high tide in the vicinity of the facility. According to maps of the area (see Figures 1 and 2), the river is generally deeper along its northern side and a navigation channel is maintained for commercial fishing vessel traffic.

By drawing water from the bottom layers of the river, the Power Plant CWIS may minimize impacts on pelagic species typically found higher in the water column, such as Atlantic mackerel and Atlantic silverside. However, benthic species associated with the river bottom, such as winter flounder and grubby, may experience greater impacts from the depth of the intake opening. In fact, the majority of numerically dominant finfish impinged at GE Aviation's Power Plant CWIS were either benthic (e.g., grubby, shorthorn sculpin, windowpane, winter flounder) or demersal[22] (e.g., cunner and tautog). In this case, benthic and demersal species were among the numerically dominant species impinged between 1994 and 1996, suggesting that the submerged intake location at GE Aviation's Power Plant CWIS may disproportionately impinge species associated with the benthos. Entrainment, however, does not appear to be associated with the location of the submerged intake opening at GE Aviation, as all of the commonly entrained eggs are buoyant (e.g., cunner/tautog, Atlantic mackerel, windowpane). While some of the commonly entrained larval species are benthic or demersal (e.g., grubby and sand lance), buoyant eggs comprised more than 60% of the numerically dominant ichthyoplankton entrained in both years (MRI 1997).

An alternative CWIS location is not known to be available to GE Aviation at this time. Construction of a new intake would almost certainly result in adverse environmental impacts to sensitive habitat. The CWIS is already located in one of the deepest parts of the river, and moving its location downstream could disturb shallow, productive salt marsh habitat, as well as tidal river habitat, and might impact more species than the existing CWIS does at its current depth. Moving the CWIS into shallow salt marsh habitat might also increase entrainment, among other harms, because the tidal flats and aquatic vegetation provides habitat for spawning fish. This type of environment also might not be an adequate source of water for cooling, due to shallow conditions at low tide and the threat of screen clogging by vegetation. Finally, moving the intake miles downstream and out to deeper offshore waters is not a viable option and would cause serious adverse environmental effects in the Saugus River and the coastal environment. Indeed, it seems unlikely that any of these options would receive the many necessary regulatory approvals that would be required from state and federal agencies. In light of the above considerations, EPA has determined that moving the location of the Power Plant CWIS is not the BTA at this facility.

c. <u>Design, Construction, and Capacity of the CWIS</u>

In addition to its location, Section 316(b) requires that the CWIS's design, construction, and capacity reflect the BTA for minimizing impingement and entrainment. *Capacity* refers to the volume of water being withdrawn by a given CWIS, while the *design* and *construction* of the CWIS can refer to any equipment or other technologies (e.g., screening mechanisms, fish return systems) employed to minimize adverse impacts. In this case, EPA evaluated the availability of capacity reductions, either through conversion to closed cycle cooling, or through the installation and operation of variable frequency drives, as well as a variety of potential technologies (e.g., wedgewire screens, traveling screens, and aquatic filter barriers) designed to minimize impingement and entrainment.

i. Closed-Cycle Cooling

[22] Demersal describes species associated with the benthos, for instance, because they forage heavily on benthic invertebrates.

As noted in the CWA § 316(b) Phase I regulations, the volume of water withdrawn has a direct influence of the numbers of organisms entrained, especially with regard to pelagic (free-floating) eggs and larvae (*see* 66 FR 65273). Closed-cycle cooling using so-called "wet cooling towers" recirculates cooling water and, according to EPA estimates, can reduce cooling water intake volumes by up to 98%. As a result, closed-cycle cooling is regarded to achieve a corresponding reduction in the number of organisms entrained by the CWIS (66 FR 65273). Dry cooling towers (also referred to as air cooled condensers) do not use cooling water at all, relying instead on fans to condense steam generated by a facility's boilers. Thus, switching to dry cooling would result in a 100% reduction in cooling water use. These closed-cycle technologies are the most effective means of reducing entrainment and impingement at steam electric power plants (66 FR 65273). Reducing flow proportionally decreases entrainment by reducing the number of organisms exposed to the CWIS, whereas other technologies designed to exclude the number of organisms or deposit them away from the intake still expose eggs and larvae to CWIS infrastructure (e.g., screens) and potential injury or mortality.

As described above, the Power Plant CWIS currently operates a once-through cooling water system permitted at a maximum daily intake of 35.6 MGD to cool turbine exhaust from three sets of steam turbine condensers. Cooling water is withdrawn from the river using three large capacity pumps (equipped with manual VFDs) and deposited into the concrete intake equalization basin, from where it is pumped to cool the condensers by a set of six pumps, only one of which has a VFD. Thus, in this case, the analysis must focus on the BTA for the existing GE facility, including issues associated with retrofitting technology to the existing plant, rather than what technology might be the BTA at a new facility.

GE evaluated the feasibility of converting its once-through cooling system to a closed-cycle system by installing wet cooling towers in the February 2008 Cooling Tower Analysis Technology and Biological Assessment Information Report. GE concluded that there was insufficient space at the facility to accommodate *natural draft* wet towers, but that *mechanical draft* towers could fit on the site. According to the permittee, retrofitting with closed-cycle cooling would require the construction of 4 cooling towers cells (each 42 feet long by 42 feet wide and 30 feet high). An existing parking lot on southeast of the power plant along the Saugus River was identified as a possible site for mechanical draft cooling towers. While the proposed site has sufficient space for construction of the towers, GE stated that it is unclear if the soil will support the infrastructure. Several underground concrete bunkers, which have been properly decommissioned, were formerly located on the proposed site. As a result, the permittee states that soil conditions would need to be evaluated at the start of the design stage to determine the foundation requirements for the cooling towers and ensure that the existing soil conditions will safely support any new construction.

According to GE, retrofitting the facility with closed-cycle cooling is the most costly of the evaluated technologies and may require substantial modifications to the existing infrastructure. Based on cost estimates provided by the permittee, EPA's consultant, Abt Associates, determined that the total present value of nominal, after-tax costs as of 2010 would be $36,491,000 for this facility. This figure does not include additional costs for any plant outages. GE estimates that electrical generation would need to be temporarily shut down for as much as 1 month to complete the conversion, during which GE could purchase power. Such power purchase cost might be reduced or avoided if GE could schedule completion of any conversion during any regularly scheduled outages, such as for may take place for regular maintenance. In their evaluation, GE commented that on the significantly high costs of cooling towers, but did not conclude that this technology would be unaffordable. GE also comments that installation and operation of mechanical draft cooling towers could interfere with existing utilities, including GE high voltage power lines, control wiring, a Keyspan natural gas line, as well as steam, groundwater transport, and jet fuel lines. Again, GE provides no analysis to indicate that any of these interferences would be unavoidable, only that the existing infrastructure could pose an additional engineering challenge during construction of cooling towers. Finally, the proximity of residential structures and major transportation routes, including the Massachusetts Bay Transportation Authority commuter rail, would require careful evaluation and would likely necessitate abatement technology to minimize impacts from vapor plumes, salt drift, and noise. If needed, abatement technologies for these impacts are readily available and in use at other facilities with mechanical draft cooling towers (e.g., drift eliminators to reduce salt drift; hybrid wet/dry cooling towers to reduce vapor plumes; low-noise fans and various types of sound attenuation devices and techniques). Despite the technological and construction challenges posed by the technology, and its substantial cost, EPA concludes that mechanical draft cooling towers are available technology for use at GE Aviation. In other words, use of the technology would be economically and technologically achievable at the GE facility.

The conversion to closed-cycle would reduce required cooling water intake volume by 97%, with approximately 840 gpm withdrawn for makeup cooling water (1.2 MGD) at 2 cycles of concentration. The TSV at the existing traveling screens under the proposed makeup volume intake would be less than 0.1 fps. The low TSV would sufficiently minimize impingement of adults and juveniles, saving more than 60,000 adult and juvenile fish annually, while the reduction in intake volume would reduce entrainment by 97%, with the potential to save nearly 67 million eggs and larvae. Of the available technologies that EPA considered in this BTA determination, closed-cycle cooling is the most biologically effective technology because it will result in the greatest reduction in impingement and entrainment. An additional benefit of closed-cycle cooling would be the substantial reduction in thermal discharge from Outfall 018 that would result from using closed-cycle cooling. Outfall 018 currently discharges non-contact cooling water from the power plant. (The draft permit's thermal discharge limits are discussed in the Fact Sheet.) Discharges from the operation of cooling towers would consist primarily of boiler blowdown, which the permittee proposes would be discharged directly to the Lynn Municipal Sewer System.

ii. Pump Modifications and Operational Measures

Variable frequency drives (VFDs) enable the facility to reduce the volume of its water withdrawals from the Saugus River under certain circumstances. All three seawater pumps that currently supply water to the Power Plant's intake equalization basin are equipped with VFDs, which allow the facility to reduce intake flow to levels lower than the pumps' maximum design capacity. The permittee proposes also to install and operate VFDs on each of the six condenser cooling water pumps to reduce flow at the CWIS.

The facility proposes that it could reduce monthly average cooling water demands 20% from the current permit (from 35.6 MGD to 28.7 MGD) by operating both seawater pumps and condenser cooling water pumps with VFDs and reducing flow to each of the condenser units from November to March. Dividing the flow over two intake bays would reduce the through-screen velocity to 0.5 fps when operating at 35.6 MGD, and to 0.4 fps when operating at 28.7 MGD, providing adequate year-round impingement mortality control. These reductions in TSV could potentially save more than 61,000 adult and juvenile fish per year from impingement.[23] Instrumentation and controls would be installed to automate operation of the seawater pumps and reduce overflow to the intake equalization basin, which would enable the facility to coordinate the seawater and condenser cooling water pumps more closely to the Power Plants demands. EPA concludes that dividing flow between two intake bays to reduce TSV to 0.5 fps or less is an available technology for reducing impingement.

EPA evaluated the availability of VFDs to minimize both impingement and entrainment at the Power Plant CWIS. According to the permittee, the installation and operation of VFDs at all six cooling water condenser pumps would require modification of the existing condenser pump drives and the addition of a vacuum prime and maintenance system along with controls integrating stable condenser vacuum conditions. Installing VFDs for the condenser pumps is feasible, as they have been operated for several years at the seawater pumps, and one of the condenser pumps is already equipped with a VFD. The permittee has already purchased two additional VFDs for installation at the condenser pumps. The permittee estimated the capital cost for the technology to be $526,000, with no annual operation and maintenance cost. Indeed, using VFDs would be expected to reduce energy needed for the intake pump systems and, therefore, to result in a cost savings. The non-water quality impacts of using VFDs would be beneficial for the facility and would include reduced auxiliary power consumption and extended equipment life. EPA has determined that VFDs are an available technology at GE Aviation's Power Plant CWIS.

The permittee also proposes automating the operation of the seawater pumps to better correlate the supply and demand of cooling water at each set of pumps (seawater and condenser) and minimize "spillover" from the intake equalization basin. It should be

[23] EPA, in preparation of the § 316(b) Phase I Rule for New Facilities, estimated that a conservative through screen velocity of 0.5 fps would protect 96 percent of the tested fish. See 66 FR 65274 (December 18, 2001) and Draft Background and Justification for Using a Through-Screen Velocity of 0.5 Foot per Second as a Threshold Criterion Value for the Section 316(b) Rulemaking, June 2000 (DCN:1-1054-TC).

understood that presently the seawater pumps withdraw more water than the facility actually needs for cooling. Thus, the withdrawal by the seawater pumps results in entrainment and impingement, but some of this water is not actually needed for cooling and is discharged back to the river as spillover from the intake equalization basin. Based on historical monthly water demands, the permittee estimates that these operational measures would result in a 20% reduction in average monthly cooling water demands over the course of a year. However, the timing of flow reductions would be critical to realizing the full benefit of the proposed action in terms of entrainment reductions. Actual intake flow reductions realized on a monthly basis would depend on inlet water temperatures, condenser loads, facility power demands, off site power availability, and thermal discharge limits.

According to the MRI biological monitoring reports, densities of eggs and larvae in the Saugus River are lowest in fall and winter and highest in spring and summer. Therefore, flow reductions occurring mainly in fall and winter would reduce entrainment by less than flow reductions during spring and summer when eggs and larvae are abundant. In supplemental responses to EPA on May 21, 2009, and May 24, 2010, the permittee estimated that flow reductions from the use of VFDs would potentially occur from November through March. In addition, GE indicated that it could shut down some non-critical equipment on weekends in order to maintain a 20% flow reduction on an average weekly basis year-round. Use of VFDs to reduce flows during fall and winter months when entrainment potential is lower, combined with weekend shutdowns to reduce flows on an average weekly basis, may provide a year-round flow reduction of 20% compared to the current permit. Such a year-round flow reduction could reduce entrainment by 20% and potentially save as many as 13.8 million eggs and larvae annually. Other technologies evaluated in this assessment can potentially reduce entrainment more than the proposed 20% flow reduction, but VFDs and equipment shutdowns offer a relatively inexpensive method to reduce unnecessary CWIS withdrawals that would otherwise result in mortality. Furthermore, if used in conjunction with another available technology (e.g., a screening technology), an even greater entrainment reduction could be achieved than would be attained by using either technology individually. Therefore, VFDs are an available technology and could be determined to be one component of BTA for this facility.

iii. Wedgewire Screens

A wedgewire screen uses a "v" or wedge-shaped wire welded to a framing system to form a slotted screening element (EPRI 2007). Wedgewire screens can potentially reduce both impingement and entrainment, depending on the slot size, through both physical exclusion and hydrodynamic effects. Small slot size (0.5 – 3 mm) wedgewire screens have been used or tested at a number of facilities, including Chalk Point Station, Charles Point Recovery Facility, Oyster Creek Nuclear Generating Station, and Arbuckle Hydroelectric Station, as well as in controlled laboratory and field studies (EPRI 2007).

In part, the performance of wedgewire screens depends on the presence of sufficient ambient current to cause organisms to bypass the structure (or assist them in doing so) and to remove debris from the screen face (*See* EPA Technical Development Document for the Final Section 316(b) Phase II Rule, Feb. 12, 2004, p. A-13). A field study of 0.5 mm wedgewire screens in Narragansett Bay (an environment and aquatic community comparable to the Saugus River) demonstrated that the tidal flux at the study site provided sufficient channel velocity (greater than 0.25 fps) for operation of the screens (EPRI 2005). The mean tidal range of the Saugus River (9.5 feet) is nearly 2 times that of Narragansett Bay (4.4 feet, Spaulding and White 1990), which should provide adequate sweeping flow to maintain the performance of wedgewire screens except during slack tide (approximately 30 minutes per tidal cycle). Still, installation and operation of wedgewire screens at GE Aviation would likely require periodic operation of an airburst system to clear debris, which could be coordinated with peak tidal velocity to maximize transport of debris from the installation. The potential for biofouling would also possibly require the screens to be manually cleaned, either in place by scuba divers or by removing the screens from the water. At least one other facility in the area removes their wedgewire screens from the water annually using a rail system and jib crane to perform manual cleaning. Biofouling and other types of screen clogging are a problem because they could interfere with a facility obtaining sufficient water for cooling and could result in increased TSV, resulting in increased impingement and entrainment effects.

EPA evaluated the availability of wedgewire screens at the Power Plant CWIS. Regarding the age of the facility's existing equipment, the existing conventional screens are outdated and wedgewire screens are available and in use at other facilities, as referenced above, and would be feasible for installation at GE Aviation. The permittee estimated a capital cost of $1,513,000 and annual operation and maintenance (O&M) costs of $109,000 (net present value capital and O&M cost of $2,705,000). Wedgewire screens result in no process changes, but would change how water is withdrawn from the river. In addition, as indicated above, a compressed air system would likely be required to clear debris from the screens. Regarding the engineering feasibility of wedgewire screens, the permittee estimated that 3 screens with a slot size of 0.5 mm and diameter of 6 feet would meet the flow requirements of the Power Plant CWIS. Only 3 screens are required, and a slot size as low as 0.5 mm is viable, at GE Aviation because the facility's cooling water demand is low relative to, for example, a larger steam electric facility. Moreover, river depth in front of the Power Plant CWIS (19.5 feet) is sufficient to provide the necessary clearance of the screens without having to dredge the riverbed. Arranged side-by-side, the total screen length would be 53 feet. The permittee specified a TSV of 0.5 fps in the design of the screens, which would result in an approach velocity of only 0.09 fps with a slot size of 0.5 mm.

The deep location (19 feet) and relatively low intake volume (35.6 MGD) would enable a wedgewire screen installation at GE Aviation to be limited to 3 large diameter screens. A maximum TSV of 0.5 fps would be sufficient to minimize impingement of adult and juvenile fish at GE Aviation. Relative to the depth (19.5 feet) and width (approximately 600 feet) of the river at the proposed location, the 3 screens represent a minor structural addition to the existing CWIS. In contrast, an installation at a facility with a larger intake volume location on a shallower river would require many more screens (both due to a higher intake volume and limitations on screen diameter dictated by depth), which would be likely to present more of a structural impediment to navigation and to zones of passage for migrating or floating pelagic organisms. The policies of the Army Corps of Engineers (ACOE) do not permit structures in navigational channels or setback areas (U.S. ACOE, July 1996), and under 310 CMR 9.35(2)(a), the state further restricts impediments to navigational channels. However, based on ACOE maps of the Saugus River navigation channel, there is more than 100 feet between the channel and the intake. In fact, the distance from the intake and the shoaling area is approximately 50 feet, which is large enough to accommodate the installation with no impact to the navigational channel. Any installation designs would have to be reviewed by the ACOE, but its agency representative has maintained that it would not be opposed to structures that do not impact the channel or increase shoaling (email between E. O'Donnell and D. Gaito, 11/23/09).

EPA concludes that the site-specific conditions at GE Aviation (sufficient sweeping flow, low intake volume, limited size of installation, and adequate river depth and width at the proposed site) make wedgewire screens particularly well-suited for this facility. Based on the physical conditions and engineering considerations relevant for GE Aviation, EPA has determined that wedgewire screens are an available CWIS technology for the facility. EPA also concludes that the low TSV associated with the technology, coupled with the operation of an airburst system to maintain performance, should successfully minimize the impingement of juvenile and adult fish. EPA estimates that a TSV of 0.5 fps or less has the potential to minimize impingement mortality by 96% and could save more than 60,000 juvenile and adult fish annually at GE Aviation (see Footnote 23 on page 23 of this Fact Sheet).

EPA also considered the potential for wedgewire screens to minimize entrainment. The ability of fine mesh screens (including wedgewire screens, fine-mesh traveling screens, and aquatic filter barriers) to effectively exclude organisms from being entrained at a specific site depends on the relative sizes of the mesh and the aquatic organisms of concern. Commonly entrained organisms at GE Aviation during the MRI study (1997) included cunner/tautog eggs (approximately 0.7 to 1.14 mm in diameter), windowpane eggs (1 to 2 mm in diameter), Atlantic mackerel larvae (3.1 to 3.3 mm long at hatching), and winter flounder larvae (3 to 3.5 mm at hatching) (Bigelow and Schroeder 1953). However, a mesh size small enough to exclude the smallest egg present (in this case 0.7 mm) may not be enough because the combination of a soft bodied organism with intake velocity can result in eggs and larvae larger than the mesh size becoming entrained (EPRI 2003). Field and laboratory studies suggest that 0.5 mm mesh retained[24] significantly more eggs and larvae than 1.0 mm mesh, including species common to the Saugus River such as winter flounder, grubby, and sand lance (ESEERCO 1981, EPRI 2005, EPRI 2008). Results of the Narragansett Bay field study suggest, a 0.5 mm slot wedgewire screen effectively reduced entrainment by 83% for all larval species combined, and was

[24] Retention describes the proportion of a given type of organism that is successfully excluded by a screening system and can be measured by the number of larvae recovered in front of the screen after an experimental trial.

particularly effective in reducing entrainment of eggs (92.5% reduction), whereas a 1 mm slot size was less effective (27% reduction) (ERPI 2005). EPA concludes that these studies, combined with the size range of species common to the Saugus River, suggest that a mesh size of 0.5 mm would be necessary to minimize entrainment at GE Aviation.

The large tidal flux, low design TSV, size of eggs and larvae, and demonstrated performance of 0.5 mm-slot screens in an environment similar to the Saugus River all combine to suggest that wedgewire screens have the potential to substantially reduce entrainment at GE Aviation. However, it is important to recognize the difference between excluding eggs and larvae from being entrained and from providing for their survival. Indeed, survival is critical, but difficult, to assess when evaluating the effectiveness of a screening technology, such as wedgewire screens. To effectively reduce adverse environmental impacts associated with entrainment (i.e., mortality), eggs and larvae excluded from the intake by fine-mesh screens must also survive any impingement on those screens and be safely returned to the aquatic habitat. If egg and larval mortality by entrainment is simply replaced with mortality by impingement, the cause of the CWIS's adverse environmental impact will have been shifted from entrainment to impingement, but the adverse impact of mortality to aquatic organisms will not have been reduced.

Unfortunately, the tiny eggs and delicate larvae that are entrained through coarse mesh screens, such as are currently in use at GE Aviation, are at a high risk of being killed if they are instead impinged on a fine-mesh wedgewire screen. The egg and larval life stages are quite fragile. While the fate of eggs and larvae following any impingement on fine-mesh screens is integral to the overall performance of the technology, EPA is unaware of any studies that have evaluated the survival of eggs and larvae exposed to wedgewire screens. In laboratory tests, impingement of eggs and larvae excluded from entrainment by 0.5 mm wedgewire screens was generally low (less than 13 percent for eggs and less than 9 percent for winter flounder and rainbow smelt larvae) (EPRI 2003). However, impingement of eggs and larvae on wedgewire screens has not been studied in field settings.

The few survival studies that have been conducted have been tested with fine-mesh (0.5 mm) traveling screens (which are different from wedgewire screens). In these studies, survival is species- and stage-specific, is influenced by intake velocity, and can be poor for fragile species. In one study of a prototype screen, initial and latent survival of larvae was generally low (less than 20%) (Taft et al. 1981). High mortality was also observed in laboratory and field studies for winter flounder, alewife, bay anchovy, and common carp larvae, regardless of velocity or impingement duration (ESEERCO 1981, EPRI 2007, EPRI 2008). The limited results available suggest that, for some species, larval survival on fine mesh screens may be poor.

On the other hand, initial survival of fish eggs in the Taft et al. study (1981) was 100% for some species (e.g., weakfish, black drum, Southern Kingfish, silver perch) and 40 to 75% for other species (anchovy, herring, sardine, croaker). Hatchability and latent survival did not differ between test and control samples, suggesting that latent impacts of impingement on fish eggs may be minimal. Similarly, initial and latent survival of decapod zoea was high in both test and control samples, suggesting that mortality of crustacean larvae from fine mesh screens is low (Taft et al. 1981). The results of the limited available survival data suggest that while larvae are unlikely to survive impingement on fine mesh screens, this technology may effectively reduce entrainment mortality for eggs and crustacean larvae.

EPA estimated the potential for wedgewire screens to reduce entrainment of fish eggs and larvae, and allow for their survival, at GE Aviation based on the performance of wedgewire screens in laboratory and field studies as well as on survival studies of fine mesh screens. The eggs of species commonly entrained at GE Aviation are generally robust and, based on the information cited above, EPA estimates that impingement survival by eggs would be high. In EPRI's Narragansett Bay study with a similar biological community, approximately 92% of eggs were excluded from entrainment (EPRI 2005). At GE Aviation, EPA assumed that 92% of eggs would be excluded, and 95% of the excluded eggs would survive.[25] On the other hand, because larvae are fragile and the limited data that we have indicate that survival of larvae following contact with fine-mesh screens is low, EPA conservatively assumed that all larvae excluded from entrainment by wedgewire screens would die via contact with the screen (i.e., 0% reduction in larval mortality). Nevertheless, in this case, wedgewire screens have the potential to substantially reduce entrainment mortality even under conservative assumptions regarding survival of larvae because the ichthyoplankton composition at GE Aviation is dominated by eggs (66% of in-river and entrainment samples in both years of the Power Plant sampling study). Based on these numbers, EPA concluded that wedgewire screens could reduce entrainment mortality by nearly 59% and save as many as 40 million eggs. When used in conjunction with operational measures to reduce flows by 20% (VFDs and weekend equipment shutdowns), the added benefit for larvae could reduce entrainment mortality nearly 67% and save over 46 million eggs and larvae.

EPA concludes that the site-specific conditions at GE Aviation (sweeping flow, low intake volume, limited size of installation relative to depth and width of river) and the performance of 0.5 mm wedgewire screens in a similar biological community (Narragansett Bay) indicate that this technology could substantially reduce entrainment mortality at GE Aviation. As a result, EPA has determined that 0.5 mm slot wedgewire screens, either alone or in conjunction with flow reductions, could potentially represent the BTA for the Power Plant CWIS at GE Aviation.

iv. Coarse Mesh Traveling Screens

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[25] EPA assumed 95% survival of eggs based on the average of the initial survival percentage of the species with the higher egg survival rates (ranging from 75.3 – 100% survival) in the Taft et al. 1981 survival study. EPA assumed that survival of eggs with wedgewire screens would be higher than overall survival in the Taft et al. study because with wedgewire screens eggs are not exposed to a spraywash or collection trough.

The existing traveling screens at the Power Plant CWIS were installed in 1946 and primarily function to exclude debris. They are ineffective for reducing mortality from either entrainment or impingement. First, the coarse mesh size (9.5 mm) is too large to exclude eggs and larvae from being entrained. Second, the TSV exceeds EPA's recommended level under current operating regimes (permitted flow pumped through one screen with a single pump). Third, debris and organisms are deposited into a single return trough after being washed off the screens by a high pressure hose. Physical impacts from the high pressure spray and comingling with debris during transport to the river can result in injury or death. Fourth, and according to the permittee, the basket frames on the existing traveling screens do not provide a secure way to safely transport fish from the screen well to the fish return system and the metallic frames may cause injury.

EPA evaluated the feasibility of upgrading the existing coarse mesh traveling screens at the Power Plant CWIS to reduce impingement mortality. Put simply, the facility's existing conventional screens are outdated and improved technologies are available to reduce impingement mortality. One such technology is known as "Ristroph screens" (named after the designer of the equipment). Ristroph screens improve fish survival following impingement and are now commonly used at power plants nationwide (EPRI 2007). While the Power Plant's current intake screens are not equipped with non-metallic fish buckets, improved seals, or smooth texture screen material, all of these features are available on Ristroph-style screens. Moreover, a low pressure spray system would be more protective of impinged organisms and is generally considered a standard feature of Ristroph-style screens (EPRI 2007). Finally, providing separate troughs for organisms and debris removed from the intake screens would better protect the organisms in the fish return system and could be provided in conjunction with a new Ristroph screen system. In sum, installing a low-pressure spray wash, improved fish return trough, and upgrading the conventional screens consistent with Ristroph screens would likely improve the survival of impinged fish. According to GE Aviation, such upgrades could be completed at a capital cost of approximately $2,611,000, and annual operating and maintenance costs of $232,000 (net present value capital and O&M costs of $5,147,000).

Implementing coarse mesh Ristroph traveling screens would require two minor process changes. The improved screens would require more frequent maintenance than the existing screens and might require the facility to use a portion of its thermal effluent to prevent icing on the screens in the winter. There are no other significant process changes, non-water quality impacts, or feasibility issues with this technology. Based on the information provided by the permittee, EPA has determined that improvements to the existing screen and fish return, as discussed above, are available for use at GE Aviation's Power Plant CWIS to reduce impingement mortality of adult and juvenile fish.

Due to the relatively coarse mesh size, however, this screening technology, even with the improvements provided by Ristroph screens, will not reduce entrainment. The existing 9.5 mm mesh screens permit most fish eggs and larvae to enter the facility, where they likely perish. Therefore, EPA has determined that although available for implementation at GE Aviation, coarse mesh traveling screens are not BTA for this facility.

v. Fine-Mesh Traveling Screens

EPA evaluated the feasibility of installing fine-mesh traveling screens – as opposed to fine-mesh wedgewire screens – at the Power Plant CWIS. Fine-mesh traveling screens, which typically include screens with mesh sizes less than 5 mm, can exclude smaller life stages from CWISs, depending on the relative sizes of the screen mesh and the organisms that are present. These screens can be installed in place of existing traveling screens or overlaid on top of existing screens. This type of screen has been implemented or studied at Big Bend Power Plant (Tampa, Florida), Somerset Station (Lake Ontario, New York), and Prairie Island Station (Mississippi River), among others (EPRI 2007).

EPA evaluated the availability of fine-mesh traveling screens for reducing impingement mortality and entrainment at the Power Plant CWIS. The existing conventional screens are outdated, as discussed above, and fine-mesh screens are an available technology that has been installed or piloted at other facilities (see above). The permittee considered three alternatives for installing fine mesh screens: 1) overlay fine-mesh screens over the existing 9.5 mm mesh screens and install Ristroph fish recovery buckets, 2) replace the existing 9.5 mm mesh with fine-mesh and install Ristroph fish recovery buckets, and 3) complete replacement of the existing 9.5 mm mesh screens with new modified "Fletcher/Ristroph" screens. Alternatives 1 and 2 could also be implemented on a seasonal basis. The permittee estimated a capital cost ranging from approximately $2.2 to $2.4 million and an annual operation and maintenance cost ranging from $269,000 to $333,000, depending on which configuration is installed. Complete replacement of the screens results in the highest capital cost, but lowest operation and maintenance costs.

The use of fine-mesh screens in any configuration would not result in any process changes or non water quality impacts. The technology would be feasible and, as referenced above, has been used at other facilities. The permittee highlighted potential screen head loss as a potential feasibility issue at GE Aviation. Head loss increases as screens become clogged with debris (a condition that may be exacerbated by finer mesh), which in combination with low tide, can cause pump vortexing and cavitation, or could result in screen failure if hydrostatic forces exceed design limits. The permittee states that if fine-mesh traveling screens were selected as BTA, a pilot study would likely be necessary to determine the rate of debris loading, associated head losses, and additional operation and maintenance requirements for this technology. The permittee did not, however, provide a reason to eliminate this technology based on these concerns.

Fine-mesh screens employ a small mesh to exclude organisms from being drawn into the CWIS. The mesh size selected may be dictated by the size of the organisms being entrained. As summarized in the discussion of wedgewire screens, the size of commonly entrained organisms at GE Aviation coupled with results from field and laboratory studies indicate that a mesh size of 0.5 mm would be necessary to minimize entrainment at the facility. As with wedgewire screens, eggs and larvae excluded from entrainment but impinged on the screens must survive and be safely returned to the aquatic habitat in order to reduce entrainment mortality. If eggs and larvae suffer impingement mortality, the cause of the CWIS's adverse environmental impact has shifted from entrainment to impingement, but mortality has not been reduced. The organisms that would be impinged on fine-mesh screens include tiny eggs and delicate larvae, which would otherwise be entrained through the existing coarse-mesh screen. These fragile life stages are at a high risk of being killed as a result of impingement. The results of limited available survival data (summarized in the discussion for wedgewire screens) suggest that while larvae are unlikely to survive impingement, fine mesh screens may effectively reduce entrainment mortality for eggs and crustaceans.

As for wedgewire screens, EPA assumed that only eggs are likely to survive impingement on fine-mesh screens. Therefore, only the entrainment mortality of eggs would be reduced by this technology. Compared to wedgewire screens, there are a few differences between the two technologies that suggest that wedgewire screens would be preferable at GE Aviation. These differences are as follows:

(1) Based on the permittee's evaluation, a 0.5 mm mesh traveling screen will result in TSVs ranging between 1 fps (with screens 100% clear) to as high as 4 fps (at 75% debris loading). Because traveling screens are used in combination with a fish return system to transport impinged organisms back to the receiving water, and because it is unlikely that eggs and small larvae can escape even a low TSV, a TSV of 0.5 fps is not required for entrainment. Nonetheless, in laboratory studies survival of impinged organisms tended to decrease as TSV increased (EPRI 2008). Moreover, because eggs and larvae are somewhat pliable, eggs and larvae that would otherwise be excluded by the small mesh size could potentially be drawn through the mesh by high TSVs, which would limit the effectiveness of this technology for reducing entrainment.

(2) With wedgewire screens, eggs and larvae never leave the receiving water even if they become impinged. Furthermore, the low TSV, low approach velocity, and additional hydrodynamic forces surrounding wedgewire screens could minimize the portion of the water column influenced by the withdrawal of water. At least one study (EPRI 2005) suggested that at a TSV of 0.5 fps, and with sufficient channel velocity, organisms more than 2 feet away from the screens would likely be swept past the structure unharmed. In contrast, any individual that enters the intake bay is likely to become impinged on a fine mesh traveling screen, where it will be exposed to the air, subject to pressurized spraywash, and transported through a fiberglass chute back to the receiving water. In the Taft et al. survival study (1981), which used a fine-mesh screen with a spraywash and collection trough, the average egg survival for all species was 75%. This could be reflective of the egg survival that could be expected at GE Aviation with a fine-mesh screen and spraywash and return system. At this lower percent survival (i.e., lower than predicted for wedgewire screens), entrainment mortality would be more than estimated for wedgewire screens (47 to 57% compared to 59 to 67%). Therefore, as compared to fine-mesh traveling screens, wedgewire screens are preferred

because they present fewer stressors for impinged eggs and larvae that could negatively impact survival.

(3) Based on the permittee's estimates, the capital cost of fine-mesh traveling screens could be $687,000 to $887,000 more than wedgewire screens. In addition, operation and maintenance costs for traveling screens are more than double that of wedgewire screens. In this case, wedgewire screens are less costly and are likely to be more effective at reducing adverse environmental impacts than fine-mesh traveling screens.

EPA has determined that while fine-mesh screens are an available technology for GE Aviation's Power Plant CWIS, and would reduce impingement and entrainment mortality, wedgewire screens would be preferred because they are likely to be more effective given that they may better prevent entrainment, present fewer stressors for impinged organisms (e.g., air exposure, spraywash), potentially impact fewer organisms, and are less costly.

vi. Aquatic Barrier Nets/Filter Barriers

EPA also evaluated aquatic barrier nets and filter barriers. Barrier net systems involve nets anchored in front of an intake to passively filter water and exclude organisms larger than the mesh size of the net. These systems include simple static nets, as well as more specialized filter fabric nets known as aquatic filter barriers. Both technologies seek to reduce entrainment by having a mesh size small enough to effectively exclude eggs and larvae, and reduce impingement of adult and juvenile fish with low through-screen velocities. Again, the systems' success at excluding organisms from entrainment would depend on the relative sizes of the barrier mesh and the organisms present. Aquatic filter barriers also may incorporate a compressed air system to clear debris and maintain system performance. Installations of these technologies for entrainment reduction are limited (e.g., Lovett Generating Station, Taunton River Desalination Plant, Bethleham Energy Center). However, laboratory and field results suggest that this technology could potentially be effective for reducing impingement and entrainment (ASA 2004, EPRI 2004). As with wedgewire screens, a sufficient ambient flow is required to sweep eggs, larvae, and other organisms away from the net where they could otherwise be subject to impingement, predation, and/or competition for food.

The Power Plant CWIS is located on the main navigational channel, which is likely large enough to accommodate a barrier net system. GE Aviation did not evaluate this technology, however, and provided no estimate of the appropriate size of such a system for the required intake flow. Based on information from other facilities and various studies, EPA estimated that a typical flow capacity of a fine mesh aquatic filter barrier is 10 gpm per square foot. The permitted cooling water flow for GE Aviation's Power Plant is approximately 25,000 gpm, which would require a net about 140 feet long at a depth of 18 feet. A net this size would be unlikely to impact navigation in the Saugus River, provided it did not extend more than 50 feet from the shoreline.

The low TSV (no greater than 0.5 fsp) associated with these technologies would likely be effective for reducing impingement of adults and juveniles, similar to wedgewire screens. Limited entrainment data from a full-scale deployment of an aquatic filter barrier at Lovett Generating Station on the Hudson River between 2004 and 2007 suggest that exclusion of eggs and larvae with 0.5 mm mesh is similar to that of wedgewire screens (average exclusion of all species was 79% and maximum exclusion was 95% in 2007) (ASA 2007). In one study of egg hatchability on G-weave fabric, survival of impinged river herring eggs was high (80-100%) and was not generally different from survival of the control group, suggesting that impingement had little impact on hatchability of river herring eggs under laboratory conditions (Alden 2007). These studies suggest that exclusion and survival of eggs and larvae with a 0.5 mm mesh aquatic filter barrier may be similar to that achieved by wedgewire screens. To EPA's knowledge, there is no available data on the survival of larvae, and EPA conservatively assumed that larval survival would be similar to that seen with the other screening technologies described above. In this case, entrainment mortality of eggs may be substantially reduced (nearly 59 to 67%) and as many as 40 to 46 million eggs could be saved annually.

One of the primary drawbacks of barrier net technologies is their susceptibility to debris loading. In addition to siltation and algal growth, one study demonstrated that the performance of an aquatic filter barrier was negatively affected by colonization by tubeworms, mussels, and other aquatic organisms (Henderson et al. 2001). Biofouling complicated initial deployment of an aquatic filter barrier at Lovett Station in 1993 and 1994. In 1993, the net became clogged with fine suspended sediment, which caused it to sink (LMS 1994). In situ cleaning with a high pressure spray reduced clogging. In 1994 algal buildup on the net caused two of the support piles to snap. In this case, the net had to be removed from the water and cleaned with a high pressure spray (LMS 1996). However, according to one report, the facility was able to resolve the clogging and biofouling issues and ultimately successfully deployed an aquatic filter barrier that effectively reduced entrainment and impingement by 2004 (ASA 2004).

Based on present information, EPA concludes that an aquatic filter barrier would likely reduce impingement and entrainment mortality to a level equivalent to, but not more than, wedgewire screens (i.e., 96% for impingement and 59 to 67% for entrainment). Installing and operating an aquatic filter barrier at GE Aviation could, however, require more operation and maintenance effort and expense than wedgewire screens, based on the performance and difficulties of operating an aquatic filter barrier at Lovett Station. EPA did not evaluate the cost of an aquatic filter barrier for GE Aviation because the permittee did not provide an estimate. Estimates from the Technical Development Document for the 2004 Phase II Rule indicate that an aquatic filter barrier rated for a flow of 10,000 gpm (less than half of the required flow for the Power Plant) had an average capital cost of $762,000 and average annual operation and maintenance cost of $218,000 (in 1999 dollars). Based on these costs, the expense of an aquatic filter barrier for the Power Plant would likely be similar to that of a wedgewire screen system (though the operations and maintenance costs could be higher for the aquatic filter barriers). Based on a preliminary analysis of the estimated size and effectiveness of an aquatic filter barrier at

GE Aviation, EPA concludes that this technology is available for reducing entrainment and impingement at GE Aviation's Power Plant CWIS. However, in this case, as between aquatic filter barriers and 0.5-mm slot wedgewire screens, EPA prefers the latter technology for consideration as the potential BTA for GE Aviation because aquatic filter barriers are not likely to reduce entrainment mortality more, and may reduce it less, than wedgewire screens, which have been studied in more detail and in tidal rivers similar to the Saugus River. Moreover, GE Aviation neither proposed nor evaluated the use of this technology and there is not enough site-specific information to draw clear conclusions about the application of this technology at the facility.

d. Benefits of Implementing BTA to Reduce Entrainment and Impingement

Reducing impingement and entrainment by GE Aviation's CWIS's will directly increase the number of commercial, recreational, and forage fish (eggs, larvae, juveniles and adults), as well as other types of aquatic organisms found in the river (e.g., invertebrates). The more that entrainment is reduced, the more likely it is that those reductions will contribute to increased populations of juvenile and adult fish. But reducing the loss of eggs and larvae is valuable in and of itself because of the role they play at the base of the food web and other benefits that they provide, such as contributing to species' compensatory reserve. Reducing impingement directly contributes to increased abundance of adult fish.

Beyond these direct benefits to aquatic life, reducing entrainment and impingement will also likely result in additional indirect benefits to the ecosystem and the public's use and enjoyment of it. Examples of such indirect benefits include increasing recreational and educational opportunities, increasing or maintaining biological diversity, and increasing populations of resident and migratory birds and other terrestrial wildlife dependent on the estuary for food.

The predominant benefits to be obtained in this case include non-market (e.g. recreational opportunities), indirect (e.g., ecosystem services), and non-use benefits (e.g., "existence values," "bequest values"). EPA has not endeavored to produce a monetized estimate of these benefits – such as by undertaking a stated preference study to estimate non-use benefits – because EPA decided that doing so would be prohibitively difficult, time-consuming and expensive for this permit. In addition, EPA concludes that the available information is adequate for assessing and comparing the alternative technologies. At the same time, EPA recognizes the importance of considering benefits that have not been quantified, but are potentially significant, and also recognizes that where relevant benefits have not been quantified, it is appropriate to consider them qualitatively. *See, e.g., EPA Guidelines for Preparing Economic Analyses* (EPA 2000a). Just as EPA considers the cost of technological options, it is important that the Agency also assess the benefits of these options in as complete a way as possible.

Therefore, in this case, EPA has qualitatively considered the value of the Saugus River ecosystem and the organisms that occupy it and the benefits that may result from the implementation of the various potential BTA technologies at GE Aviation's CWIS's. As explained above, EPA also has considered these benefits in light of their contribution to the "attainment of the objectives of the Act and § 316(b)." *Central Hudson, supra.* Again, the relevant "objectives of the Act and § 316(b)" include the minimization of adverse environmental impacts from cooling water intake structures, restoring and maintaining the physical and biological integrity of the Nation's waters, and achieving, wherever attainable, water quality providing for the protection and propagation of fish, shellfish and wildlife, and providing for recreation, in and on the water. 33 U.S.C. §§ 1251(a)(1) and (2), 1326(b).

Minimizing impingement and entrainment at the Power Plant CWIS would have many ecological benefits for the Saugus River ecosystem. Several commercially and recreationally important species are among the species commonly impinged or entrained, including winter flounder, windowpane flounder, Atlantic mackerel, and Atlantic herring. As stated in the discussion of entrainment impacts, fishery management plans are in place for many of these species which restrict fishing for them in order to help rebuild stocks. With fishermen facing tight controls on the beneficial harvest of, for example, adult groundfish, it would be anomalous to allow manufacturing facilities such as GE Aviation to systematically kill millions of groundfish eggs and larvae each year in the process of withdrawing cooling water from public waterways because their CWISs have not been adequately controlled by the use of available technology. Increases in forage fish and invertebrate populations (e.g., cunner, tautog, and grubby) may also benefit commercially and recreationally important fish species, as well as resident and migratory birds and other terrestrial wildlife (including State-listed threatened and endangered species), by increasing prey abundance. Anadromous species that would benefit from changes to GE's CWISs include American eel, rainbow smelt, and river herring. Both rainbow smelt and river herring have experienced declining populations in recent years, and minimizing adverse impacts to these populations is fundamental to their recovery. In fact, both rainbow smelt and river herring are listed as Species of Concern by the National Oceanographic and Atmospheric Administration (NOAA), and the Massachusetts Division of Marine Fisheries (MassDMF) provides further protection for river herring through a moratorium on the harvest, possession, and sale of river herring extended through 2011.

In addition to these direct and indirect benefits of increasing fish populations for the Saugus River ecosystem, fish populations generate a multitude of ecosystem services. Many of these ecosystem services have no direct market value and occur at regional spatial scales over the long term, making them difficult to monetize or even quantify. However, the potential benefits of increasing fish populations in terms of their functional role in natural ecosystems cannot be overlooked, and, at a minimum, these ecosystem services should be considered qualitatively.

Thus, in addition to food production, fish populations can control the growth of algae and macrophytes, supply recreational opportunities, regulate food web dynamics, recycle nutrients, serve as active and passive links between ecosystems, and maintain species and genetic biodiversity (Holmlund and Hammer 1999). Biodiversity has recently emerged as a critical measure of ecosystem resilience. Systems with high biodiversity tend to be more stable and have enhanced primary and secondary productivity, as well as lower rates of collapse of commercially important fish and invertebrate taxa over time (Worm et al. 2006). Low phenotypic diversity (i.e., the physical expression of a fish genotype), which can be a result of loss of a percentage of the population (such as through mortality associated with a CWIS), can decrease equilibrium catch and effort levels used by regulatory agencies to set quotas for commercial fishing stocks (e.g., through fishery management plans). Overestimating the maximum sustainable yield based on a conventional growth model in populations with low levels of phenotypic variance may lead to overharvesting and potentially collapse the stock (Akpalu 2009).

Clearly, the Saugus River is a productive ecosystem that provides resident and transitory populations of finfish, invertebrates, birds, and terrestrial animals; critical feeding areas for migratory birds; and spawning, nursery, and forage habitat for commercially and ecologically important species. It is also an ecosystem of public importance. Its critical functions have prompted a number of special designations recognizing the importance of the Saugus River. In 1988, Massachusetts designated the tidal area encompassing the facility and its three CWISs, known as Rumney Marsh, an Area of Critical Environmental Concern (ACEC). The boundary of this ACEC is the limit of the 100-year flood on the Lynn side of the Saugus River and includes GE's pumphouse. Rumney Marsh is one of the most extensive and biologically significant salt marsh systems in the Greater Boston area. The ACEC provides habitat for a diverse assemblage of birds and marine life, including migratory birds and at least five state-listed threatened and endangered species or species of concern. In addition to providing biological habitat, the salt marsh is significant to flood control, prevention of storm damage, pollution prevention, the protection of public and private water supplies, and public interests defined in the Wetlands Protection Act (see MGL c.131, s.40 and 310 CMR 10.00). As a result of this designation, the Massachusetts Department of Conservation and Recreation has acquired approximately 38% of the land in the ACEC boundary. In addition, MassDEP has designated the Saugus River an Outstanding Resource Water, defined as a waterbody having outstanding socio-economic, recreational, ecological, and/or aesthetic values under 314 C.M.R. 4.04(3). Finally, the Saugus River is also part of the Massachusetts Bays national estuary under the National Estuary Program, whose goal is to improve quality of estuaries of national importance.

In addition to special classifications representative of the significance of the estuary, Massachusetts has recognized the value of the Saugus River through the commitment of financial resources. For example, the state has earmarked $13.85 million for Saugus River watershed projects, including $4.25 million specifically for environmental stewardship, wetlands restoration, and open space initiatives for the Saugus River as part of the Energy and Environmental Bond Bill (signed August 14, 2008). The MA Coastal Zone Management's Wetlands Restoration Program has identified 16 potential salt marsh restoration sites (120 acres) along the Saugus River including five priority sites, and has completed 14 salt marsh restoration projects totaling 140 acres. In 2008, several priority projects were located in the ACEC, including one at Ballard Street not far upstream from GE Aviation. Recently, the city of Lynn has spent $35 million to $40 million to upgrade its municipal sewer and stormwater systems to improve water quality in the Saugus

River. Finally, programs such as annual water quality and fish monitoring programs carried out by a volunteer force and organized by the Saugus River Watershed Council show the community's dedication to preserving and restoring the Saugus River.

In summary, achieving substantial reductions in impingement and entrainment by GE Aviation's CWISs will increase the number of commercial, recreational, and forage fish (eggs, larvae, juveniles and adults) as well as invertebrate species in the Saugus River. These improvements are also likely to contribute to increased populations of adult fish. In turn, reducing adverse impacts from impingement and entrainment could provide a number of direct, indirect, and non-use benefits both within the Saugus River and at a regional scale. Benefits may include, for example, preservation of habitat for migratory birds and other terrestrial animals dependent on the salt marsh, enhanced recreational opportunities, including birdwatching, fishing, and kayaking, and preservation of Rumney Marsh, an outstanding resource water and ACEC with intrinsic biological value particularly worthy of protection, as indicated by the state's ACEC designation. While EPA has not developed a monetized estimate of these benefits, the value to the public of the Saugus River ecosystem and its natural resources is evident from the federal, state and public commitment of limited financial resources and effort to protect these natural resources and the multiple special designations given these resources to promote their protection. Moreover, substantially reducing entrainment and impingement will contribute to "attainment of the objectives of the Act and § 316(b)," including (a) minimizing adverse environmental impacts from cooling water intake structures, (b) restoring and maintaining the physical and biological integrity of the Nation's waters, (c) achieving, wherever attainable, water quality providing for the protection and propagation of fish, shellfish and wildlife, and (d) providing for recreation, in and on the water.

e. Determination of BTA for the Power Plant CWIS

In the text above, EPA has, among other things, evaluated technological options for reducing entrainment and impingement by the GE Aviation Power Plant CWIS and evaluated the benefits of achieving such reductions. Here EPA considers the technologies, including their cost and capacity to reduce mortality from entrainment and impingement, and the environmental benefits they offer in order to determine the BTA for this CWIS.

To begin with, EPA concludes that the current location, design, construction, and capacity the Power Plant's CWIS do not reflect the BTA for minimizing adverse environmental impacts. This conclusion is based on the Agency's evaluation of existing technology at the Power Plant CWIS, current levels of entrainment and impingement (from MRI 1997), and the estimated degree to which other available technologies would be capable of reducing mortality to aquatic organisms from entrainment and impingement.

In determining the BTA for the Power Plant CWIS, four available technology options stood out for consideration: (1) the VFD plan proposed by GE; (2) fine-mesh wedgewire screens;[26] (3) a combination of the VFD plan and fine-mesh wedgewire screens; or (4) converting to closed-cycle cooling using wet mechanical draft cooling towers. While all of these options are capable of achieving a 96% (or more) reduction in impingement, their estimated costs and capacity to reduce entrainment varied significantly.

The VFD plan was estimated to achieve a 20% reduction in entrainment (by reducing intake flow by a like amount) at a total capital cost of $526,000, with no annual operations and maintenance cost, for an annualized cost of approximately $41,000. The fine-mesh wedgewire screen option was estimated to be capable of reducing entrainment (and the mortality of organisms that would have been entrained in the absence of the screens) by approximately 59%, at an estimated capital cost of $1,513,000 and annual operation and maintenance costs of $109,000, for an estimated annualized cost of approximately $205,000. When combined with the VFDs, EPA estimates that the combination of technologies could at this particular facility achieve a 67% reduction in mortality at an estimated annualized cost of approximately $246,000. Finally, closed-cycle cooling was estimated to be capable of reducing entrainment by 97% at an estimated annualized cost of approximately $3,000,000, based on a total present value of nominal, after-tax costs of $36,491,000 as of 2010.

EPA has discussed the benefits of reducing entrainment and impingement above. EPA also concludes that the greater the reduction in these adverse impacts, the greater the benefits that will be achieved. That said, the Agency does not have any data in this case to indicate that there is a threshold for impact reduction below which ecological gains will be forfeited, or above which there would be no difference. On one hand, the Power Plant CWIS withdraws less than 3% of the total volume of the Saugus River over a single tidal excursion (ebb and flow). On the other hand, EPA estimated that at the permitted intake flow more than 64,000 juvenile and adults are impinged and 69 million eggs and larvae are entrained annually. EPA concludes that this represents a high level of unnecessary mortality in a productive estuary of public importance that is subject to cumulative stresses from, among other sources, municipal stormwater runoff, industrial discharges, and flow alterations.

EPA concludes that the VFD option would achieve some benefit of significance at very little cost, but rejects it as the possible BTA because other options could perform substantially better at only a relatively small cost increase. Specifically, the option of combining wedgewire screens with the VFD plan could achieve a substantially greater reduction in entrainment (approximately 67%) at a reasonable cost that is only slightly greater than the costs of VFDs alone. In other words, EPA concludes that the costs of

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26 While EPA found that fine-mesh traveling screens were an available technology, the Agency rejected them because they were not likely to perform quite as well as wedgewire screens and would be more expensive. Similarly, EPA rejected aquatic filter barriers, although an available technology, because the permittee did not provide site-specific information for this technology and because EPA estimated that it would perform either less well or, at best, equal to wedgewire screens. In contrast, EPA could make a more site-specific, detailed determination for wedgewire screens based in part on information provided by the permittee.

this option are warranted by the benefits to be achieved.[27] The closed-cycle cooling option will achieve an approximately 30% greater reduction in entrainment (approximately 97%), but at an annualized cost that is 12 times and an order of magnitude greater than the wedgewire screen-and-VFD option (approximate annualized costs of $3,000,000 vs. $246,000). Whether or not this type of cost difference would be warranted by the additional quantitative and qualitative ecological benefits will depend on the facts of the case at hand, but in this case, based on current information, EPA does not think the additional costs are warranted.[28] As a result, EPA has determined that the fine-mesh wedgewire screen-and-VFD plan constitutes the BTA for minimizing adverse environmental impact for the GE Aviation Power Plant's CWIS. The draft permit also authorizes GE to convert to closed-cycle cooling instead of wedgewire screens, as doing so would reduce adverse environmental impacts sufficiently to satisfy CWA § 316(b).

4.3. Test Cell CWIS

a. Existing Conditions

The Test Cell CWIS is located at the end of a 90-foot long intake canal perpendicular to the northern shore of the Saugus River, just upstream of the Power Plant CWIS (*see* Figure 1, March 2008 Cooling Water Intake Structure Information Document). As noted above in the discussion of the Power Plant CWIS, the northern portions of the river are generally deeper and do not contain salt marshes. The intake canal is approximately 28 feet wide and generally shallow with an even invert grade to the river. The depth of the canal is not maintained with dredging and siltation is an ongoing problem. During low tide, the shallow depth precludes the operation of the Test Cell CWIS.

The Test Cell CWIS is equipped with two primary pumps that provide once-through cooling water for a test turbine. A single, continuously rotating, dual-flow conventional traveling screen is located at the end of the intake canal. The seawater pumps each have a design capacity of approximately 38.2 MGD (26,500 gpm). An additional 1,500 gpm pump supplies a high pressure spray wash system that clears debris from the traveling screen, resulting in a total design capacity of 78.5 MGD at the Test Cell CWIS.

The Test Cell CWIS supplies cooling water for the aircraft engine testing that occurs intermittently throughout the year. The current permit limits the maximum daily flow of this CWIS to 45 MGD and average monthly flow to 27 MGD. However, the Test Cell typically operates with a single pump, limiting the maximum daily capacity to 40.3

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[27] In other words, EPA thinks that the estimated costs are reasonable in light of the benefits. Put differently, the Agency concludes that this option does not produce an extreme disparity in costs and benefits. More specifically, EPA thinks these costs are neither wholly disproportionate to, nor significantly greater than, the benefits to be achieved.

[28] Put differently, EPA does not think the increased costs would be reasonable in light of the margin of increased benefits that would be involved. In this case, we think such additional costs would be wholly disproportionate to and, therefore by definition, significantly greater than the additional benefits.

MGD. Additionally, average monthly flows are much lower than the current permit limit of 27 MGD because engine testing is infrequent and when it does occur, it is typically limited to a few days at a time. As a result of its intermittent operation, the Test Cell CWIS withdraws much less water annually than does the Power Plant CWIS (which operates year-round). According to the permittee, the Test Cell CWIS operated an average of 300 hours per year between September 2000 and January 2005. A review of DMRs from 1999 through 2008 indicates that average monthly flows ranged from 0 to 9.3 MGD. The average of these average monthly flows is 1.5 MGD, which accounts for less than 5% of the total annual plant flow.

According to the permittee, capacity utilization was 8% from 1996 to 1998, and ranged from 4.9% to 6.6% in 1998, 2001, 2002, 2006, and 2007. In 2008, GE Aviation installed and began operation of an auxiliary closed-loop recirculating cooling tower system to provide approximately 1,500 gpm of auxiliary cooling water. GE uses municipal water to provide water used for this cooling system. Because the auxiliary cooling water was previously diverted from the seawater pump associated with spraywash, the new auxiliary system decreases the overall cooling water demand at the Test Cell CWIS. According to the permittee, the new closed-loop system will result in a 5% capacity utilization rate for the Test Cell CWIS.

There is no entrainment data specific to this CWIS. According to the permittee, aircraft testing is most commonly scheduled during the months of September through November when entrainment potential is relatively lower. A review of entrainment data from the Power Plant CWIS biological monitoring study confirms that 97% of eggs and larvae entrained at the facility from 1994 through 1996 were captured between March and July. Eggs were prevalent from May through July, while larvae were most common between March and April with another peak in June. In late winter/early spring, grubby and sand lance larvae dominated the sample, while the June peak was dominated by Atlantic silverside, stage 3 winter flounder, Atlantic mackerel, and stage 2 and stage 3 cunner larvae. If the capacity of the Test Cell CWIS is limited between the months of March and July, the biological monitoring to date suggests that the potential for entrainment would be substantially reduced.

EPA evaluated DMRs from the Test Cell from 1999 through 2008 to determine if the capacity of the Test Cell CWIS is limited during the period of peak entrainment. Average monthly flows between March and July ranged from 0 to 9.3 MGD during this period, with an average of 1.7 MGD. Maximum daily flows could be as high as 40 MGD, but engine testing is typically limited in duration (e.g., during half of the test dates from March through July, testing appears to have occurred on only one day of the month). Still, the highest recorded average monthly flow (9.3 MGD) occurred during the peak entrainment period in April 2008. EPA's review of biological monitoring data and DMRs from the Test Cell suggest that the capacity of the CWIS could be limited sufficiently to reduce the potential for entrainment, but the Draft Permit would require seasonal flow limits to ensure that prolonged testing does not occur during entrainment season. Still, Draft Permit limits restricting average monthly flow at the Test Cell CWIS from March through July (peak entrainment period) are an available method of reducing the potential for entrainment while continuing to allow testing to be conducted commensurate with the permittee's characterization of Test Cell operations.

The permittee also evaluated the availability of additional entrainment technologies such as fine-mesh (0.5 mm) Ristroph traveling screens, fine-mesh wedgewire screens both inside and outside the canal, and closed-cycle cooling. At least one of these technologies is technically available (fine-mesh wedgewire screens outside the canal based on the same methodology as the Power Plant CWIS), but the minimum cost is $2 million. At this time, considering the lack of data and limited operation of the Test Cell CWIS, the limited potential benefits at this CWIS do not warrant the substantial cost of entrainment technologies such as fine-mesh wedgewire screens. Limiting flow into a CWIS is the most effective method to reduce entrainment, and the historic operation of this CWIS indicates that more stringent average monthly flow limits from March through July would reduce the potential for entrainment at the CWIS while still allowing some engine testing during this time.

b. Location

An alternative CWIS location on the site is not available to GE Aviation at this time. Moreover, EPA concludes that constructing a new intake would not represent the BTA for this CWIS for essentially the same reasons that the Agency rejected this option for the Power Plant CWIS. Constructing a new intake would result in adverse environmental impacts to sensitive habitat. The CWIS is already located in one of the deepest parts of the river, and moving its location downstream would disturb shallow, productive salt marsh habitat and might impact more species than the existing CWIS does at its current depth. Moving the CWIS into shallow salt marsh habitat might result in increased entrainment because the tidal flats and aquatic vegetation provide habitat for spawning fish. In light of these issues, it also uncertain at best that a proposal to construct a new CWIS would receive the necessary regulatory approvals. Thus, EPA has determined that moving the Test Cell CWIS is not the BTA at this facility.

c. Impingement Technologies

The Test Cell CWIS intake canal has a series of bar skimmers to exclude floating debris. At the end of the canal, a single dual entry-single exit traveling screen equipped with 9.5 mm (3/8-inch) mesh is oriented perpendicular to the flow from the pumps. The 9.5 mm coarse mesh screen is rotated continuously when the intake is in operation. A high-pressure (80-120 psi) spraywash system supplied by a single 1,500 gpm pump cleans the screens. No biocides or other chemicals are used at the CWIS. Any debris and organisms from the screens are deposited into a narrow (6-inch wide by 6-inch high) wooden debris return trough which exits from the north side of the traveling screen and discharges at the riprap-lined shoreline approximately 2 feet upstream of the intake canal. The discharge point at low tide is above the water line, and the wooden trough is in poor condition in some places. Both factors increase the risk of fish injury or mortality.

No impingement monitoring has been conducted at this CWIS. Inferences regarding the rate of impingement at this CWIS may be made, however, based on impingement data collected at the Power Plant CWIS. Impingement occurs year-round at the Power Plant CWIS, occasionally in very high numbers (e.g., October 1996). It is likely that the Test Cell CWIS also has the potential to impinge fish and invertebrates during its operation. Moreover, because this CWIS is not operated on a regular basis, aquatic organisms may take up residence in the intake canal during downtime. Any organism residing in the intake canal would be subject to impingement when the CWIS begins operating.

According to the permittee, the facility currently operates a single seawater pump and the spray wash pump, for a total operating capacity of 40.3 MGD. As discussed above, a low TSV tends to minimize impingement because it allows adult and juvenile fish to swim away from the screens, whereas a strong TSV tends to trap fish. EPA generally accepts a TSV no greater than 0.5 fps as protective for most fish. In its Cooling Water Intake Structure Information Document submitted March 2008, GE Aviation calculated the through-screen velocity at the Test Cell CWIS based on this operational capacity at 0.85 fps. A TSV higher than the protective level of 0.5 fps might be acceptable if coupled with a fish return system well designed to safely transport fish back to the receiving water. The fish return system presently in place at the Test Cell CWIS does not, however, meet this standard.

Like the technologies in use at the Power Plant CWIS, the intake screens at the Test Cell CWIS, installed in 1947, are primarily designed to exclude debris and are ineffective for reducing impingement mortality. EPA's assessment of the Power Plant intake screens is also applicable to the Test Cell intake due to similar design features (e.g., 9.5 mm mesh, intake through-screen velocity greater than 0.5 fps, debris and organisms comingled in a single fish/debris return trough). In addition, the poor condition of the Test Cell CWIS fish/debris return trough subjects organisms to additional hazards from rough edges or other irregularities, and then deposits organisms directly onto the rip rap above the tide line at low tides. Furthermore, the return location is only 2 feet upstream from the mouth of the intake canal, which is a poor location due to the potential for re-impingement. EPA concludes that the existing technology at the Test Cell CWIS is not the BTA to minimize the adverse impacts from impingement.

i. Coarse-Mesh Traveling Screens

To date, impingement at the Test Cell CWIS has not been studied. However, given the poor condition of the Test Cell's fish return system and because it discharges above the water level at low tide, survival from impingement at this CWIS is unlikely to be as high as the initial impingement survival observed in the 1994-1996 studies at the Power Plant CWIS. A redesigned fish return system, proposed by the permittee, would return organisms to the river a suitable distance away from the CWIS to prevent re-impingement, replace the single high-pressure spray wash system with a low pressure spray to more gently wash organisms into the fish return system, and improve the fish return and support structure design. According to the permittee, replacing the fish return system (including a low pressure spraywash) would cost approximately $105,000. Because the TSV of the CWIS at the permitted intake is greater than 0.5 fps, it is imperative that the fish return system be designed to safely transport adult and juvenile fish to the receiving water in a manner that maximizes their survival. Upgrading the existing fish return system would not require any process changes, and this upgrade would have no feasibility issues or non-water quality impacts.

According to the permittee, the basket frames on the existing traveling screens do not provide a secure way to safely transport fish from the screen well to the fish return system and the metallic frames may cause injury such as descaling. Fiberglass fish buckets are available on Ristroph-style screens and have been successfully used at other facilities and in laboratory studies to improve survival of juvenile and adult fish (EPRI 2007). According to the permittee, replacing the metallic frames with fiberglass fish buckets would cost about $75,000. Upgrading the fish buckets is not likely to require any process changes, and would have no feasibility issues or non-water quality impacts. In combination, fiberglass fish buckets and a new fish return system would likely increase survival of impinged organisms compared to the existing screens at relatively minimal cost to the permittee (approximately $180,000).

Alternatively, the permittee also evaluated the feasibility of replacing the existing coarse-mesh traveling screens at the Test Cell CWIS with new Ristroph-style screens. The upgrade would include installing non-metallic fish buckets, improved seals, and smooth-textured screen material consistent with Ristroph screens to improve the survival of impinged fish by reducing stress and physical injury. The capital cost of replacing the existing screens in this manner would be approximately $1,743,000, with an additional $124,000 for annual operation and maintenance costs. According to the permittee, these improvements would require more frequent maintenance than the existing screens, and might require the facility to recirculate a portion of thermal effluent in winter to prevent icing on the screens. There are no other process changes, non-water quality impacts, or feasibility issues with replacing the existing screens.

Based on the information provided by the permittee, EPA has determined that all of the improvements to the existing traveling screen discussed above are available technologies for reducing impingement mortality at GE Aviation's Test Cell CWIS. In order to reduce impingement at the Test Cell CWIS, the permittee would have to reduce the through-screen velocity to less than 0.85 fps. According to the permittee, at the current capacity (40.3 MGD) and using traveling screens, the TSV cannot be lowered without increasing the size of the CWIS to accommodate an additional screen. Additionally, upgrading the existing screens consistent with Ristroph traveling screens would likely reduce impingement mortality substantially. At this time, EPA does not believe that adding an additional traveling screen to reduce the TSV would be preferred because the cost would be substantially more than any of the improvements already discussed in this section, without additional benefit.

ii. Coarse-mesh Wedgewire Screens

As described above in the discussion of wedgewire screens for the Power Plant CWIS, this technology can potentially reduce both impingement and entrainment, depending on the slot size used, through physical exclusion and hydrodynamics and by using the flushing action of currents present in the source waterbody. Wedgewire screens maintain a low TSV, although a sufficient ambient current must be present in the source waterbody to aid organisms in moving by the structure and to remove debris from the screen face (See EPA Technical Development Document for the Final Section 316(b) Phase II Rule, Feb. 12, 2004, p. A-13).

The permittee evaluated the feasibility of coarse-mesh cylindrical and flat plate screens with a design TSV of 0.5 fps positioned in the intake canal. Designed for mean low water (typical for this technology), the diameter of a cylindrical wedgewire screen would be limited to 3 feet due to the shallow depth of the canal. At this diameter and a slot size of 1.75 mm, 16 cylindrical screens would be required with a total length of 95 feet. An array of cylindrical screens this large would not be feasible in the 90-foot long canal. According to the permittee, a 1.75 mm-slot flat plate screen could be installed in the canal in front of the existing traveling screen at a certain horizontal to vertical ratio and an invert elevation of -9.5 feet, which would require dredging within the canal. Additional, frequent dredging might also be required to maintain the required depth for both screen designs in the intake canal.

In addition, siltation could result in heavy clogging, which might interfere with performance of the screens. While wedgewire screens can be equipped with an airburst mechanism that discharges a pulse of compressed air through the screen to clear any accumulated debris, the flow in the intake canal for the Test Cell CWIS is predominantly influenced by the pumps and is unlikely to provide a sweeping current sufficient to clear the screens of debris following an "airburst" cleaning. Such clearing of debris is necessary to maintain screen performance. Given the space limitations and lack of sweeping flow in the intake canal, EPA has determined that 1.75 mm-slot cylindrical and flat plate wedgewire screens are not available at this location to reduce impingement at the Test Cell CWIS.

According to the permittee, both the coarse-mesh flat plate and cylindrical screen configurations could be located at or outside the entrance to the intake canal, where the river provides sufficient ambient flow to clear debris and organisms from the screen face, except at slack tide. The river is large enough with sufficient depth to accommodate the required number of cylindrical screens for the Test Cell CWIS (three 4-foot diameter screens) or flat plate screen area (287 square feet). EPA considered whether the installation of both coarse-mesh flat plate and cylindrical screens in the Saugus River could potentially impact navigation, resulting in an adverse non-water quality impact. The policies of the Army Corps of Engineers, the agency that maintains the navigation channel, do not permit structures in navigational channels or setback areas (U.S. ACOE, July 1996), and under 310 CMR 9.35(2)(a), the state further restricts impediments to navigational channels. However, based on ACOE maps of the navigation channel, there is more than 100 feet between the channel and the intake. In fact, the distance from the intake and the shoaling area is approximately 50 feet, which is large enough to accommodate the installation with no impact to the navigational channel. Any installation designs would have to be reviewed by the ACOE, but the agency has maintained that they would not be opposed to structures that do not impact the channel or increase shoaling (email between E. O'Donnell and D. Gaito, 11/23/09).

The existing conventional screens at the Test Cell CWIS are outdated and coarse-mesh wedgewire screens are an available technology (in use at other facilities) that would reduce mortality to aquatic organisms from impingement. GE Aviation estimated the cost of a 1.75 mm-slot flat plate wedgewire screening system at $582,000 (capital) plus $72,000 (annual operation and maintenance), and a 1.75 mm-slot cylindrical wedgewire screening system at $613,000 (capital) plus $72,000 (annual operation and maintenance). Both the coarse-mesh flat plate and cylindrical wedgewire screens would reduce impingement with a design TSV equal to 0.5 fps and, if selected as the BTA, would not require replacement of the existing coarse mesh traveling screens.

EPA has determined that either 1.75 mm-slot flat plate or cylindrical wedgewire screens outside the intake canal are available technologies for substantially reducing impingement from the Test Cell CWIS as compared to the existing traveling screen.

d. Determination of BTA for the Test Cell CWIS

In the text above, EPA has, among other things, evaluated technological options for reducing entrainment and impingement by the GE Aviation Test Cell CWIS. In Section 4.2.d of this Fact Sheet, EPA evaluates the benefits of achieving reductions in impingement for the Power Plant CWIS, which also apply to the Test Cell CWIS. Here, EPA considers the technologies, including their cost and capacity to reduce adverse impacts from the CWIS, and the environmental benefits they offer in order to determine the BTA.

EPA first evaluated existing operations at the facility. GE Aviation has not conducted entrainment monitoring at the Test Cell CWIS. However, compared to the Power Plant CWIS, the Test Cell CWIS likely entrains fewer organisms due to its intermittent operation and lower total volume of withdrawals on a monthly basis. Under the existing operations at the Test Cell, the average monthly flow is 1.5 MGD, which is substantially less than the average monthly flow of 27 MGD at the Power Plant CWIS. Moreover, rather than pumping at a continuous rate year-round like the Power Plant, the Test Cell's intake flow limited to a few days each month. The Test Cell CWIS is shut down when there is no testing, which can be the majority of the month. According to the permittee, the Test Cell CWIS primarily operates during colder months (see, for example, page 2-4 of March 2008 Response "aircraft engine testing is scheduled most commonly during the fall months of September through November" and page 7-5 "typically limited to colder months"). Although the actual operation of the DMRs suggest that limited operation occurs during all months, EPA sees no reason why the operation of this CWIS should not be limited during months when eggs and larvae are most prevalent and the potential for entrainment is highest. Limiting flow more than the current permit during these months is one available option to reduce entrainment that would appear to require limited expenditure by the permittee.

EPA also looked at the availability of alternative technologies to reduce entrainment and concluded, at a minimum, that fine-mesh wedgewire screens could be installed and operated outside the intake canal at a total capital cost of $2 million.[29] Fine-mesh wedgewire screens could potentially reduce entrainment more than limiting the capacity during entrainment season alone, but because there is no entrainment data for this CWIS, EPA is unable to estimate how many more eggs could be saved by implementing the additional technology. Still, given the low operating capacity at this CWIS, EPA anticipates that any incremental benefits would likely be small, in comparison to the differences in benefit that would be provided by the available BTA options at the Power Plant. Considering that the actual operating capacity of this CWIS is low and contributes minimally to the total flow at the facility, EPA has determined that the magnitude of the entrainment impacts at the Test Cell CWIS do not warrant the expenditure that would be required to install and operate any of the available technologies for reducing entrainment. EPA concludes that the BTA to minimize entrainment at the Test Cell CWIS is to restrict the capacity during peak entrainment season. GE is, of course, free to install fine-mesh wedgewire screens if it prefers, as doing so would also reduce entrainment sufficiently to satisfy CWA § 316(b).

GE Aviation has not conducted impingement monitoring at the Test Cell CWIS. Assuming that impingement at the Test Cell CWIS is equivalent to the rate of impingement at the Power Plant CWIS,[30] EPA estimates that this CWIS could impinge more than 4,000 adult and juvenile fish per year. Moreover, impingement rates are highest in the fall when, according to the permittee, the Test Cell operates most frequently. EPA concludes that this CWIS has the potential to result in adverse impacts associated with impingement mortality based on impingement rates at the Power Plant CWIS, operation of the Test Cell during fall when impingement can be high, a TSV greater than 0.5 fps, and the poor condition of the existing fish return system.

In determining the BTA for the Test Cell CWIS, 3 available technology options to reduce impingement mortality stood out for consideration: (1) upgrade existing coarse-mesh traveling screens with new fish buckets and return system, (2) replace existing coarse-mesh traveling screens with new Ristroph screens, and (3) install and operate 1.75-mm slot flat plate or cylindrical wedgewire screens. While all of these options are capable of

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[29] Due to the similar physical and biological environments, technological improvements to reduce entrainment at the Test Cell CWIS are likely to have the same constraints as those at the Power Plant CWIS. However, because the annual flow at the Test Cell is substantially less than at the Power Plant, any reductions in entrainment will be relatively lower at the Test Cell. See analysis of entrainment technologies for the Power Plant CWIS in Section 4.2.c.

[30] Impingement rate of 1.58 fish per million gallons withdrawn based on estimate from MRI 1997.

reducing impingement mortality, their estimated capacity to reduce impingement and their estimated costs varied significantly.

Upgrading the existing technology with fiberglass fish buckets and a new fish return system would reduce impingement mortality at a total cost of about $180,000 with little additional operation and maintenance required. Similarly, replacing the existing screens with coarse-mesh Ristroph screens would reduce impingement mortality at a total capital cost of $1.7 million and annual operation and maintenance cost of $124,000. Although neither technology would reduce impingement – impingement is thought to be reduced only at TSVs no greater than 0.5 fps and these technologies would not alter the existing TSV of 0.85 fps -- mortality from impingement would be expected to be reduced by use of smooth fish buckets that protect fish from injury, coupled with a new fish return system that better protects fish during transport and reduces the potential for re-impingement. It is difficult, at this time, to estimate the survival of impinged fish at this facility, but laboratory studies suggest that survival with Ristroph screens is generally high (greater than 95%) and fish injury and scale loss was lowest at TSVs similar to the existing TSV at the Test Cell (EPRI 2006). In this case, EPA conservatively assumes that improving the existing coarse-mesh technology would reduce impingement mortality by 80% based on a review of this technology conducted for the suspended Phase II Rule (EPA 2004). In contrast, 1.75-mm flat plate or cylindrical wedgewire screens could potentially reduce impingement by 96% at a total capital cost of $420,000 to $592,000 and annual maintenance cost of $109,000.

EPA has discussed the benefits of reducing impingement in Section 4.2.d. Generally, EPA considers that the greater the reduction in adverse impacts, the greater the benefits that will be achieved. EPA concludes that all three technology options would reduce impingement mortality substantially. Specifically, upgrading or replacing the screens would reduce impingement mortality by 80% or more and potentially save more than 3,200 fish, while installing wedgewire screens would likely reduce impingement by 96% and potentially save more than 3,800 fish. The potential for impingement at the Test Cell CWIS represents unnecessary mortality in a productive estuary of public importance that is subject to cumulative stresses from, among other sources, municipal stormwater runoff, industrial discharges, and flow alterations. As a result, EPA has determined that some expenditure is necessary to reduce impingement at the Test Cell CWIS. Replacing the existing screens with new Ristroph screens is unlikely to reduce impingement mortality much more than replacing the fish buckets and improving the fish return, at nearly 10 times the cost. For this reason, EPA concludes that replacing the existing coarse-mesh screens is not the BTA to minimize impingement at the Test Cell. Wedgewire screens could potentially reduce impingement by an additional 16% compared to improving the existing coarse-mesh screens, but because of the overall limited flow, this improvement only saves about 600 more fish per year, at nearly 12 times the cost. In this case, EPA does not think the additional costs are warranted by the benefits. As a result, EPA has determined that improving the existing coarse-mesh traveling screen with new fiberglass fish buckets and a new fish return system constitutes the BTA for minimizing adverse impacts from impingement for the GE Aviation's Test Cell CWIS. GE is, of course, free to replace the existing screens or install wedgewire screens if it prefers, as doing so would also reduce impingement sufficiently to satisfy CWA § 316(b).

4.4. Permit Requirements Based on BTA Determinations

For this permit, EPA is making a 316(b) determination for this facility on a BPJ basis. EPA has considered the design, construction, and capacity of the existing CWISs, improvements proposed by GE, available technologies, and potential adverse environmental impacts and determined that the following measures represent BTA.

a. Power Plant CWIS

To minimize impingement mortality, the permittee shall reduce the through-screen velocity at any new or existing screening system to a level no greater than 0.5 fps.

To minimize entrainment, the permittee shall either:

(i) maintain a year-round monthly average intake flow of 28.7 MGD, commensurate with a 20% reduction in average monthly flow from the current permit; *and* install and operate a fine mesh wedgewire screen with a slot or mesh size no greater than 0.5 mm and a pressurized system to clear debris from the screens; *or*

(ii) maintain a year-round maximum daily intake flow commensurate with the operation of a closed-cycle cooling system.

b. Test Cell CWIS

To minimize impingement the permittee shall improve the existing coarse mesh traveling screen with new fiberglass fish lifting buckets, a low pressure spraywash, separate fish and debris return troughs, and a new return trough that avoids high elevation drops and 90-degree turns, and that returns fish to a location that minimizes potential for re-impingement and is submerged at all tidal stages.

To minimize entrainment, the permittee shall operate the CWIS with an average monthly limit of 5 MGD from March 1 to July 31 and an average monthly limit of 27 MGD from August 1 to February 28.

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Attachment K: Thermal Analysis from Derivation of Permit Limits for Wheelabrator Saugus (NPDES Permit No. MA0028193)

1) Fact Sheet: Determination under CWA § 316(a)

2) Response to Comment: Response to General Comment

3) Figures 2.11 to 2.15 from *Temperature Mapping and Hydrothermal Model Calibration of the Lower Saugus River Estuary* (Draft Report 04-115) prepared for Wheelabrator Saugus, Inc. by ASA (August 2004).

of the critical temperature was also seen in the benthic layer. The area exceeding 75°F dropped to 0% as the tide ebbed and then built up to 100% coverage on slack high water. There was little discernable difference between the areas of exceedance under Scenarios 1 and 6.

October – The model did not predict any exceedances of the critical temperatures during the October period.

6.1.1.5 Determination under CWA § 316(a)

The draft permit grants a § 316(a) variance to allow WS to discharge heat to the Saugus River in a manner that will exceed the MA SWQS, but will nonetheless assure the protection and propagation of the BIP. EPA is granting the §316(a) variance based on available data indicating that no appreciable harm to the BIP has occurred from the existing thermal discharge and modeling results showing that the 30% reduction in cooling water flow, combined with a delta T limit increased to 22 °F and a maximum T limit maintained at 90°F, will only nominally affect the size, shape and magnitude of the current thermal plume, while benefiting the BIP by reducing entrainment and impingement. Consistent with this result, the amount of heat discharged by the facility to the Saugus River will change very little, if at all, under this combination of discharge limits.

Based on these modeling results, EPA has determined that the benefits of reducing impingement and entrainment of aquatic organisms at the CWIS outweigh any potential concerns about increased thermal impacts in the lower Saugus River because no significant change in the thermal plume is predicted to result from the change in intake flow.

Therefore, as discussed in more detail below in the sections addressing BTA requirements under CWA § 316(b), seasonal flow reductions have been established in this permit under CWA § 316(b). Specifically, this permit requires that WS reduce its intake flows (and corresponding effluent flows) by 28% for the period of October 1 to May 31. This is roughly consistent with Scenario 6 of the temperature modeling and reduces the flow limit from 60 MGD to 43.2 MGD. Although the modeling used a flow reduction of 30%, WS determined that the flow of 43.2 MGD, or a 28% reduction, was as close to 30% as the facility could reliably achieve, using a specific pumping rate. For the remainder of the year, June 1 through September 30, the permit will maintain the present flow limit of 60 MGD, but will require that the permittee limit intake flow consistent with specific intake temperature ranges, as shown in Section 7.6.3 below and in the permit.

With regard to thermal discharge limits, the 1991 permit states that the difference between the river intake and the NCCW discharge, the delta T, cannot exceed 20°F, and the maximum temperature of the discharge (effluent) can not exceed 90°F. In order to accommodate the permittee's operational needs while achieving the intake flow reductions discussed above, the permit's delta T limit has been increased from 20 °F to 22 °F. In addition, the maximum effluent temperature and the delta T limits will now be expressed as hourly averages, instead of as instantaneous values. The new draft permit retains the effluent temperature limit of 90°F in the permit as a year-round limit. The influent temperature is measured in the pipe leading from the pump house approximately 80 feet from the outlet of the pumps. The effluent temperature is measured at the outlet from the condenser.

For the period of October 1 through May 31, in light of colder river water temperatures that allow for lower intake flows than the currently permitted 60 MGD, the permittee is limited to an effluent flow of 43.2 MGD. For the period from June 1 through September 30, the effluent flow limits are based on the highest hourly average intake temperature recorded for each calendar day. When this temperature is below 65°F, the flow limit will be a daily maximum of 43.2 MGD. When the intake temperature is between 65 and 70°F, the flow limit will be 50 MGD and when the temperature is 70°F or higher, the flow limit will be 60 MGD.

In consideration of the reduced seasonal flow limits, the permittee's September 1, 2006, submission requested both a delta T of 22°F and elimination of the permit's maximum temperature limits. Consistent with this request, and as stated above, the draft permit changes the delta T limit to 22 °F year-round to reflect the fact that the permittee will be reducing permitted flows through most of the year. Moreover, the permittee has indicated that WS is not operated above a delta T of 22°F because it would lead to efficiency and operational problems.

In response to the permittee's request that maximum effluent temperature limits be eliminated during the period from June through September, EPA reviewed the scientific literature regarding temperature sensitivities for a number of species that utilize the Saugus River. EPA looked at winter flounder, alewives and striped bass, as these species are known to be thermally sensitive and represent a range of life histories. Collette and Klein-MacPhee (2002, AR #18) reported that winter flounder juveniles experience significant mortality at 86°F. Otto et al. (1976, AR #19) detailed some acute toxicity in juvenile alewives at 90°F. In addition, Pardue (1983, AR #20) classifies water temperatures above 90°F as completely unsuitable habitat for juvenile alewives. Finally, Collette and Klein-MacPhee (AR #18) report the temperature range for juvenile striped bass as extending up to 90°F. In light of this review, EPA does not believe that a discharge temperature in excess of 90°F would be protective of the balanced indigenous population and that a maximum temperature limit is needed because intake water temperatures are high enough that relying exclusively on a delta T of 22 °F would result in discharge temperatures in excess of 90°F and, at times, well in excess of that level.

In addition, without a maximum temperature limit, the increased delta T limit would result in an increased thermal load to the river during times of higher intake water temperatures. As explained earlier, EPA concludes that any small, temporary instream temperature increases associated with the increase in permitted delta T and the change in temperature limits to hourly averages would be more than offset by the benefits of reduced intake flows and corresponding decreases in entrainment. However, during periods of time when intake temperatures are highest – for example, from June through September, intake water temperatures approach and occasionally exceed 80°F, *see* **Figure 6** – allowing higher maximum effluent temperatures as well as higher delta T could lead to more significant increases in thermal loadings to the river as the permittee would need to take in and discharge water at a rate of 60 MGD or higher. Furthermore, at those times, there would be no benefit of entrainment reductions because there would be no decrease in permitted flows.

The draft permit also includes thermal effluent monitoring requirements, which have been established to yield data representative of the discharges under the authority of Sections 308(a) and 402(a) of the Clean Water Act, and in accordance with regulations set forth at 40 CFR §§ 122.41(j), 122.44(i) and 122.48. The approved analytical procedures are to be found in 40 CFR 136 unless other procedures are explicitly required in the permit.

6.1.1.6 Antibacksliding Provisions Regarding Temperature Limits

As discussed above, the CWA's anti-backsliding provisions, set forth in Section 402(o) of the CWA and 40 C.F.R. §122.44(l), bar the relaxation of prior permit limits under certain circumstances. These antibacksliding prohibitions do not, however, apply to this permit. The CWA's antibacksliding bar on relaxing permit limits explicitly applies only to the renewal, reissuance, or modification of technology-based or water quality-based effluent limitations in NPDES permits, as opposed to the revision of permit limits that were based on a § 316(a) variance. Since the thermal discharge limits in the current WS permit were based on a CWA 316(a) variance, the anti-backsliding prohibitions do not apply to these limits.

Even if the anti-backsliding provisions were applied to revisions of permit limits based on § 316(a) variances, two exceptions to the anti-backsliding bar on relaxing permit limits would apply to the thermal discharge limits set forth in this permit. First, the regulations at 40 C.F.R. §122.44(l)(2)(i)(D) offer an exception to the anti-backsliding provisions for permits that have limits or conditions developed pursuant to CWA § 316(a), as is the case in this permit. Specifically, not only were the thermal discharge limits in the currently effective permit based on a § 316(a) variance, but the limits proposed in the new draft permit are also based on a new § 316(a) variance analysis.

Second, the regulations at 40 C.F.R. §122.44(l)(2)(i)(B)(1) provide an exception to the anti-backsliding provisions where information is available that was not available at the time of the earlier permit issuance that would have justified the application of a less stringent effluent limitation. The results of the temperature modeling at WS, coupled with consideration of new intake flow restrictions, represent new information that was not available at the time of the previous permit issuance. As explained above in the discussion of permit requirements under § 316(a), and based on the new modeling information, the proposed changes in permit limits related to thermal discharges will result in only minor, inconsequential changes in the facility's overall thermal discharge and, at the same time, will allow for significantly reduced intake flow that will result in significantly reduced impingement and entrainment.

8. Part I.D.3.b. of the Final Permit has eliminated the requirement that the permittee sample impingement using ¾-inch stainless steel baskets placed in the screenwash return sluiceway. Instead, the language in the Final Permit has been changed to require the permittee to collect aquatic organisms passing through the fish return system without specifying a particular method.

9. Part I.D.3.e. of the Final Permit has been revised to require that the total number of impinged fish shall be derived from an extrapolation of observed counts. (C4)

10. Parts I.D.2.a. and I.D.3.a. have added the following language regarding the biological monitoring program "Samples shall not be taken during consecutive periods of the diurnal cycle or on consecutive days." This language was added to these Parts in order to prevent the permittee from completing sampling on a single day. EPA and MassDEP believe that spreading this sampling out over several days or a week would yield more representative results.

A) Comments submitted by Wheelabrator Saugus:

General Comment: The Draft permit includes an absolute discharge temperature of 90 °F for outfall 001. Allowing higher absolute discharge temperatures while maintaining a 22 °F Facility temperature rise (delta T) was the approach that we had proposed to maintain de-minimis thermal impacts which continue to protect the Balanced Indigenous Populations (BIP) and reduce impingement and entrainment impacts by reducing flow as much as possible without significantly impacting plant operations.

Our facility is obligated by contracts with municipalities and others to receive and process MSW (our fuel) regardless of weather conditions. As we have indicated in previous correspondence, in warm weather conditions, historically in July and August, when intake temperatures reach the high 70s(°F) and low 80s(°F) we have had to drop load and vent steam to avoid exceeding the 90 °F absolute discharge limit. This has resulted in significant wasted energy over the years. Wheelabrator has requested the increase to prevent the need to waste energy in the future, especially in the summer when power demand is typically higher.

During the permit renewal process, we recommended and conducted thermal modeling of an approach that addresses this issue as well as addressing concerns about entrainment and impingement, particularly in the late winter and spring when fish eggs and larvae are most abundant. The approach included:

> Use of a variable frequency drive (VFD) on one of the pumps to allow turndown during cold water months (essentially October through May) and thereby achieving significant impingement and entrainment reduction especially in the months when eggs and larvae have been determined to be most abundant (March through May).

Use of the VFD on warm days to increase flow as required for operations during warmer periods (typically ebb tide to low tide) and operate at lower flow during relatively cooler periods (typically flood tide through high tide) while always staying within our Daily Maximum 60 MGD flow limit.

Request to eliminate, or increase the absolute discharge temperature limit above 90°F to 95 °F to allow lower flow for longer periods in the warm weather months while allowing the plant to operate at full load, and produce electricity from a renewable source during periods of high demand. Operating with lower cooling water flows for longer periods of time will further decrease potential impingement and entrainment impacts. Modeling analysis provided to EPA in presentations and in our December 15, 2005 report on modeling results (Scenario 6) has shown no meaningful or significant difference between scenarios with and without the 90°F discharge temperature limit.

The Draft Permit includes some, but not other, pieces of our proposal. We are concerned that by not taking the pieces together, as proposed, that the targeted benefits will not be achieved and our operations will be significantly impacted without providing additional environmental benefit.

Response to General Comment: Wheelabrator comments that the Draft Permit's maximum temperature limit (Max-T) of 90°F should either be replaced with a limit of 95°F (or higher) or be eliminated. In support of this comment, the company states that Wheelabrator Station is obligated by contract to receive and process municipal solid waste (MSW) "regardless of weather conditions." Further, the company expresses concern that the facility has at times in the past had to "drop load and vent steam" in July and August, when intake temperatures peak, in order to avoid violating the permit's maximum temperature (Max-T) limit of 90°F. Wheelabrator explains that it had proposed that the permit require reduced intake flow (to achieve entrainment and impingement reductions) but allow an attendant increase in the permit's temperature change (Delta-T) and Max-T limits (in order to avoid restricting electrical generation and in light of the company's view that increased discharge temperatures would not harm aquatic organisms).

While EPA and MassDEP have agreed to certain of the permit changes requested by Wheelabrator – notably, an increase in the Delta-T limit from 20°F to 22°F and a shift from assessing compliance based on instantaneous temperature values to using hourly averages – the agencies do not agree that the permit's current Max-T limit of 90°F should be eliminated or replaced with a limit of 95°F or higher. The reasons for the agencies' determination in this regard are set forth below.

With regard to Wheelabrator's reference to its contractual obligations, the agencies point out only that the company is, of course, obligated to comply with its NPDES permit limits. It is apparent that the company understands this given its statement that it has on occasion in the past dropped load in July and August to avoid violating its Max-T limit. The facility's original owners chose to locate the power plant on the Saugus River, a water of both the United States and the Commonwealth of Massachusetts, and a part of the Rumney Marshes Area of Critical Environmental Concern (ACEC), as later designated by the Commonwealth. Wheelabrator Station uses the river both as a source of water for cooling and as a receptacle for the facility's waste heat (and certain other pollutants). The Saugus River is an important public natural resource and Wheelabrator Station's uses of the river are subject to the requirements of the Clean Water Act (and other laws) designed to protect the Nation's waters and the organisms that inhabit them. Whether or not Wheelabrator ultimately chooses to comply with its permit limits by occasionally dropping load and venting steam, or some other method, has no bearing on the derivation of the thermal discharge limits needed to protect the river consistent with legal requirements.[1]

Wheelabrator Station's cooling system can adversely affect the Saugus River ecosystem in two primary ways. First, the facility's withdrawal of river water for cooling causes the entrainment and impingement of aquatic organisms. Second, its discharge of waste heat can raise ambient water temperatures in the river. EPA and MassDEP appreciate that Wheelabrator has explored and proposed certain changes in operation that will benefit the ecology of the Saugus River. Specifically, Wheelabrator proposes operating at lower cooling water intake flows, which will reduce current levels of entrainment and impingement. Accordingly, the new permit's limits reflect sizable reductions in flow for a large percentage of the year, and these more stringent flow limits can be achieved by operational changes using the recently installed VFDs. At the same time, however, handling the same amount of waste heat with a lower volume of cooling water produces a corresponding increase in the maximum temperature of the thermal discharge.

EPA and MassDEP must consider both sides of the equation. Weighing the environmental benefits of reducing intake flow against the drawbacks of increasing discharge temperature is a delicate balancing act. As detailed below, the agencies conclude that, for the most part, the ecological benefit of the entrainment and impingement reductions associated with reduced cooling water intake flows will more than offset the risk of harm from the resulting increase in discharge temperatures. This conclusion does not, however, extend so far as to support eliminating the permit's Max-T limit of 90°F and replacing it with a limit of 95°F (or higher) or no limit at all. Without the 90°F Max-T limit, the increased risk of adverse thermal discharge effects would threaten the protection and propagation of the Saugus River's balanced, indigenous population of fish. Moreover, this increased risk would not be offset by the marginal additional entrainment and impingement reductions that would be associated with the marginal additional intake flow reductions that would be facilitated by a higher thermal discharge limit.

Wheelabrator's comment expresses concern that load shedding could potentially be required in July and August to meet the Max-T limit of 90°F. EPA's review of ambient water temperature collected at the intake by Wheelabrator from 1997-2003 (Figure 6 in the Fact Sheet) confirms that July and August is the time of year, on average, when the

[1] While energy is lost when load is dropped and steam vented, energy is also lost when waste heat is discharged to the Saugus River. Maximizing plant efficiency and finding productive uses for the facility's waste heat would help to limit these energy losses.

discharge limit of 90°F could occasionally require Wheelabrator to curtail generation of electricity. (Obviously, in a cool summer, the quantity of time that generation might need to be curtailed would be less, and in a warm year it would be more.)

Nevertheless, EPA's biological analysis indicates that discharge temperatures above 90°F in July and August would be ecologically damaging. Permit limits for Wheelabrator Station's thermal discharge are being set under a CWA § 316(a) variance from otherwise applicable technology-based and water quality-based standards. As such, these limits must assure the protection and propagation of the balanced, indigenous population of fish, shellfish and wildlife (BIP) in and on the Saugus River. EPA's initial review of the species expected to be present in the Saugus River and their temperature sensitivities, *see* Fact Sheet at 17, suggested that, taking into account the limited temporal exposure to the thermal plume that organisms would likely experience due to the dynamic flushing of the Saugus River, water temperatures in the mid-80s to 90° F would serve as a maximum temperature threshold for multiple species (*e.g.*, winter flounder, alewives and striped bass). The scientific literature suggests that water temperatures as low as the mid-80s (F) could cause these species to suffer effects ranging from mortality, to reduced habitat suitability, to forced habitat avoidance and possibly other sublethal effects. Alewife population numbers are dramatically reduced throughout Massachusetts, resulting in the state closing both the commercial and recreational fishery for the species. Moreover, winter flounder populations have significantly deteriorated regionally, which has resulted in the National Oceanic and Atmospheric Administration (NOAA) severely restricting fishing for the species. Striped bass are a popular recreational species that generates millions of dollars of revenue per year in Massachusetts. As a result, the agencies have heightened concerns over the potential for Wheelabrator Station's cooling system to harm these species within the Saugus River.

Based on data from neighboring river systems (Charles River), and in the opinion of the state of Massachusetts anadromous fish biologist (Phillips Brady, MADMF), July through October/November would most likely be the period of juvenile alewife outmigration in the Saugus River. Juvenile winter flounder and striped bass would also certainly be present in the Saugus River during that time frame.

Additional literature review on alewives in particular, suggests that temperatures in the mid-80s to 90° F can trigger sublethal impacts and mortality within relatively short exposure times. Otto et al. (1976), Administrative Record Item (AR) #88, observed that (i) 50% of juvenile alewives acclimated to 18-20°C (64.4-68°F) and later exposed to 31°C (87.8°F) died in about an hour or less (actually, 70 minutes or less); and that (ii) 50% of juvenile alewives acclimated to 24-26°C (75.2-78.8°F) and later exposed to 33°C (91.4°F) died within 76 minutes or less. Coutant (1972), AR #89 has shown that one can arrive at an approximate NOAEL (no observed acute effect level) in thermal tests for some fish by subtracting 2° (3.6°F) from the TL50 (the temperature lethal to 50% of the test organisms). NOAELs in the two tests cited above from Otto et al. (1976) appear to be 2.5-3°C below the approximate TL50 and generally support the Coutant figure. Based on the Coutant estimate, we would expect the NOAEL from this particular exposure scenario to be about 84.2°F (29°C) to 87.8°F (31°C). The agency selected these particular values from the Otto et al. (1976) to help (roughly) estimate juvenile survival rates after about an hour of exposure time and these were a reasonably close fit.

The agency realizes that it is not possible to accurately predict acclimation temperature or exposure time for juvenile alewives in the lower Saugus River, and that we cannot be certain how closely the critical temperatures identified in either laboratory studies or *in situ* studies from other locations would be mirrored in the Saugus River. Nevertheless, the data from Otto et al. (1976) suggest that significant mortality (and/or sublethal effects) to juvenile alewives could occur at temperatures in the mid-80s to low 90s°F within exposure times (around 60 minutes) that could be experienced around the low slack tide in that system given the range of water temperatures that exist upstream of the Rt. 107 Bridge in the summertime. The Fact Sheet, at 17, also discusses scientific literature indicating that water with temperatures above 90°F (and in some cases as low as 86°F) could result in acute toxicity for juvenile winter flounder, juvenile striped bass and juvenile alewives.

Thermal modeling of the discharge plume predicts that the period of slack low tide is the period of time with the least amount of mixing and dilution. Dispersion of the facility's thermal discharge due to tidal currents is also at its minimum at slack tide. This combination of factors is expected to occur twice a day for a period of roughly one hour each time. During these periods, Wheelabrator Station's thermal plume drives water temperatures across and throughout virtually the entire water column. This is of greatest concern during the summer months from July through September, when ambient water temperatures are at their maximum and thermal discharges could cause river temperatures to approach or exceed the range determined to be protective of the BIP.

In General Comment (A) the permittee maintains that "operating at lower flows for longer periods of time will further decrease potential impingement and entrainment impacts." EPA agrees that lower flows result in reduced impingement and entrainment impacts. In general, reduced impingement and entrainment losses would be beneficial to the Saugus River. However, during the summer, EPA believes that the potential negative impacts from a higher absolute discharge temperature outweigh the potential incremental benefits of the reduced flow. In the Draft Permit, EPA increased the Delta-T limit and introduced an hourly average (as opposed to instantaneous) maximum daily temperature limit to allow the facility to reduce flows between October 1 and May 31, resulting in at least a 28% reduction in impingement and entrainment. Low intake water temperatures during these months allow the permittee to reduce intake flows and increase the Delta-T of its discharge while remaining below the Max-T limit of 90°F and ensuring protection of the BIP. Under these conditions, the amount of heat (as measured in British thermal units (BTUs)) discharged remains essentially the same; although the water is somewhat warmer, a smaller volume is discharged. When intake temperatures exceed 65°F, however, the facility must increase its intake flows to compensate for the loss of cooling capacity in the water [See Figure 5 in the 2008 308 Response, AR #3]. Indeed, when intake temperatures reach the high 70s to 80°F, which can occur periodically in August (See ASA 2004, AR #4, Figure 2.8a and b), intake flows may need to reach as high as 50,000 to 55,000 gallons per minute (gpm), which would require the facility to discharge at or approaching the maximum permitted volume of 60 MGD. Thus, under such conditions, cooling water intake volumes would not be significantly reduced even if the Max-T limit was increased above 90°F. As a result, during these periods, raising the Max-T limit would result in increased thermal loading (i.e., more BTUs) to the river without significantly reduced entrainment and impingement.

In other words, while the permittee will likely be able to reduce cooling water withdrawal volumes during the cooler months (i.e., October through May, and most likely all or part of June and September), operational limitations associated with higher intake temperatures will likely preclude such reductions during the hottest summer months (i.e., July and August) (*see* March 2008 308 Response, AR #3, Section 6.4, page 2). Thus, increasing the maximum daily discharge temperature to 95°F at times when ambient river temperature is high, and intake flows are approaching or equal to 60 MGD, would result in increased heat load to the river at a time when river conditions are approaching the limits of thermal tolerance for several fish species. Retaining the maximum daily discharge limit of 90°F will protect the BIP during the hottest summer months by preventing the facility from adding even more heat to the system than is currently permitted. While EPA and MassDEP recognize that retaining the Max-T limit of 90° F may keep Wheelabrator Station from reducing its water withdrawal volumes at certain times – most likely to occur on some number of days in June and September -- and that this will result in marginally greater entrainment and impingement, the agencies have concluded, in light of our review of the scientific literature on thermal effects, that it is more important in this case to prevent the effects that could result from discharges above 90°F.

The permittee maintains that the modeling results show "no meaningful or significant difference with or without the 90°F discharge temperature limit." For the most part, EPA agrees with this assessment. The model appears to predict average water temperatures over entire tidal cycles with reasonable accuracy and is useful in predicting the impacts of a small Delta-T increase with reduced flows. At the same time, however, a comparison of modeled and observed temperatures indicates that at stations in the vicinity of the GE discharge and upstream of the Wheelabrator discharge, the model is not accurately predicting peak temperatures around low slack tide. In some cases, observed temperatures near the low slack period were 5-7°C (9-12.6°F) higher than the model's predicted value (See ASA 2004, AR #4, Figures 5.2-5.10). The differences between observed and modeled temperatures suggest that the model may not accurately predict the impact of a 95°F discharge at 60 MGD during low slack tide in August, which is a serious concern for EPA and MassDEP given that this time period reflects the highest natural river temperatures and the least mixing and dilution, and is the time when thermal impacts to alewife, winter flounder, and striped bass juveniles are most likely to occur. Indeed, the occurrence of very high temperatures in localized areas (i.e., near the thermal discharges) during low slack tide is one of EPA's chief concerns with regard to assuring the protection and propagation of the BIP.

In light of the above considerations, EPA and MassDEP also considered imposing a maximum discharge temperature limit even lower than 90°F. The agencies currently conclude, however, that the more conservative approach of a lower discharge temperature is not necessary at this time. This conclusion is based on the limited temporal and spatial extent of the thermal plume at temperatures above levels of concern for resident and anadromous species in light of the dynamic flushing provided by the Saugus River. After issuance of the new permit, the agencies anticipate additional evaluation of the actual behavior of the thermal plume in the Saugus River at periods of low slack tide in the summer (and during other periods) to further characterize the water temperatures that will result during that segment of the tidal cycle.

As stated above, this discharge is being regulated under 316(a) of the Clean Water Act. As such, the discharge limits must assure the protection and propagation of the BIP. In light of the above analysis, EPA and MassDEP find that a permit with a Max-T limit of 95°F (or higher), or without any Max-T limit at all, would under certain conditions raise river temperatures to levels that would pose a risk of significant adverse thermal impacts to at least 3 important resident species in the Saugus River – namely, alewives, winter flounder and striped bass – and would as a result not reasonably assure the protection and propagation of the BIP as required by § 316(a). Moreover, EPA and MassDEP must also consider the possible cumulative effect of the Wheelabrator Station thermal discharge when coupled with the thermal discharge from the nearby General Electric facility. *See* 40 C.F.R. §§ 125.73(a) and (c)(1)(i).

Conversely, for the reasons stated above, with a maximum discharge temperature of 90°F, EPA and MassDEP find that the risk of adverse thermal impacts would be sufficiently reduced to provide reasonable assurance of the protection and propagation of the BIP. Although EPA and MassDEP have decided to grant the company's request to increase the Delta-T limit from 20°F to 22°F, and to base compliance on hourly average temperatures rather than instantaneous temperatures, the agencies have also decided to reject Wheelabrator's request to raise or eliminate the maximum temperature limit. As a result, the overall thermal load (as measured in BTUs) to the Saugus River from Wheelabrator Station's discharge will not appreciably increase because despite the increased Delta-T, the cooling water flow volume will be reduced for much of the year and the 90°F maximum temperature limit will be retained.

While the permit's thermal discharge limits are based on a CWA § 316(a) variance, rather than state water quality standards, the regulatory agencies also note that under the Massachusetts Surface Water Quality Standards (SWQS), 314 CMR Part 4.00, the Saugus River is designated as a Outstanding Resource Water (ORW) due to its designation by the state as an Area of Critical Environmental Concern (ACEC). ORWs receive a high level of protection under the state's SWQS. For example, new or increased discharges of pollutants to an ORW are prohibited unless they are determined to be for the express purpose of enhancing the resource for its designated uses. *See* 314 CMR 4.04(3).

In connection with the Rumney Marshes ACEC designation, the US Fish and Wildlife Service (USF&WS) characterized the area as "one of the most biologically significant estuaries in Massachusetts north of Boston." USF&WS commented on the proposed ACEC designation as follows:

> "Nearly 70 percent of all commercial fish and shellfish resources are dependent on estuaries for spawning and nursery grounds. Winter flounder, alewife, smelt, blueback herring, and American eel are a few of the more common finfish that occur within the nominated estuarine ecosystems.... Intertidal habitats ... support a wide variety of invertebrate resources. These include soft shelled and razor clams, mussels, snails, marine worms, and other invertebrates that are integral components of the marine food chain. Although many of the shellfish beds are too contaminated for human consumption, they represent an important food source for wildlife, attracting large numbers of wintering waterfowl to the area annually."

In the ACEC designation document for this area, the Massachusetts Secretary of Environmental Affairs found that the:

> . . . list of bird species, migratory or indigenous, is extraordinary. The Massachusetts Natural Heritage and Endangered Species Program has commented that the area contains at least 5 species listed by the Division of Fisheries and Wildlife as Endangered, Threatened, or a Species of Special Concern. Despite its proximity to the intense development of the area, there is little doubt of the productivity of the designated area. ... Given its close proximity to a major metropolitan center with a population in excess of one million, this relatively undisturbed estuary and marsh complex is indeed unique...this relatively large tract of marshland habitat, situated in an area subject to intense development pressure, provides the resource base necessary to maintain the diversity and productivity of an ecosystem which must, despite stringent regulation, accommodate the cumulative impacts arising from this development. While there may be smaller parcels of marshland which dot the urban landscape, the inventory of larger marshes capable of supporting these vital resources is dwindling and must be preserved.

Relative to the importance of this area, the Secretary further stated:

> I also hereby find that the coastal wetland resource areas included in the Rumney Marshes ACEC, the title taken from the name used during the colonial era to identify the marshes and lowlands of this region, are significant to flood control, the prevention of storm damage, the protection of land containing shellfish, and fisheries; the prevention of pollution, the protection of wildlife habitat, the protection of public and private water supplies; public interests defined in the Wetlands Protection Act (MGL c. 131, s. 40; 310 CMR 10.00).[2]

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[2] See "Designation of Portions of the Cities of Boston, Lynn, and Revere, and the Towns of Saugus and Winthrop as the Rumney Marshes Area of Critical Environmental Concern with Supporting Findings", dated 22 August 1988.

It is noteworthy that the Secretary identified "the protection of land containing shellfish, and fisheries; the prevention of pollution, [and] the protection of wildlife habitat" as issues of importance in the ACEC designation. These issues, as they pertain to the Lower Saugus River, particularly in view of its status as an ORW resource, would likewise necessitate protection under the SWQS.

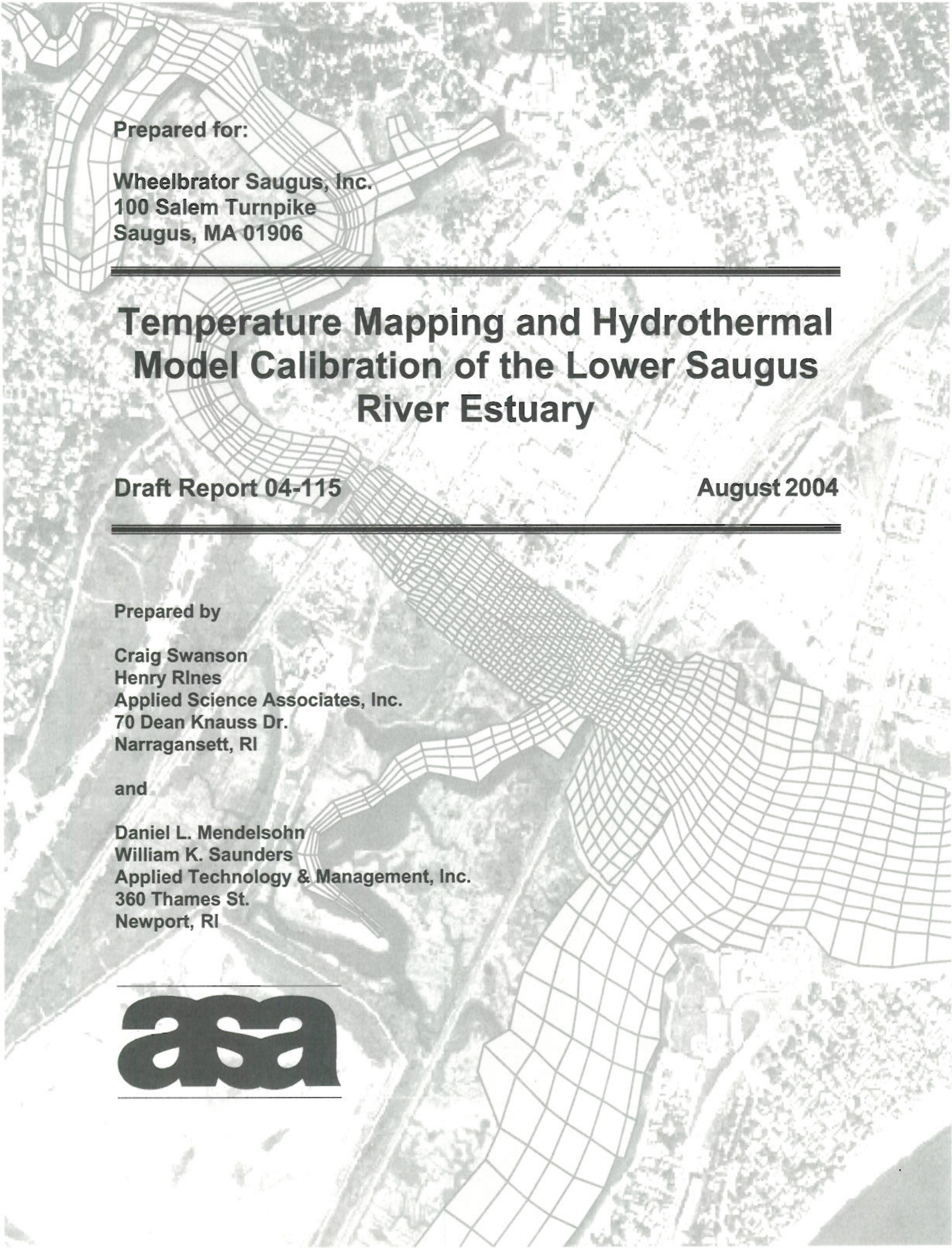
The agencies have concluded that an increase in Wheelabrator's maximum allowable discharge temperature would allow an increase in the discharge of heat, a pollutant, to the lower Saugus River. In addition, this additional discharge of heat is neither proposed for the express purpose and intent of maintaining or enhancing the resource for its designated uses (i.e., "habitat for fish, other aquatic life and wildlife, including for their reproduction, migration, growth and other critical functions, and for primary and secondary contact recreation habitat for aquatic life", among other uses, *see* 314 CMR 4.05 (4)(b)), nor would it constitute such an enhancement. *See* 314 CMR 4.04(3)(b)(1). As a result, an increase in Wheelabrator Station's discharge of heat to the lower Saugus River would be inconsistent with the intent of the anti-degradation requirements of the Massachusetts SWQS, which require the maintenance and protection of the quality of ORWs. While other Wheelabrator comments (*see* Comments A15, A16 and A19 below) ask whether a mixing zone could be provided under the state water quality standards to authorize exceedances of state water quality criteria for temperature within the zone, MassDEP has determined that, independent of a 316(a) analysis, the proposed discharge will not meet the state's Mixing Zone Policy guidance under the circumstances of this case. (*See* Response A16 below; *see also* Response A15 and A19 below.)

Comment A1: Revise Effluent Temperature from 90 °F to 95 °F

The effluent absolute temperature limit of 90 °F does not represent a threshold of significance of impact from the thermal discharge in the river and does not allow the full entrainment/impingement withdrawal reduction benefit of the VFD. A higher absolute temperature would delay the need to increase flow (and would reduce entrainment and impingement during those periods). We have demonstrated with the modeling of Scenario 6 in the December, 2005 submittal that the thermal impacts to the river are not significant using scenarios with no absolute discharge temperature and therefore we feel very strongly that this condition:

- does not provide the available benefit to the environment of the Saugus River either with regard to impingement or entrainment, nor does it materially reduce thermal impacts;
- does not provide benefit to the environment as a whole, since when the absolute discharge temperature limit is approached, steam is vented and fuel is wasted in our plant and additional fuel must be combusted elsewhere to generate electricity (high temperature days correspond with increased electrical demand). Overall air emissions regionally therefore increase.

The absolute discharge temperature limit is presumed to be a consideration in the Mass DEP Water Quality Standards aspects of the Permit, which has not yet been available for



Prepared for:

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Temperature Mapping and Hydrothermal Model Calibration of the Lower Saugus River Estuary

Draft Report 04-115

August 2004

Prepared by

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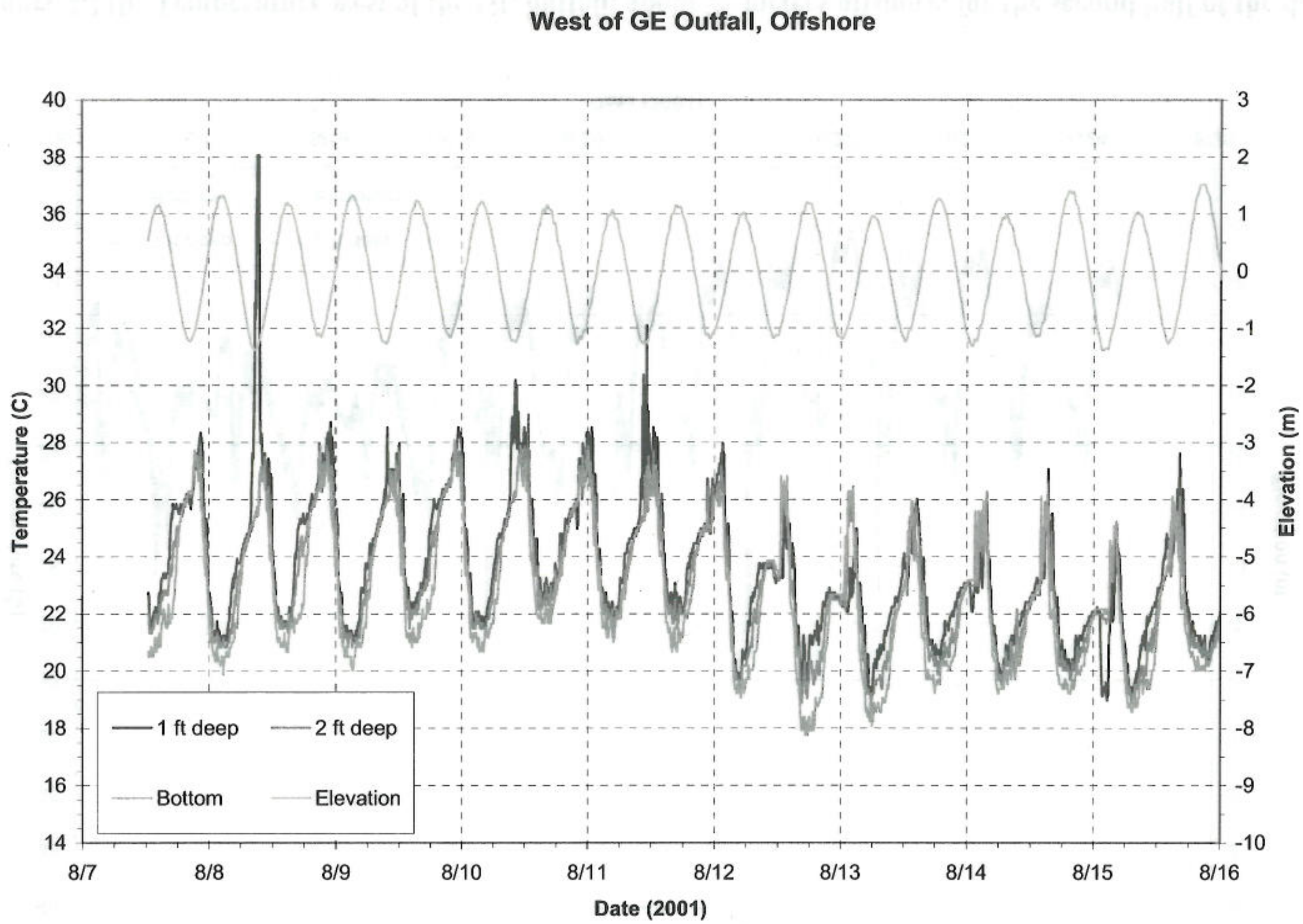

Figure 2.11a Temperature west of the GE outfall, about 25 meters offshore, for the first half of the deployment.

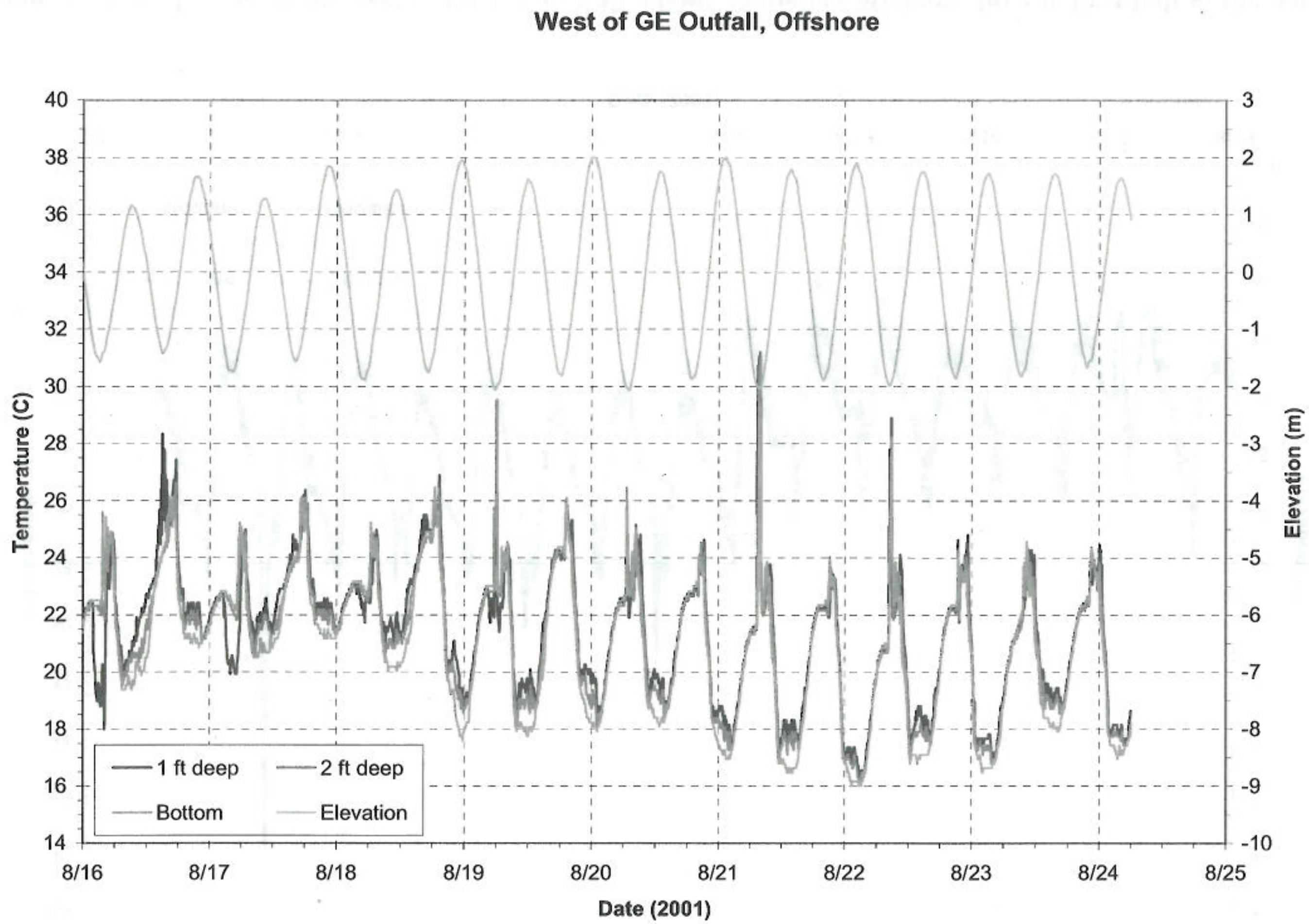

Figure 2.11b Temperature west of the GE outfall, about 25 meters offshore, for the second half of the deployment.

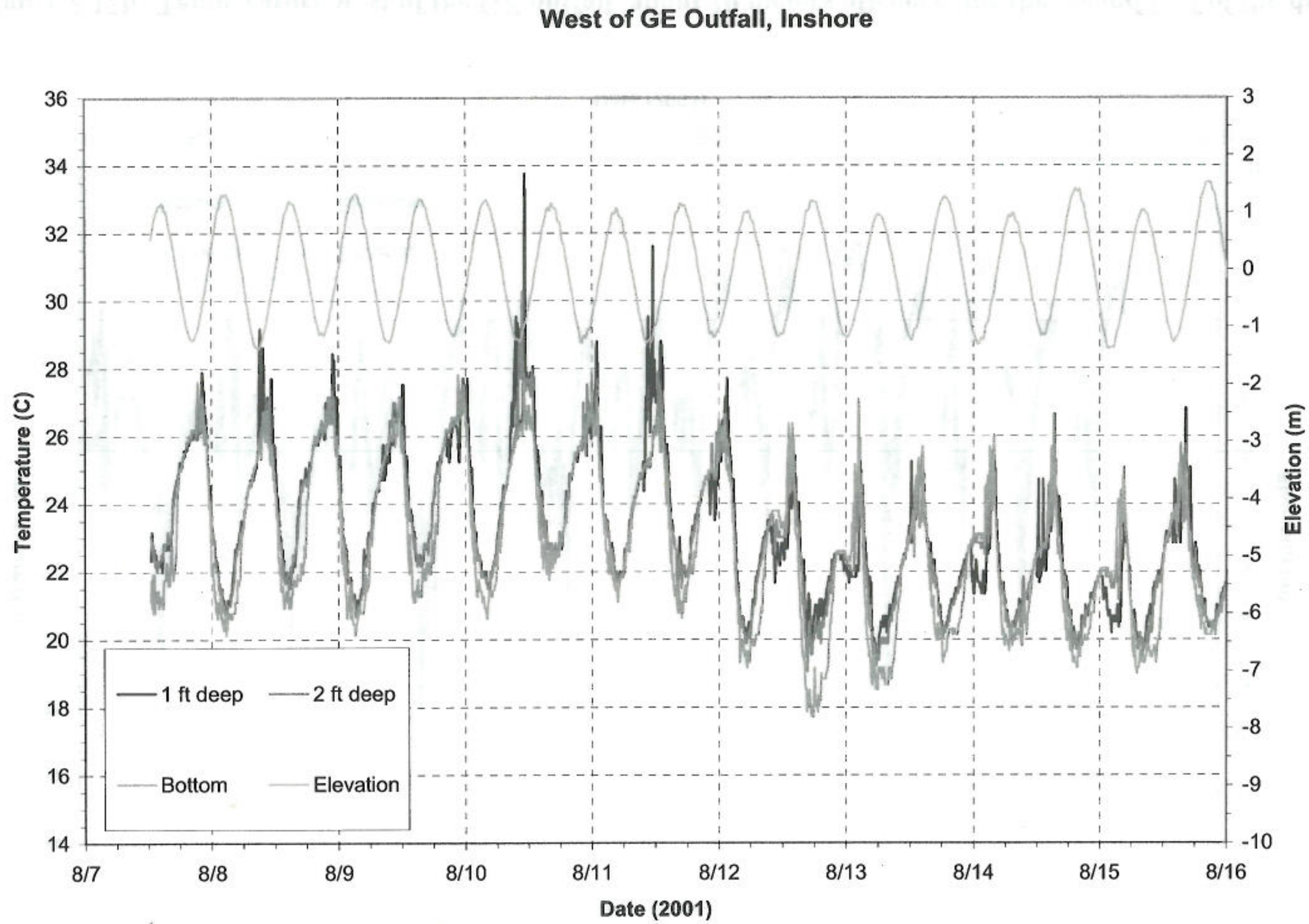

Figure 2.12a Temperature west of the GE outfall, about 10 meters offshore, for the first half of the deployment.

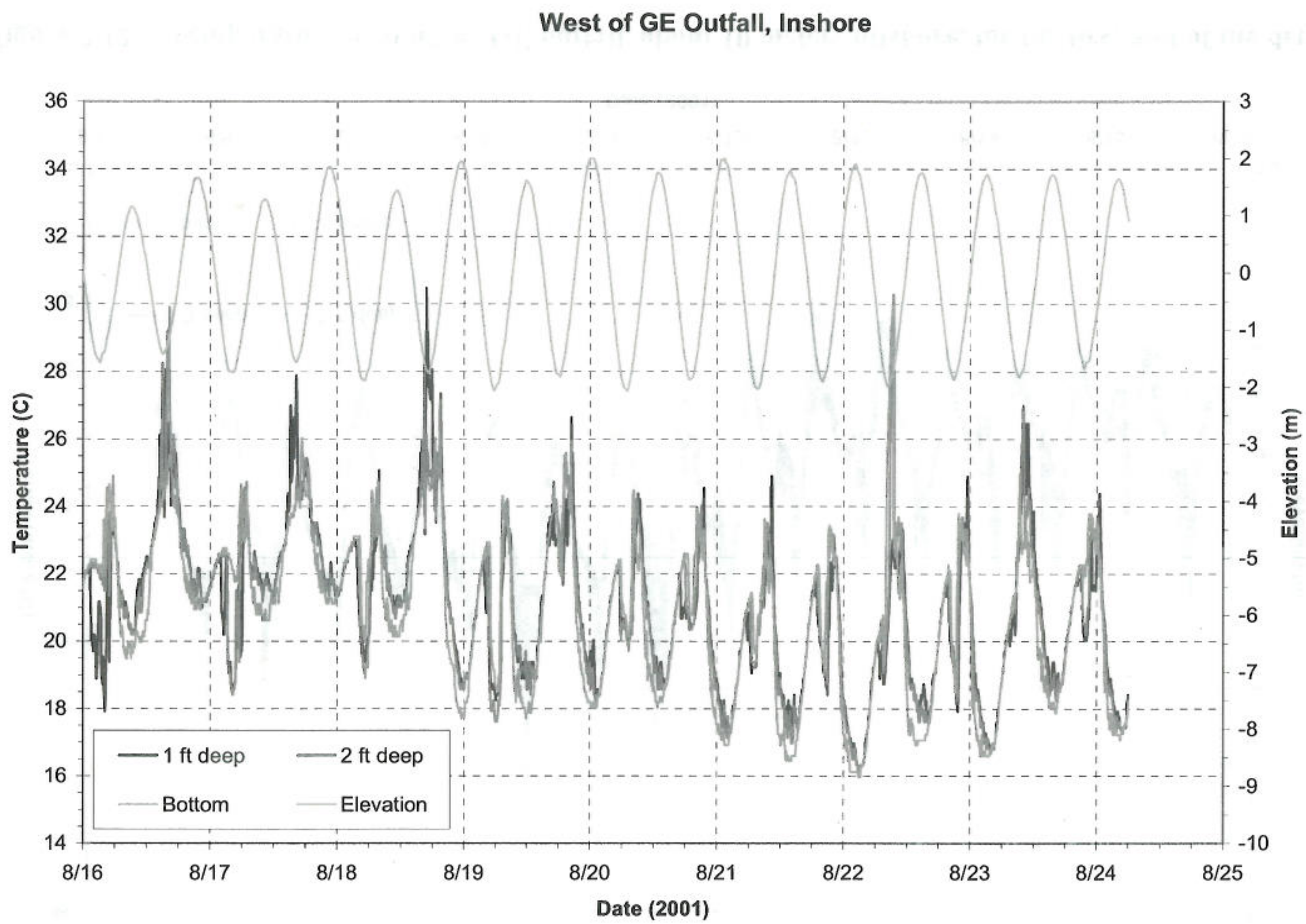

Figure 2.12b Temperature west of the GE outfall, about 10 meters offshore, for the second half of the deployment.

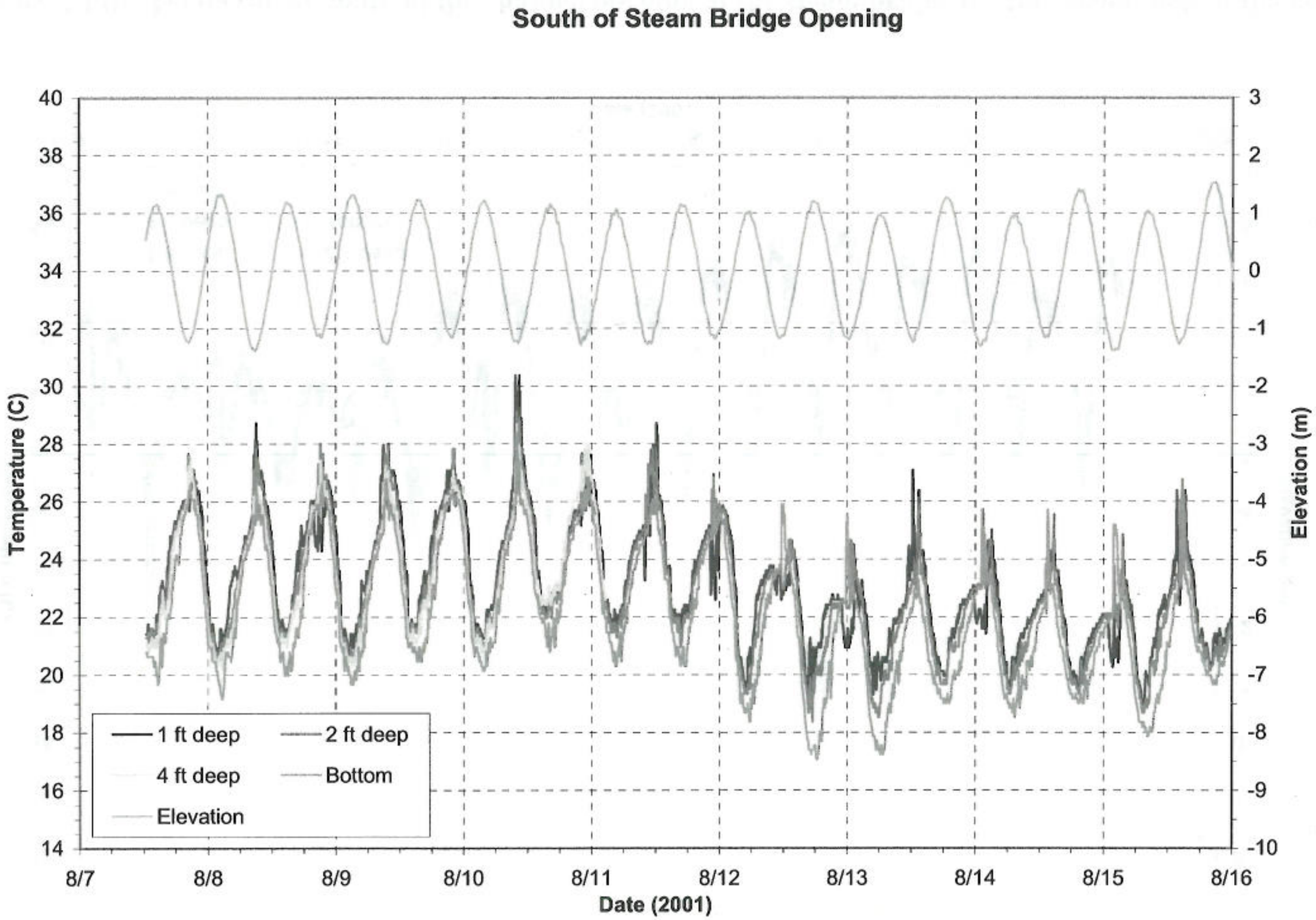

Figure 2.13a Temperature south of the channel opening at the steam bridge for the first half of the deployment.

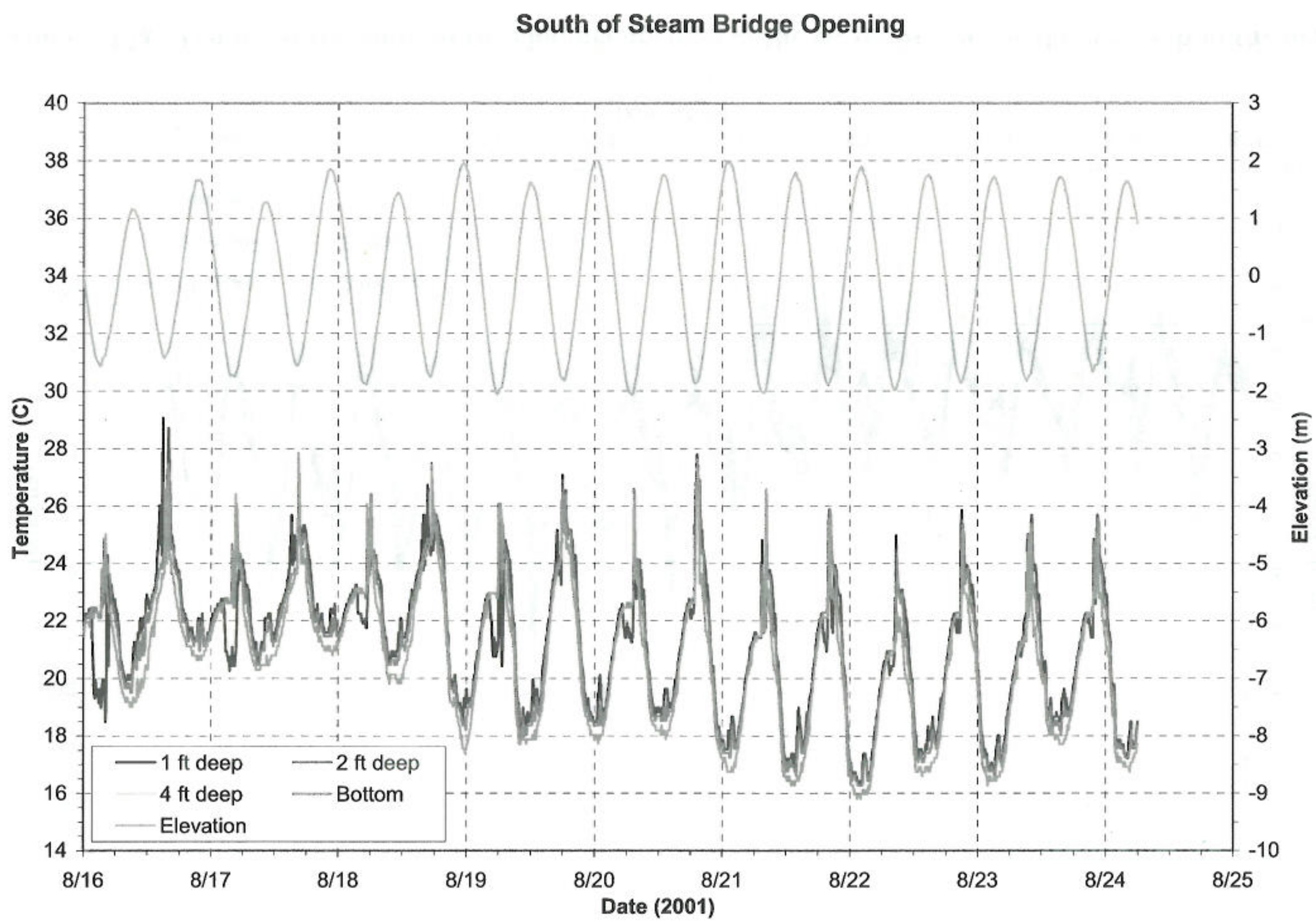

Figure 2.13b Temperature south of the channel opening at the steam bridge for the second half of the deployment.

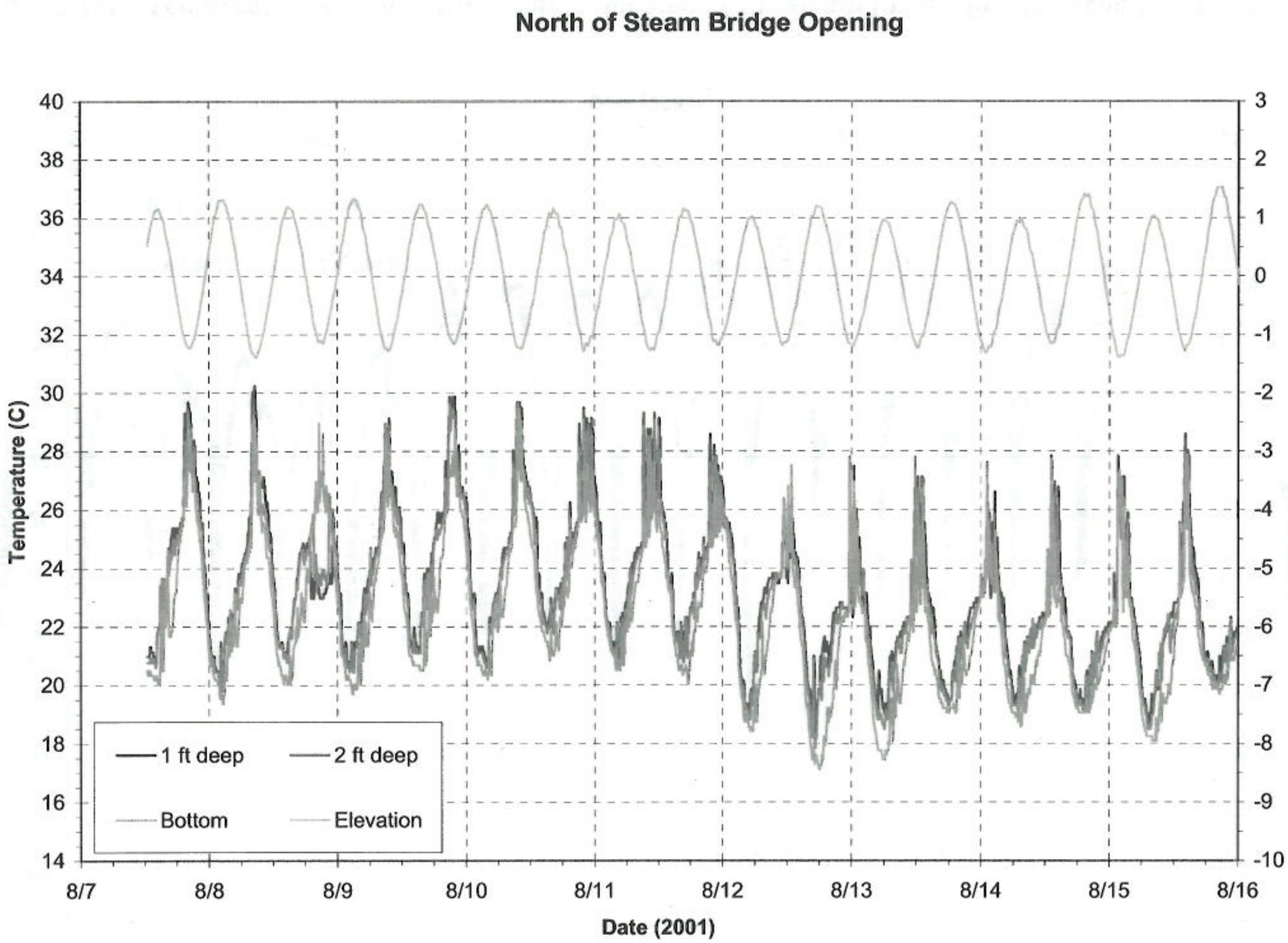

Figure 2.14a Temperature north of the channel opening at the steam bridge for the first half of the deployment.

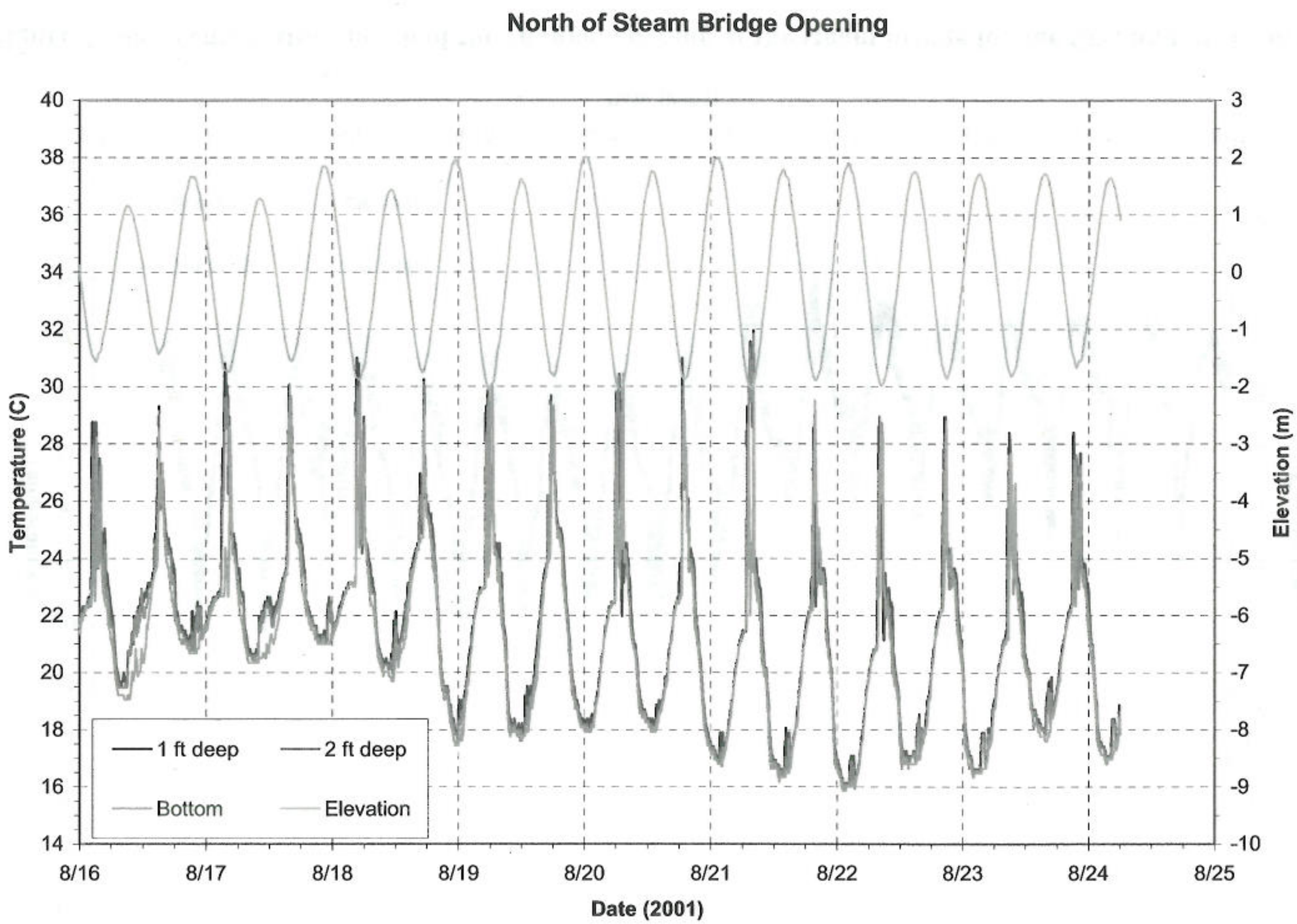

Figure 2.14b Temperature north of the channel opening at the steam bridge for the second half of the deployment.

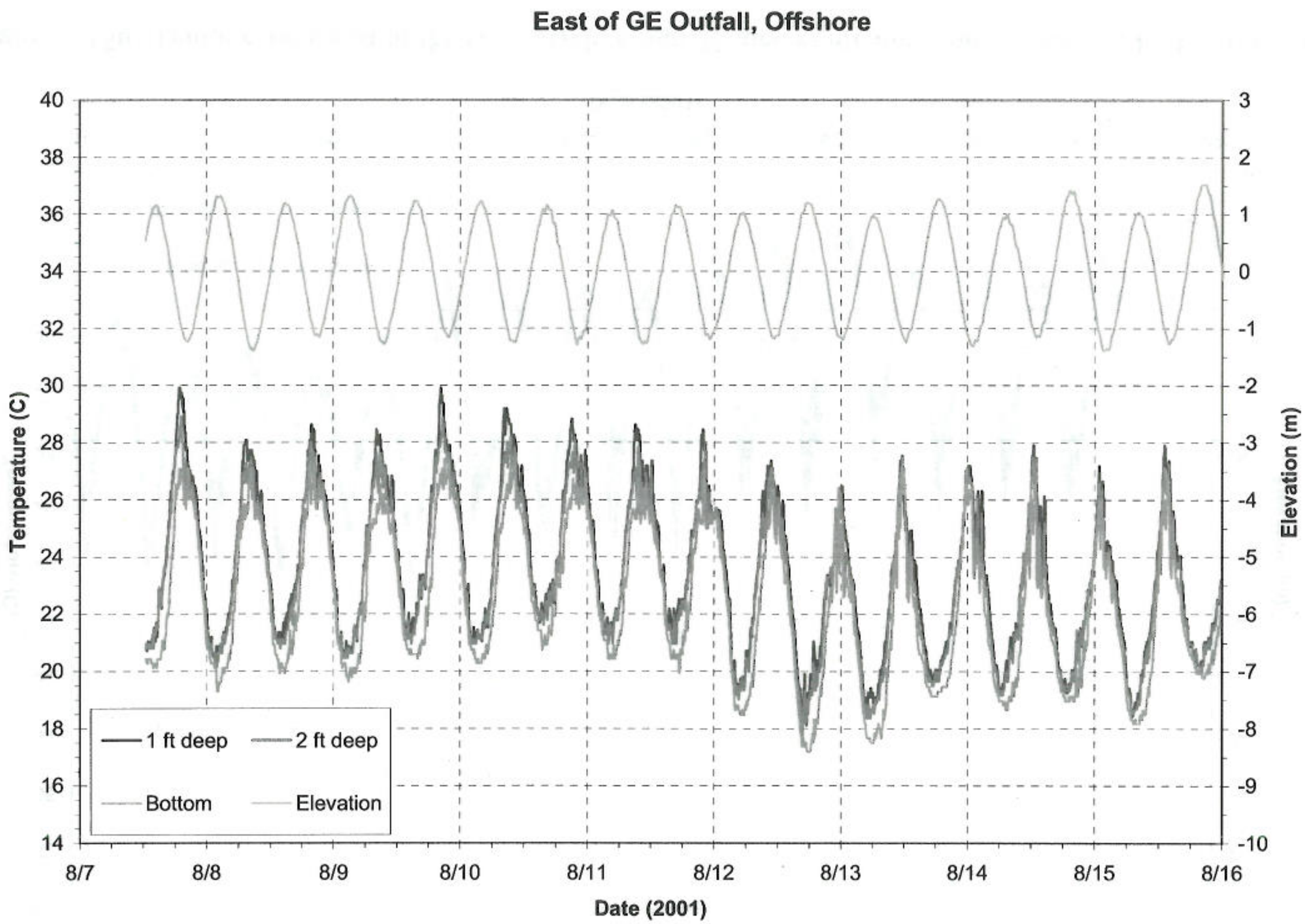

Figure 2.15a Temperature east of the GE outfall, about 25 meters offshore, for the first half of the deployment.

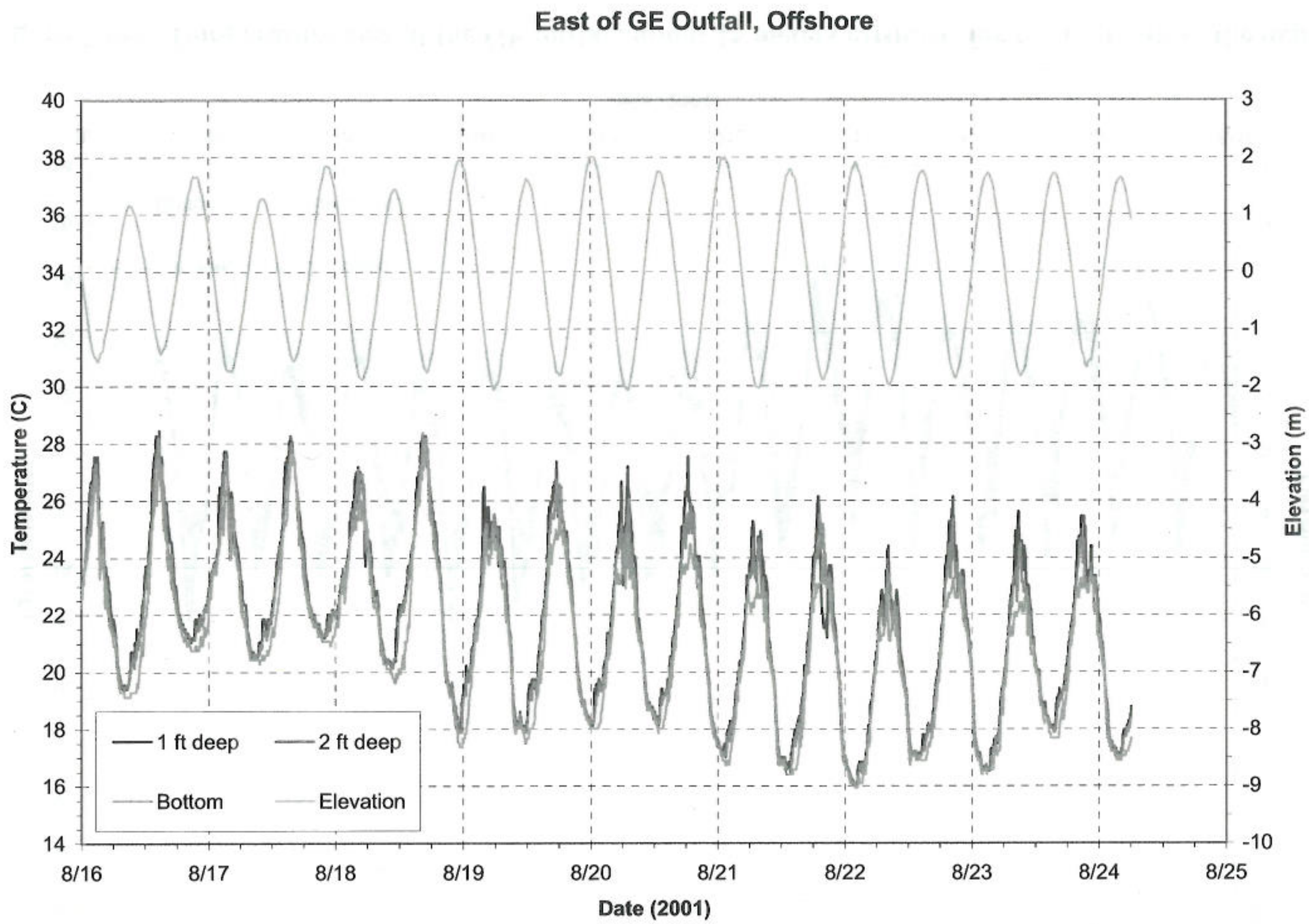

Figure 2.15b Temperature east of the GE outfall, about 25 meters offshore, for the second half of the deployment.

Response to Comments on Draft National Pollutant Discharge Elimination System (NPDES) Permit No. MA0003905 - General Electric Aviation (GE)

Introduction

In accordance with the provisions of 40 C.F.R. §124.17, this document presents EPA's and the Massachusetts Department of Environmental Protection's (MassDEP)[1] responses to public comments received on the Draft NPDES Permit (MA0003905) for General Electric Aviation's facility in Lynn, Massachusetts (GE). This response to comments (RTC) document not only provides responses public comments, but it also explains and supports the EPA and MassDEP determinations that underlie the Final Permit.

The public comment period on the GE Draft Permit began February 2, 2011, and was scheduled to end on March 3, 2011. At GE's request, EPA extended the comment period by 90 days so that it ended on June 1, 2011. Comments on the Draft Permit were submitted to EPA by GE, MassDEP, and the National Marine Fisheries Service (NMFS) of the National Oceanic and Atmospheric Administration (NOAA). EPA also received comments from the Saugus River Watershed Council (SRWC) after the close of the extended public comment period. Responses to late-submitted comments are not required, but EPA reviewed and considered these comments and notes that they mainly supported the Draft Permit's effluent limitations, monitoring requirements, and best management practices (BMPs).

EPA's evaluation of the issues has benefited from the comments and new information submitted to the Agency. EPA has carefully considered these submissions and in some cases they have prompted EPA to undertake additional analysis in response. While the Final Permit largely takes the same fundamental approach as the Draft Permit, EPA has revised some of its analyses and

[1] For simplicity, the responses in this document refer to EPA as the agency articulating each response. MassDEP, however, has collaborated with EPA on various analyses supporting these responses and the Final Permit and has concurred with EPA on the substance of each of the responses in this document.

conclusions. As a result, the Agency has changed a number of the Draft Permit's conditions for the Final Permit. These changes are explained in this RTC document and are, of course, reflected in the Final Permit. In addition, EPA has made certain editorial and formatting changes throughout the Final Permit for purposes of clarity and internal consistency. A summary of the changes made from the Draft Permit to the Final Permit is presented below.

Changes to Draft Permit

Cover (page 1)

1. The phrase "If no comments are received, this permit shall become effective following signature" has been removed.
2. Attachment 1 has been changed to the Marine Acute Toxicity Test Procedure (2012), Attachment 2 has been changed to the Marine Chronic Toxicity Test Procedure (2013), the Outfalls/Intakes Map has been changed to Attachment 3, and Attachment 4 (Approved Additives) has been added.
3. The Director of the Office of Ecosystem Protection has been changed to Ken Moraff.

Part I.A.1: Outfalls 001, 007, 010, 019, 027B, 028, 030, and 031 (pages 2-8 in Draft Permit)

1. Part I.A.1.a has been removed.
2. Part I.A.1 (formerly I.A.1.b) has been changed to authorize the discharge of stormwater and commingled dry weather flows from the drainage system outfalls.
3. The phrase "2) not cause a violation of applicable Massachusetts Surface Water Quality Standards" has been removed from Part I.A.1 (formerly I.A.1.b).
4. A requirement to report the estimated volume of dry weather flow pumped to the consolidated drains treatment system (CDTS) has been added.
5. The numeric limitations for total suspended solids have been removed and the limitation changed to report. The frequency of monitoring has been changed from monthly to quarterly.
6. The maximum daily numeric limitation for Total BTEX and benzene have been removed and the requirement changed to report. The frequency of monitoring has been changed from monthly to quarterly.
7. The maximum daily numeric limitation for total cyanide has been removed and the requirement changed to report. The frequency of monitoring has been changed from monthly to quarterly and monitoring for this parameter is limited to Outfall 001.
8. The frequency of monitoring for volatile organic compounds (VOCs), total residual chlorine, metals, total polycyclic aromatic hydrocarbons (PAHs), Group I PAHs, and total polychlorinated biphenyls (PCBs) has been changed from monthly to quarterly.
9. The requirement for chronic whole effluent toxicity (WET) testing has been removed.
10. The frequency of WET testing has been changed from quarterly to twice per year and the sample type has been changed from composite to grab.
11. The definition of wet weather in Footnote 1 has been changed to "Wet weather is defined as any time period that begins with the first opening of any drainage system outfall gate due to the addition of stormwater from a precipitation event to the drainage system and continues until two hours after the last closing of the last drainage system outfall gate

with the exception of Outfall 027B. Wet weather at Outfall 027B continues until forty-eight (48) hours after the last closing of the last drainage system outfall gate." References to hourly rainfall data have been removed.

12. Footnotes 2, 3, 4, and 5 of the Draft Permit have been removed.
13. Footnote 2 (formerly Footnotes 6 and 7) has been changed to specify monitoring "from the chamber immediately preceding the outfall gate at each of the Drainage System Outfalls the first time each outfall gate is opened (the first pulse of effluent) prior to mixing with the receiving water" and the requirement to sample during the first 30 minutes of discharge has been removed. The sentence "Samples shall be taken at during wet weather conditions, at least 72 hours from the previously measurable (greater than 0.1 inches of rainfall) wet weather event" has been changed to "Samples shall be collected at least seventy-two (72) hours after the last closing of the last outfall gate ending the previous wet weather event."
14. Footnote 3 specifying reporting sample data below minimum levels has been added.
15. Footnote 6 specifying requirements to report the volume of dry weather flow pumped to the CDTS has been added.
16. Footnote 10 ("Required for state certification") has been removed.
17. Footnote 7 (formerly Footnote 11) specifies monitoring for total cyanide at Outfall 001 only. Footnotes 12 and 13 have been removed.
18. Footnote 8 specifying reporting metals as total recoverable has been added.
19. Footnote 9 specifying minimum levels for reporting PAHs has been added.
20. Footnote 10 (formerly Footnote 14) has been changed to specify a minimum level for PCBs.
21. Footnote 11 authorizing the permittee to request a reduction in frequency of monitoring for PCBs has been added.
22. Footnote 12 (formerly Footnote 15) has been changed to specify acute WET testing and reference to chronic and modified acute WET testing has been removed. The test organism has been changed from the sea urchin (*Arbacia punctulata*) to the mysid shrimp (*Americamysis bahia*). Monitoring frequency has been changed from quarterly to twice per year. The definition of quarters as it applies to the WET requirements has been replaced with the definition of two yearly time periods.
23. Language authorizing the permittee to request a reduction in WET testing has been removed from Footnote 12 (formerly Footnote 15) and included as Footnote 13.
24. Footnote 17 has been removed.
25. Footnote 16 defining LC_{50} has been added.

<u>Part I.A.2. Outfall 027A</u> (pages 9-15 in Draft Permit)

1. The phrase "treated non-stormwater flows and stormwater" has been changed to "treated effluent" and the phrase "2) not cause a violation of applicable Massachusetts Surface Water Quality Standards" has been removed.
2. The average monthly numeric limit for PCBs has been removed and the requirement changed to reporting.
3. The numeric limit and monitoring requirement for MTBE has been removed.
4. The monitoring frequency for total cyanide has been changed from monthly to quarterly.
5. The monitoring frequency for metals has been changed from monthly to quarterly.

6. The monitoring frequency for WET testing has been changed from quarterly to twice per year.
7. Footnote 3 specifying reporting sample data at or below minimum levels has been added.
8. Footnote 4 ("Required for state certification") has been removed.
9. Footnotes 5 and 6 regarding monitoring for PCBs have been combined and the requirement to report numerical results of all samples in an attachment to the discharge monitoring report (DMR) has been changed to "numeric results of individual aroclors for all quarters shall be reported in an attachment to the December DMR."
10. Footnote 6 authorizing the permittee to request a reduction in frequency of PCB monitoring has been added.
11. Footnote 8 has been renumbered as Footnote 7.
12. Footnote 8 specifying reporting of total recoverable metals has been added.
13. The minimum levels for PAHs in Footnote 9 (formerly Footnote 7) have been changed to no greater than 1 µg/L for Group I and no greater than 10 µg/L for Group II. Approved methods in 40 C.F.R. Part 136 Table IC or 8270D have been specified.
14. Footnote 10 has been updated to reflect requirements for both chronic and acute WET testing and has removed reference to the modified acute WET test. The test organism mysid shrimp (*Americamysis bahia*) has been added for the acute WET test. Monitoring frequency has been changed from quarterly to twice per year. The definition of quarters as it applies to the WET requirements has been replaced with the definition of two yearly time periods. A reference to Attachment 2 has been added. The period of sampling prior to requesting a reduction in monitoring frequency has been changed from one year to two years.
15. Footnote 13 has been changed to state "Analyses conducted for WET testing may also be used to satisfy other monthly or quarterly sampling requirements in Part I.A.2 as long as the timing of sampling for the parameters coincides with WET testing for selected pollutants.
16. Footnotes 14 (defining LC_{50}) and 15 (defining C-NOEC) have been added.

<u>Part I.A.3. Outfall 014</u> (pages 16-20 in Draft Permit)

1. The phrases "(commingled with minimal contaminated groundwater flows)" and "2) not cause a violation of applicable Massachusetts Surface Water Quality Standards" have been removed from Part I.A.3.
2. The seasonal average monthly flow limit from March 1st to July 31st has been changed from 5 MGD to 18 MGD.
3. The average monthly temperature limit has been changed from report to 90°F and the maximum daily temperature limit has been changed from 90°F to 95°F.
4. The numeric effluent limits for total suspended solids have been removed and replaced with reporting requirements.
5. Monitoring requirements for total iron, total chromium, total lead, PCBs, PAHs, total VOCs, total BTEX, benzene, toluene, ethylbenzene, and total xylenes have been removed.
6. The frequency of WET testing has been changed from quarterly to twice per year and chronic WET testing has been removed.
7. Footnote 1 regarding stormwater discharges has been removed.

8. In Footnote 2 (formerly Footnote 3), sampling frequency for 2/year is defined in place of quarterly sampling frequency.
9. Footnote 4 ("Required for state certification") has been removed.
10. Footnote 3 (formerly Footnote 5) specifies acute WET testing twice per year and references to the modified acute WET test have been removed. The test organism has been changed from the sea urchin (*Arbacia punctulata*) to the mysid shrimp (*Americamysis bahia*). The definition of quarters as it applies to the WET requirements has been replaced with the definition of two yearly time periods and the definition of LC_{50} has been added. The period of sampling prior to requesting a reduction in monitoring frequency has been changed from one year to two years.
11. The sentence "These samples, taken in accordance with the WET testing requirements, may be used to satisfy other sampling requirements as specified in the table above" has been removed from Footnote 6 (formerly Footnote 8).

Part I.A.4 Outfall 018 (pages 21-25 in Draft Permit)

1. "Boiler filter backwash and ion exchange regeneration and backwash," "commingled with minimal contaminated groundwater," and "2) not cause a violation of applicable Massachusetts Surface Water Quality Standards" have been removed from Part I.A.4.
2. The average monthly temperature limit has been changed from report to 90°F and the maximum daily temperature limit has been changed from 90°F to 95°F.
3. The numeric effluent limits for total suspended solids have been removed and replaced with reporting requirements.
4. Monitoring requirements for PCBs, PAHs, total residual oxidants, metals, total VOCs, total BTEX, benzene, toluene, ethylbenzene, and total xylenes have been removed.
5. Monitoring frequency for WET testing has been changed from quarterly to twice per year.
6. Footnote 1 regarding minimal contaminated groundwater has been removed.
7. The requirement to sample during dry weather conditions has been removed from Footnote 1 (formerly Footnote 2).
8. In Footnote 2 (formerly Footnote 3), sampling frequency for 2/year is defined in place of quarterly sampling frequency.
9. Footnote 4 ("Required for state certification") has been removed.
10. Footnote 3 (formerly Footnote 5) has been updated to reflect requirements for both chronic and acute WET testing and has removed reference to the modified acute WET test. The test organism mysid shrimp (*Americamysis bahia*) has been added for the acute WET test. Monitoring frequency has been changed from quarterly to twice per year. The definition of quarters as it applies to the WET requirements has been replaced with the definition of two yearly time periods. A reference to Attachment 2 has been added. The period of sampling prior to requesting a reduction in monitoring frequency has been changed from one year to two years.
11. The sentence "These samples, taken in accordance with the WET testing requirements, may be used to satisfy other sampling requirements as specified in the table above" has been removed from Footnote 6 (formerly Footnote 8).
12. Footnotes 13 (defining LC_{50}) and 14 (defining C-NOEC) have been added.

Part I.A.5 Outfall 018B (pages 26-30 in the Draft Permit)

1. Outfall 018B and any effluent limitations or monitoring requirements related to this outfall have been removed.

Part I.A.6 Outfall 018C (pages 31-32 in Draft Permit)

1. Part I.A.6 has been renumbered as Part I.A.5.
2. Footnote 2 regarding sampling during dry weather conditions has been removed.

Part I.A.7 Outfall 020 (pages 33-35 in Draft Permit)

1. Part I.A.7 has been renumbered as Part I.A.6.
2. The phrase "commingled with minimal contaminated groundwater infiltration" has been removed.
3. The numeric effluent limits for total suspended solids have been removed and replaced with reporting requirements.
4. Monitoring requirements for total VOCs, PCBs, PAHs, and metals have been removed.
5. Footnote 1 regarding minimal contaminated groundwater has been removed.
6. The sentence "Sampling frequency of 1/month is defined as the sampling of one (1) discharge event in each calendar month, when discharge occurs" has been removed from Footnote 2 (formerly Footnote 3).
7. Footnote 4 ("Required for state certification") has been removed.

Part I.A (continued) (pages 36-38 in Draft Permit)

1. Part I.A.8 in the Draft Permit has been renumbered as Part I.A.7.
2. Part I.A.9 in the Draft Permit has been renumbered as Part I.A.8.
3. Part I.A.10 in the Draft Permit has been renumbered as Part I.A.9.
4. Parts I.A.11, 12, 13, 14, and 15 from the Draft Permit have been removed.
5. Part I.A.10 regarding authorization to use non-toxic, biodegradable dyes has been added.
6. Part I.A.11 regarding discharges to the Lynn Water and Sewer Commission has been added.
7. Part I.A.16 in the Draft Permit has been renumbered as Part I.A.12.
8. Part I.A.17 in the Draft Permit has been renumbered as Part I.A.13.
9. Part I.A.14 stating the Massachusetts Water Quality Standard for pH in Class SB water has been added.
10. Part I.A.18 in the Draft Permit has been renumbered as Part I.A.15 and has been updated to reflect the most recent version of the Massachusetts Water Quality Standard for solids.
11. Part I.A.19 in the Draft Permit has been renumbered as Part I.A.16 and has been updated to reflect the most recent version of the Massachusetts Water Quality Standard for oil and grease.
12. Part I.A.20 in the Draft Permit has been renumbered Part I.A.17.
13. Part I.A.21 in the Draft Permit regarding reporting sampling above required frequency has been removed.
14. Part I.A.22 in the Draft Permit has been renumbered Part I.A.18.

15. Part I.A.23 in the Draft Permit has been renumbered Part I.A.19.
16. Part I.A.24 in the Draft Permit has been renumbered Part I.A.20.
17. Part I.A.25 in the Draft Permit has been renumbered Part I.A.21.

Part I.B Stormwater Pollution Prevention Plan (SWPPP) (pages 38-43 in Draft Permit)

1. Part I.B in the Draft Permit has been replaced with Part I.B Best Management Practices (BMPs).
2. Part I.B.1.a through d specifying BMPs for the drainage system outfalls during dry weather have been added.
3. Parts I.B.1 and I.B.2 have been renumbered as Part I.B.2.
4. Part I.B.3 has been renumbered as Part I.B.2.a and its subparts a. through e. have been renumbered i. through v.
5. Part I.B.4 has been renumbered as Part I.B.2.b and its subparts a. through g. have been renumbered i. through vii.
6. Part I.B.5 has been renumbered as Part I.B.2.d.
7. Part I.B.6 has been renumbered as Part I.B.2.e.
8. Part I.B.7 has been renumbered as Part I.B.2.f and the reference to stormwater in the phrase "numerical or non-numerical stormwater effluent limits" has been changed to "wet weather."
9. Parts I.B.8 and Part I.B.9 have been removed.
10. Part I.B.10 has been renumbered as Part I.B.2.c.
11. Part I.B.10.a and Part I.B.10.a.i have been removed.
12. Part I.B.10.a.ii specifying a requirement to keep vault tide gates closed has been renumbered as Part I.B.1.a and includes the phrase "except for minor weeping around the bottom edge of the gate due to hydrostatic pressure."
13. Part I.B.10.b and its subparts i, ii, iv, and v have been removed. Part I.B.10.b.iii has been renumbered as Part I.B.1.b and states "Prior to a storm event forecasted to generate 0.1 inches or more of precipitation, operate the transfer pumps to lower the elevation of dry weather flows contained in the drainage system outfall vaults to no more than the "low alarm" level prior to the start of wet weather. The average volume of dry weather flow pumped to the CDTS prior to a storm event from each drainage system outfall during each month shall be reported on the discharge monitoring report (see Part I.A.1)."
14. Parts I.B.10.c, I.B.10.d, and I.B.10.e have been removed.
15. Part I.B.10.f has been renumbered as Part I.B.2.c.i and has been changed to "Inspect all stormwater collected within the secondary containment areas at the jet fuel farm, around tanks, in the truck unloading ramps, in the Outfall 032 drainage area, and from other areas for evidence of an oil sheen or other contamination prior to such water being discharged to the drainage system. In the event that a sheen is observed, the permittee shall eliminate the sheen prior to discharging the water from the containment area to the drainage system. Otherwise, water containing a sheen shall be discharged to the CDTS for treatment, or disposed of offsite."
16. Part I.B.10.g has been renumbered as Part I.B.2.c.ii and has been changed to "Perform regular cleaning of the Drainage System pipelines. The term "regular cleaning" shall be defined by site-specific factors and described in the facility's SWPPP and include a requirement to dispose of all solids offsite which are accumulated as a result of the

cleaning; minimize the amount of solids left behind in the storm drains and dispose of all collected solids off-site in a manner that complies with federal, state and local laws, regulations and ordinances; and ensure all drainage system cleaning water is disposed of offsite or goes directly to the CDTS for treatment."

17. Part I.B.10.h has been renumbered as Part I.B.1.c and has been changed to include the phrase "except when required to operate at the "low alarm" level to minimize dry weather flow in the vault prior to a forecasted storm event consistent with Part I.B.1.b, above."
18. Part I.B.10.i has been renumbered as Part I.B.1.d.
19. Part I.B.10.j has been renumbered as Part I.B.2.c.iii.
20. Part I.B.10.k has been renumbered as Part I.B.2.c.iv.
21. Part I.B.10.l has been renumbered as Part I.B.2.c.v and includes the phrase "non-approved additives." Reference to a list of approved additives in Attachment 4 has been added.
22. Part I.B.10.m has been removed and replaced with stormwater best management practices to minimize contamination from fuel oil unloading areas (I.B.2.c.vi) and bulk fuel storage tanks (I.B.2.c.vii), and to minimize the potential for and oil or chemical spill (I.B.2.c.viii).
23. Part I.B.2.c.ix requiring continued testing of excavation dewatering has been added.

<u>Part I.C Cooling Water Intake Structure Requirements</u> (pages 43-44 in Draft Permit)

1. In Part I.C.1.a, requirements to improve the Test Cell CWIS's existing coarse mesh traveling screen with new fiberglass fish lifting buckets, a low pressure spraywash, and separate fish and debris return troughs have been removed.
2. In Part I.C.1.b the average monthly flow limit from March 1 to July 31 has been changed from 5 MGD to 18 MGD.
3. Subparts a. and b. in Part I.C.2.b have been renumbered as subparts i, ii, and iii. Part I.C.2.b.ii requires a screen slot size larger than 0.5 mm "unless the permittee can demonstrate through a site-specific study that a larger slot size is as effective in reducing entrainment as 0.5 mm."
4. The word "either" has been removed from Part I.C.2.b.
1. Part I.C.2.b(b) has been renumbered as Part I.C.3 and has been modified to state "As an alternative to the requirements in Part I.C.2, the permittee may at its option minimize entrainment and impingement at the Power Plant CWIS by maintaining a year-round maximum daily intake flow commensurate with the operation of a closed-cycle cooling system by no later than the final compliance schedule dates specified in Part I.C.5 of this permit."
5. Part I.C.3 has been renumbered Part I.C.4.
6. Part I.C.5 (Compliance Schedule) has been added.

<u>Part I.D Biological Monitoring</u> (pages 44-47 of the Draft Permit)

1. Part I.D.1.a has been renumbered as Part I.D.1. Power Plant and the requirement in former Part I.D.1 to begin monitoring no later than ninety (90) days after the effective date of the permit has been removed.

2. Part I.D.1 requires that entrainment monitoring "commence no later than thirty (30) days from the date upon which both the wedgewire screens and variable frequency drives are fully operable" and entrainment monitoring has been changed from the duration of the permit to two (2) years.
3. The frequency of entrainment monitoring at Part I.D.1.a has been changed from weekly to twice per month during the months of March through October and from twice per month to once per month during the months of November through February. The number of samples per week has been changed from three to two and the requirement to collect a representative afternoon sample has been removed.
4. Part I.D.1.b regarding requirements for demonstrating compliance with the through-screen velocity and visual inspection of the wedgewire screens has been added.
5. Part I.D.1.b and I.D.1.b.i have been combined and renumbered as Part I.D.2. The requirement in former Part I.D.1 to begin monitoring no later than ninety (90) days after the effective date of the permit has been changed to "begin monitoring no later than thirty (30) days from the date that the new fish return trough is fully operational" and impingement monitoring has been changed from the duration of the permit to two (2) years.
6. Part I.D.1.b.ii has been renumbered as Part I.D.2.a.i.
7. Part I.D.2.a.ii (formerly I.D.1.b.iii) has been changed to require that latent mortality monitoring be limited to three (3) times per year.
8. Part I.D.1.b.iv has been renumbered as Part I.D.2.a.iii.
9. Part I.D.1.b.v has been renumbered as Part I.D.2.a.iv.
10. Part I.D.1.c regarding continuing biological monitoring for the duration of the permit has been removed.
11. Part I.D.1.d has been renumbered as Part I.D.3.
12. Part I.D.1.d.i has been renumbered as Part I.D.3.a.
13. Part I.D.1.d.ii has been renumbered as Part I.D.3.b.
14. Part I.D.1.e has been renumbered as Part I.D.4.
15. Part I.D.2 regarding a bioaccumulation study has been removed.

Part I.F Monitoring and Reporting (pages 47-49 in the Draft Permit)

1. The address at Part I.F.1.b for MassDEP has been changed from 627 Main Street, 2nd Floor, Worcester, MA 01608 to 1 Winter Street, 5th Floor, Boston, MA 02108.
2. The address at Part I.F.1.c for MassDEP NERO has been changed from 205 Lowell Ave to 205B Lowell Ave. The requirement to send duplicate copies to MassDEP Surface Water Discharge Permit Program in Worcester, MA has been removed.

Comment 1.1:

General Electric Aviation ("GE") appreciates the opportunity to submit these comments on draft NPDES Permit No. MA0003905 for GE's River Works facility in Lynn, Massachusetts (the "Facility"), released by the U.S. Environmental Protection Agency ("EPA") and the Massachusetts Department of Environmental Protection ("MADEP") for public comment on February 2, 2011 (the "Draft Permit"). GE has grave concerns about the manner in which the Draft Permit would affect Facility operations, most notably the Consolidated Drains Treatment System ("CDTS"), cooling water intake structures ("CWIS") and thermal discharges. GE believes that the Draft Permit is predicated on a fundamental misunderstanding of the nature and impact of GE's operations and discharges, including, without limitation, how those discharges affect water quality in the Saugus River. GE seeks to correct this misunderstanding in the comments that follow.

Beyond the CDTS, CWIS and thermal issues, GE is concerned about the extensive new requirements, including monitoring and management practices, proposed by the Agencies.[2] GE does not believe that these requirements are justified or appropriate, and GE urges the Agencies to make fundamental revisions and corrections to the Draft Permit before proceeding any further.

Response to Comment 1.1:

In this comment, GE indicates that the company has serious concerns about various aspects of the Draft Permit. GE's concerns are presented here at a fairly general level, but are elaborated upon in subsequent comments. Consequently, EPA responds here in a general way, but responds more specifically to GE's detailed comments later in this RTC document.

In developing the Final Permit, EPA has considered the concerns expressed by GE about the effect that the new permit could have on its operations and the company's stated belief that the regulatory agencies misunderstand the nature of the facility's effects on the Saugus River. EPA has based this permit on its interpretation of applicable legal requirements and the best available technical information. This information was gleaned from a variety of sources, including GE's NPDES permit re-application, additional information submitted by GE in response to requests for information from EPA, correspondence between EPA and GE, and a variety of other documentation contained within EPA's GE Lynn facility permit file. As a result of its review of this information, as well as GE's comments on the Draft Permit, EPA is confident that it has an adequate understanding of the GE facility and its operations to support development of the Final Permit. Furthermore, EPA has revised certain permit conditions for the Final Permit in response to comments raised by GE.

[2] GE understands that the Draft Permit includes two separate and independent permit authorizations, one from EPA and the other from MADEP. However, recognizing that EPA has primary authority under the Clean Water Act for NPDES permitting actions in Massachusetts, GE commonly refers to EPA, instead of the Agencies, in these comments. Wherever relevant, GE intends for these references to EPA to include both permitting agencies.

EPA has concluded that the Final Permit's conditions are technically sound and meet the requirements of the CWA and, therefore, are justified and appropriate in order to protect water quality in the Saugus River.

2. Facility Background

Comment 2.1: Lynn Facility History and Operations

The Facility covers approximately 220 acres and is located on the east bank of the Saugus River in the City of Lynn, Essex County, Massachusetts. The Facility consists of a 45-building complex with associated storage areas, parking areas, and roadways. The Massachusetts Bay Transit Authority owns a railroad line which separates the site into two sections, referred to as River Works North facility and River Works South facility (also known as the Gear Plant).

Industrial manufacturing operations have been conducted at the Facility for approximately 112 years. Since the 1940s, the major industrial functions of the Facility have been the manufacture and testing of aircraft engines, the manufacture of turbine engines, generators, gear parts, and marine propulsion units. Current activities at the Facility include the design, manufacture, assembly and testing of aircraft engines and components. Manufacture of gearing for marine propulsion systems at the Gear Plant was discontinued as of December 2010.

Principal processes include machining, cleaning, descaling, coating, assembly and testing of engines and engine components. GE also operates a power plant to support its manufacturing operations that generates steam and electricity as well as compressed air. The GE Power Plant burns only natural gas; burning of oil was essentially discontinued in October 2009.[3]

The Saugus River is a tidally influenced, estuarine river from which GE withdraws water to use for cooling purposes. The Facility has three CWIS, designated as the Gear Plant CWIS, the Power Plant CWIS and the Test Cell CWIS. The Gear Plant CWIS has not been used in several years, and the Test Cell CWIS operates for an average of 25.2 hours per month or approximately 300 hours per year. The current permit limits for the Power Plant are 35.6 MGD and 45.0 MGD for the Test Cell. To reduce the Test Cell operation's withdrawals from the Saugus River, GE recently spent $878,000 installing a mechanical draft cooling tower. EPA published a proposed rule on April 20, 2011 that when finalized in 2012 will apply national performance standards and other requirements to GE's operation of its CWIS, which may be different than those proposed by EPA in the Draft Permit.

Response to Comment 2.1:

EPA has reviewed and considered GE's description of the history of activities at the Lynn facility. EPA notes GE's statement that the Gear Plant cooling water intake structure (CWIS)

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[3] Since October 2009, the GE Power Plant operated on oil for less than 12 hours; this operation was performed for maintenance purposes. GE currently maintains the ability to burn oil for emergency use in the remote instance that natural gas supplies are interrupted. In the near future, it is likely GE will not be able to burn any oil in order to satisfy anticipated CAA requirements, such as the MACT Boiler rule.

has not operated in "several years," that "[m]anufacture of gearing for marine propulsion systems at the Gear Plant was discontinued as of December 2010," and that the Test Cell CWIS operates approximately 300 hours per year (*i.e.*, an average of 25.2 hours per month).

EPA acknowledges that, as stated in the comment, EPA published a proposed rule on April 20, 2011, under Section 316(b) of the Clean Water Act. On August 15, 2014, EPA published the Final Rule to establish requirements for cooling water intake structures at existing facilities, which will become effective on October 14, 2014. 79 Fed. Reg. 48300-48439 (August 15, 2014). The Final Rule speaks directly to the issue of permits issued prior to the Rule's effective date and indicates that permitting should proceed and that BTA determinations should be made on a site-specific, Best Professional Judgment (BPJ) basis. As demonstrated in response to comment 11.1, EPA's Final Permit is consistent with the New CWA § 316(b) Regulations, even though they do not constitute "applicable requirements" for GE's Final Permit. *See* 40 C.F.R. § 122.43(b).

Comment 2.2: Economic Considerations

The Facility is a critical Department of Defense facility that provides the T700 turboshaft engine powering the Apache and Black Hawk helicopters and the F414 that powers the F/A-18E/F Super Hornet fighter jet. These aircraft are among the most vital and prominent in Operation Iraqi Freedom and Operation Enduring Freedom. The Facility also produces the CF34 regional/business jet engine and other power plant components that support the commercial aviation sector. GE employs 3,250 full-time workers with an average annual salary of nearly $82,000 (not including overtime and benefits). The site generates a payroll tax base in excess of $250 million. The workforce is comprised of production workers, engineers, planners, draftsmen, tradesmen, sales and marketing, and support roles. In addition, the Facility hired 125 college/university co-op students in 2010 plus dozens of part-time and contract hires. The Facility is GE's most sizeable Massachusetts operation, and is one of the largest private employers on the North Shore and one of the Commonwealth's leading manufacturing sites. GE procures millions of dollars in raw material, products and services, much of it from more than 25 Massachusetts vendors that support nearly 2,500 workers. Numerous second-tier vendors (restaurants, retail stores, gas stations/convenience stores, etc.) also benefit from the operation of the Facility and the activities of its employees.

GE in Lynn and its employees contributed approximately $500,000 to charitable causes in 2010 through its Good Neighbor Fund, GE Volunteers Council, matching gifts program and community relations grants. In addition, thousands of employee volunteer hours (an estimated $800,000 of company-sponsored volunteer time) directly supported 75 projects that benefitted a variety of local nonprofits. GE has also donated land parcels (for Habitat for Humanity), provided various other gifts-in-kind and partnered with Lynn schools to promote educational initiatives and several local agencies on a wide variety of environmental projects.

Response to Comment 2.2:

GE's comment describes various economic facts associated with its operations at the Lynn facility and the role GE's Lynn facility generally plays in the local community. Although EPA recognizes and has considered GE's discussion of these points, EPA has also concluded that these facts do not bear on the terms and conditions of the Final Permit. Consequently, EPA provides no further response to these comments. To the extent that any of the points raised in these comments is pertinent to a permit condition or the analysis underlying a permit condition, EPA will address it in the discussion pertaining to that permit condition.

Comment 2.3: Environmental Good Citizen

The Facility's NPDES compliance record is excellent and its current estimated annual expenditure on environmental protection and enhancement programs is approximately $2.1 million.

In 1999, GE voluntarily entered into an Administrative Consent Order with the MADEP and in consultation with EPA to construct the CDTS to collect and treat dry weather flows with a state-of-the art granular activated carbon treatment system. Dry weather flows ("DWF") include non-contact cooling water, ion exchange regeneration and backwash, steam conduit water, as well as any residual stormwater remaining in and/or groundwater infiltrating the drain pipes. Since its startup in 2000, the CDTS system has treated approximately 1,314 million gallons of dry weather flow prior to discharge to the Saugus River.

The facility has achieved Phase V Remedy Operation Status ("ROS") under the Massachusetts Contingency Plan through various source removal activities and completed a Risk Characterization based on comprehensive groundwater, soil, surface water and sediment sampling that concluded a condition of "no significant risk of harm to the environment" exists under current conditions. Source removal activities include, but are not limited to: installation and operation of remedial systems that have removed over 27,000 gallons of LNAPL from the subsurface; removal of over 150 underground storage tanks and 5.7 miles of inactive underground fuel piping and another 1.3 miles cleaned and closed-in-place; and excavation and removal of well over 8,000 cubic yards of petroleum impacted soil during numerous excavation activities. GE has also achieved a Temporary Closure (i.e., Response Action Outcome Class C) under the MCP for two areas of the facility including the Building 33/35 Area through construction of a 200-foot long and 20-feet deep slurry cut-off wall to eliminate petroleum migration to the river together with manual LNAPL recovery and the Building 64 Area through installation of a LNAPL recovery system. GE will continue to conduct remedial activities until the LNAPL has been reduced to a level of 0.5-inch as measured in groundwater monitoring wells that will support permanent closure under the MCP. While there were substantial expenditures on tank removals and Phase I activities prior to 1997, since 1997, GE has spent more than $20 million on site assessment and remediation/risk reduction measures and will continue to spend approximately $500,000 (including $100,000/year by GE Energy on Bldg. 64 area) annually on the operation and maintenance of active remediation systems and monitoring groundwater in selected areas for the next three to five years, depending upon when remedial objectives have been achieved. In addition, GE plans on investigating and remediating conditions (if necessary) beneath the 500,000 square foot Gear Plant building slated for demolition in 2011.

As discussed in more detail below, beginning in 2010 and with the approval of EPA, GE converted 500,000 sq. feet of paved area into green space to promote rainwater infiltration. GE also constructed a two-acre stormwater retention pond and made drainage improvements that will allow solids suspended by turbulence during storm events to settle out before the stormwater is discharged to the Saugus River, reducing sedimentation and potential pollutant loading to the river. This green space construction project was completed as of January 2011 at an estimated overall cost of $ 2.9 million.

Response to Comment 2.3:

GE's comment describes measures it has taken toward remediating and containing a variety of environmental problems at the Lynn facility, including: a) construction and implementation of the Consolidated Drains Treatment System (CDTS) to collect and treat dry weather process wastewater flows, stormwater, and contaminated groundwater; b) remedial actions conducted under Massachusetts state law to remedy contaminated groundwater; and c) a project to reduce stormwater discharges to the Saugus River.

EPA has considered GE's actions described in the comment. GE's comment does not, however, assert that any of the measures described indicate or establish that the Draft Permit's terms and conditions are unjustified or flawed in some technical or legal manner. Consequently, EPA provides no further specific response to this comment. That said, EPA has taken account of GE's environmental remediation measures in determining technology-based limits for the facility's new NPDES permit. Indeed, certain of these measures, such as the CDTS, have been incorporated as essential elements of the best available technology for controlling contaminated groundwater discharges from the facility's drainage system. As a result, some of GE's environmental remediation measures are discussed in detail below within this document.

Comment 2.4: Permitting History

The Facility's National Pollutant Discharge Elimination System (NPDES) permit (No. MA0003905) expired on September 29, 1998, and has been administratively continued by virtue of a timely and complete renewal application submitted on June 29, 1998 (following a 90-day extension granted by EPA). After submitting the 1998 application, GE made changes to the Facility and its discharges with the approval of the EPA and MADEP. In order to reflect these changes and address questions from EPA, GE has submitted revisions/updates to its renewal application and other responsive information. A chronological list of documents submitted to EPA following the 1998 renewal application is included as Technical Exhibit 1.

Despite nearly 13 years of cooperative dialogue on the details underlying GE's NPDES-related activities, EPA provided no advance notice to GE of its decision to develop or release a Draft Permit. Instead, EPA simply released the draft for public review and comment, initially providing only 30 days for this vitally important public process. The Draft Permit, if finalized in its present form, would force GE to substantially alter if not completely shut down many, if not all, of its manufacturing and testing operations at the Facility, with profound adverse consequences to both GE and the larger community.

Response to Comment 2.4:

GE's comment complains that EPA did not give GE "advance notice" of its decision to issue the Draft Permit. EPA notes that the NPDES permitting regulations governing permit issuance do not specify that EPA must provide any such advanced notice to a permittee. At the same time, however, EPA also notes that it had numerous communications with GE between the time that GE submitted an NPDES permit renewal application[4] and the date the Draft Permit was issued. Those communications have included a site visit by EPA on January 29, 2009, CWA Section 308 information requests issued by EPA to GE about the Lynn facility, e-mail communications between EPA and GE representatives, and in-person discussions between EPA and GE representatives. Furthermore, EPA issued a new NPDES permit to the Wheelabrator-Saugus trash-to-energy plant in February 2010. This facility is directly across the river from GE and in the record for Wheelabrator permit, EPA noted its concern about the cumulative impact of the two facilities' on the Saugus River and its inhabitants. *See* Responses to Comments, Final NPDES Permit Wheelabrator Station (NPDES No. MA0028193) (February 12, 2010). It should have been clear to GE that EPA was working on its new permit and that a draft permit would be issued for review and comment. Indeed, GE submitted an NPDES permit renewal application to EPA, as required by EPA's regulations, and EPA's issuance of a Draft Permit was the proper response to that permit renewal application.

GE comments that EPA initially only provided a 30-day public comment period. A 30-day comment period is consistent with applicable regulations, *see* 40 C.F.R. § 124.10(b)(2), and EPA subsequently granted GE's request for a 90-day extension of the comment period. The intent of the comment period is to provide time for the permittee, and any other interested parties, to review a Draft Permit and submit comments. The 120-day public comment period provided by EPA provided ample time for GE and other interested parties to provide EPA with comments on the Draft Permit.

GE also comments that the requirements of the Draft Permit "would force GE to substantially alter if not completely shut down many, if not all, of its manufacturing and testing operations at the [Lynn] Facility." GE has not, however, provided concrete information to demonstrate, or enable EPA to assess, the accuracy of its claim. That said, EPA has considered GE's comments about the cost and technical difficulty of certain technology approaches to controlling pollutant discharges. Ultimately, the Final Permit reflects a number of changes that EPA has made to the provisions of the Draft Permit. EPA believes that the Final Permit no longer contains the provisions of the Draft Permit that GE appears to have found most objectionable. That is, the Final Permit retains the current permit's maximum daily temperature limits for the Test Cell and Power Plant outfalls, and removed the Draft Permit's requirement to eliminate to the maximum extent practicable the infiltration of groundwater into the drainage system as well as the requirement to treat the first 30 minutes of wet weather from the drainage system outfall vaults in the CDTS. The absence of these requirements in the Final Permit means the costs of compliance with the permit will be greatly reduced and it will not be necessary under the Final Permit to "dig up" large areas of the facility to address faulty drainage system piping, thereby eliminating any disruption to GE's operations that might have arisen from such work. The changes from the Draft Permit to the Final Permit resulted from EPA carefully and thoroughly considering GE's

[4] NPDES Permit Renewal Application, June 29, 1998.

objections to certain provisions of the Draft Permit which GE characterized as impossible to comply with or unduly burdensome financially.

Comment 2.5: Recent Changes to Drainage at the Facility

As described in a letter to EPA dated October 7, 2010, GE reconfigured the Drainage System to separate the northern part of the Facility from the southern part of the Facility to facilitate the sale and redevelopment of the Gear Plant property.

Three stormwater outfalls are located in the Gear Plant area: Outfalls 028, 030, and 031. Outfalls 028 and 030 discharge stormwater runoff and groundwater infiltration from the Gear Plant area. GE re-routed stormwater from the northern part of the Facility flowing to Outfall 031 to Outfall 027. As part of this project GE converted 500,000 sq. ft. of existing paved area that drained to Outfall 031 into green space.

In addition, GE installed a two-acre stormwater detention pond that collects stormwater runoff from the green space and a parking lot. The new stormwater detention basin is designed to detain a 25 year, 24-hour storm with 0.5 feet of freeboard. The basin is designed with a low-level outlet control structure that drains the pond within 48 hours after a storm event. The reduction in impervious area and the addition of the stormwater detention basin results in a decrease in the net stormwater discharge to the Saugus River and any associated pollutant loading from the Facility.

The flow of non-stormwater from the northern part of the Facility was also rerouted from Outfall 031 to Outfall 027. Under dry weather conditions, non-contact cooling water and other types of dry weather flow from the northern part of the Facility continue to be discharged from Outfall 027 after treatment through the CDTS.

All operations at the Gear Plant ceased in December, 2010. As described previously to EPA, GE plans to remove infrastructure (e.g. pumps, overhead piping, and gates) associated with dry weather flow treatment for Outfalls 028, 030 and 031 as these outfalls only receive stormwater and possibly some incidental groundwater infiltration. This infrastructure must be removed as part of the demolition of the Gear Plant building because the building structure serves as support for the overhead piping that runs to the CDTS. Outfall 029 (salt water discharge) will be closed in accordance with Brown and Caldwell's letter to EPA, on behalf of GE, dated June 1, 2010. The end-of-line separators will remain in place during demolition activities and activities [sic], and all ground disturbance conducted in accordance with the required EPA Construction General Permit and Stormwater Pollution Prevention Plan ("SWPPP"). GE is currently evaluating whether the contribution of stormwater and potential groundwater infiltration from a catch basin located outside the fuel farm containment area can be rerouted to Outfall 027 as well, since GE intends to retain the portion of the property encompassing the fuel farm.

After demolition of the buildings, GE plans to conduct response actions as necessary to achieve a Response Action Outcome in accordance with the Massachusetts Contingency Plan at 310 CMR 40.0000, and potentially sell the Gear Plant property for redevelopment.

The Draft Permit is inconsistent with GE's plans for the Gear Plant. In particular, the prohibition on dry weather flows and other provisions based on a presumption that gates will remain in place at the vaults associated with Outfalls 028, 030 and 031 should be deleted from the Permit. GE informed the Agency of its plans in email and letter correspondence and in a meeting held with EPA on July 30, 2010. The Agency offered no objections to these plans.

Addendum to Comment 2.5:

In a letter to EPA submitted July 31, 2014, GE submitted additional comments regarding the impact of the recent operational changes that have taken place at the facility on GE's ongoing NPDES permit proceeding. Although GE submitted these additional comments after the close of the comment period on the Draft Permit, EPA has considered these comments in developing the Final Permit and responds to them below. In June 2014, GE entered into a contract to sell the Gear Plant Property (with the exception of an aboveground fuel tank farm and a small utility service/storage building "Building 7") with an anticipated closing date of September 2014. The Gear Plant Property sale includes three outfalls (028, 030, and 031) that discharge stormwater and infiltrated groundwater in accordance with GE's NPDES permit. According to GE, ownership and operation of these outfalls will transfer to the new owner upon finalization of the sale. The following are excerpts from GE's letter to EPA pertaining to the sale of the Gear Plant property and its impact on GE's new Final Permit.

The Gear Plant is served by three outfalls (028, 030, and 031) that are subject to GE's NPDES permit and were included in the draft renewal permit. GE intends to transfer ownership of these outfalls as part of the sale of the Gear Plant Property. As previously discussed with the EPA and outlined in detail below, due to the elimination of industrial uses of the Gear Plant Property, changes in Main Facility and Gear Plant Property drainage, and completion of remedial response actions under the Massachusetts Contingency Plant, EPA should delete from the Facility's renewal permit all requirements, including dry weather flow collection and treatment, related to the Gear Plant Property outfalls. GE believes that the transfer of ownership and deletion of these outfalls falls squarely within 40 C.F.R. 122.63(d) and (e)(2), which allow for simple "minor modification" of the permit in circumstances like these.

Termination of Gear Plant Operations. GE ceased all industrial operations at the Gear Plant Property, with the exception of the fuel farm and Building 7, and razed substantially all of the Gear Plant Property buildings in 2011. As a result of the termination of Gear Plant operations and subsequent changes to Gear Plant Property drainage detailed below, discharges from outfalls 028, 030, and 031 are currently limited to stormwater and incidental groundwater infiltration.

<u>Facility Drainage Changes.</u> As detailed in an October 7, 2010 letter to Nicole Kowalski of EPA Region 1, GE reconfigured the Facility's drainage system to hydraulically separate the Main Facility from the Gear Plant Property and to eliminate all industrial/operational sources of dry weather flow to Outfalls 028, 030, and 031. Currently, these outfalls continue to discharge only stormwater and incidental groundwater infiltration originating from the Gear Plant Property. Regarding Outfall 031, prior to implementation of drainage changes in 2010, storm and non-stormwater flows from both the Main Facility and the Gear Plant Property were discharged at this outfall. As communicated to EPA in 2010, all stormwater and dry weather flows originating

from the Main Facility were rerouted to discharge through Outfall 027 located at the Main Facility. As a result, no stormwater or dry weather flows originating at the Main Facility discharge from any of the Gear Plant Property outfalls. Outfall 031 discharges are currently limited to stormwater and incidental groundwater infiltration originating from the Gear Plant Property. In addition, in 2010 the former Gear Plant building roof drains were cut and capped at the storm drain manholes and between approximately 1992 and 2008 GE conducted a significant stormwater drainage system relining project under which GE relined the Facility's main stormwater sewer lines located below the water table in order to substantially reduce the likelihood of groundwater infiltration into the stormwater drainage system. There are no dry weather flow sources, except for some incidental groundwater, discharged from the current Gear Plant Property outfalls.

Remedial Site Closure. Dry weather flow discharged from Gear Plant Property outfalls 028, 030, and 031 is currently limited to incidental groundwater infiltration. As discussed with EPA in October 2013, groundwater at the Gear Plant Property has been assessed as part of a remedial program implemented by GE in accordance with the Massachusetts Contingency Plan ("MCP"). The Gear Plant Property achieved a Class A-3 Response Action Outcome as outlined in the "Site Assessment and Remediation Activities in Support of a Massachusetts Contingency Plan Class A-3 Partial Response Action Outcome Statement for Former Gear Plant and Saugus River Areas" ("RAO") which GE provided to both EPA and MassDEP in October 2013. As indicated in the RAO, no additional response actions (site assessment or remediation) are required at the portions of the Gear Plant Property that GE anticipates selling by September 2014. Based on the conclusions of the RAO (including the ecological risk assessment), the stormwater sewer relining efforts and the elevations and locations of Gear Plant Property sewer lines in relation to groundwater impacts, there are no indications that groundwater conditions at the Gear Plant Property negatively impact the Gear Plant Property drainage system or the Saugus River.

Building 7 Discharge. As noted above, GE intends to retain ownership of a small parcel of property that includes Building 7 (the "Building 7 Parcel"). The Building 7 Parcel will continue to be owned and operated by GE for utility and storage uses in support of Main Facility operations. GE anticipates that stormwater flow from the Building 7 Parcel will continue to discharge from Outfall 031. However, because ownership and operation of Outfall 031 will transfer during the sale of the Gear Plant Property, GE requests that, to the extent that an NPDES permit is required, a new discharge and compliance point be established for the Building 7 Parcel that reflects only discharges associated with the Building 7 Parcel.

Based on the contemplated sale of the Gear Plant Property, the significant changes to the Gear Plant Property drainage and elimination of all dry weather flows from the Gear Plant Property except incidental groundwater infiltration, GE respectfully submits that the requirements contemplated under the draft renewal permit to continue collection of dry weather flows from outfalls 028, 030, and 031 are unnecessary and should not be included in a final renewal permit.

Response to Comment 2.5:

In its comments on the Draft Permit and the addendum to those comments submitted on July 31, 2014, GE objects to permit conditions related to the discharge of stormwater and groundwater from Outfalls 028, 030, and 031 on the basis that 1) GE has eliminated industrial uses of the Gear Plant Property, 2) drainage changes have eliminated discharges from the Main Property at these outfalls, and 3) remedial response actions under the Massachusetts Contingency Plan (MCP) have been completed. GE requests that all requirements associated with drainage system outfalls 028, 030, and 031, particularly those conditions related to the collection, conveyance, and treatment of dry weather flow, be removed from the Final Permit. For the reasons explained below, the Final Permit retains requirements for Outfalls 028, 030, and 031. EPA disagrees that it would be appropriate to remove all permit requirements associated with these outfalls. The Final Permit requires the permittee to continue to treat dry weather flows from these three outfalls at the CDTS and includes a best management practice (BMP) to minimize the discharge of dry weather flows commingled with stormwater during wet weather. See Attachment A: BPJ analysis, and Part I.B of the Final Permit (Best Management Practices).

First, EPA accepts GE's representations that since closure and demolition of the Gear Plant in December 2011, all industrial operations by the Gear Plant have ceased and its industrial process discharges to Outfalls 028, 030, and 031 have been eliminated. This does not, however, mean that all discharges from these outfalls have been eliminated. GE's comments indicate that discharges of stormwater and groundwater infiltration remain. Second, EPA takes no issue with the remedial site closure in accordance with the MCP or the Class A-3 Response Action Outcome (RAO) as outlined in the "Site Assessment and Remediation Activities in Support of a Massachusetts Contingency Plan Class A-3 Partial Response Action Outcome Statement for Former Gear Plant and Saugus River Areas" provided to EPA in October 2013. Having said that, remedial site closure under MCP does not guarantee that the point source discharges from Outfalls 028, 030 and 031 will not contain pollutants –indeed, EPA would expect that the discharges of stormwater and groundwater infiltration from these outfalls are likely to contain various pollutants – and it does not excuse such discharges from requiring authorization from an NPDES permit. Moreover, remedial site closure also does not guarantee that discharges from the outfalls will be protective of water quality as directed by the CWA and its implementing regulations. Thus, EPA evaluated available information, including monitoring data provided in the 2013 RAO, to determine if the discharge of stormwater commingled with groundwater infiltration would be consistent with technology- and water quality-based effluent limitations in compliance with NPDES regulations.

In its original comments on the Draft Permit, GE asserted that as part of its plans to demolish the Gear Plant and sell the property, it also planned to remove the outfall gates, vaults and overhead piping (connected to the building in question) associated with Outfalls 028, 030, and 031. Thus, GE commented that no treatment should be required for flows from this area. Subsequently, however, in its 2013 Site Assessment (p. 8), GE states that:

> While a small amount of groundwater infiltration continues to occur into the drainage systems at the former Gear Plant Area, MassDEP and USEPA asked that GE continue to treat dry weather flow until data can be provided to justify elimination of treatment in compliance with a February 9, 1999 Administrative Consent Order (ACO-NE-99-1004) between GE and MassDEP. As a result, GE re-routed the conveyance piping that was supported on the roof of the Gear Plant on route to the CDTS located in Building 35 on River Works North so that building demolition activities could move forward. Plans are

> in place to inspect and clean the end-of line vaults and catch basins prior to collecting data to justify dry weather flow elimination."

Therefore, GE has infrastructure capable of conveying the dry weather flows from the drainage system outfalls on the Gear Plant property to the CDTS.

When GE calls for EPA to eliminate outfalls 028, 030 and 031 from the permit despite continuing discharges of stormwater and groundwater infiltration from these outfalls to the Saugus River, GE is suggesting that these discharges do not need to be regulated and do not require authorization from an NPDES permit. EPA does not agree. Despite GE's assertions about the source and quality of the discharges, EPA believes that monitoring data from Outfalls 028, 030, and 031and from groundwater monitoring wells located in the drainage system for these outfalls suggests that the discharges in question may contain pollutants originating from contaminated groundwater. In 2009, monitoring results of dry weather flow indicated elevated concentrations of residual chlorine, antimony, copper, iron, and lead at Outfall 028, elevated levels of residual chlorine, copper, iron, lead, vinyl chloride at Outfall 030, and elevated levels of residual chlorine, copper, iron, zinc, and indeno(1,2,3-cd) pyrene at Outfall 031. Each of these pollutants, with the exception of residual chlorine, has been determined through historical sampling to be in the contaminated groundwater at the Lynn facility.[5] Monitoring conducted between 2007 and 2011 and reported as part of the 2013 Site Assessment and Remediation Activities[6] indicates the presence of VOCs, metals, and PAHs in groundwater monitoring wells on the River Works South site in the vicinity of stormwater drains that lead to Outfalls 028, 030, and 031. Table 3-1 of the 2013 RAO indicates the elevated concentrations of 1,1 dichloroethane, chloroethane, and vinyl chloride in groundwater monitoring wells MW01-01 and MW01-11 (located in near Bay 9 at the former TCA tank area) which drain to Outfall 030 (RAO Figure 5). In light of these considerations, EPA continues to regard it to be appropriate to address these outfalls in GE's new Final Permit.

In EPA's view, GE's proposed plan to disconnect Outfalls 028, 030 and 031 from the CDTS so that wastewater from these vaults is directly discharged without treatment or monitoring to the Saugus River, even during dry weather, would not satisfy CWA technology requirements or Massachusetts antidegradation requirements. *See* 314 CMR 4.04(3). In Attachment A and in response to GE's comments, EPA has concluded that BAT for dry weather flows at the facility is to continue to transfer and treat them in the CDTS. This includes dry weather flows that collect in the vaults at Outfalls 028, 030, and 031. Disconnecting these outfalls from the CDTS will result in the direct discharge of flows previously conveyed to the CDTS directly to the Saugus River. This could constitute a "new or increased discharge" to an Outstanding Resource Water (ORW) under the Massachusetts antidegradation regulations and policy. *See* 314 CMR 4.04; "*Implementation Procedures for the Antidegradation Provisions of the Massachusetts Surface Water Quality Standards, 314 CMR 4.00* "(October 21, 2009) ("new or increased discharges to ORWs may be allowed only where both the discharge is determined by the Department to be for

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[5] Residual chlorine is unlikely to be present following the elimination of industrial discharges from these outfalls, as chlorine likely originated from city water that GE used in industrial processes.

[6] Site Assessment and Remediation Activities in Support of an MCP Class A-3 Partial RAO Statement for Former Gear Plant and Saugus River. GE Aviation River Work s Facility. MassDEP RTN 3—357. October 2013.

the express purpose and intent of maintaining or enhancing the resource for its designated use and an authorization is granted pursuant to 314 CMR 4.04(5).").

Finally, GE comments that transfer of ownership and deletion of Outfalls 028, 030, and 031 "fall squarely within" the regulations for a minor modification at 40 C.F.R. §122.63(d) and (e)(2). These regulations state that the Director may, upon consent of the permittee, make a "minor modification" to a permit to make corrections to:

> (d) Allow for a change in ownership or operational control of a facility where the director determines that no other change in the permit is necessary, provided that a written agreement containing a specific date for transfer of permit responsibility, coverage, and liability between the current and new permittees has been submitted to the Director.
>
> (e)(2) Delete a point source outfall when the discharge from that outfalls is terminated and does not result in discharge of pollutants from other outfalls except in accordance with permit limits.

Based on present facts, EPA cannot agree that these two provisions of 122.63 apply in the case of GE's drainage system outfalls on the Gear Plant property. GE has not submitted a written agreement between the current and new owner/operators of the facility that allocates responsibility for permit compliance between the two entities. *See* 40 C.F.R. 122.63(d). Indeed, it is unclear at this time whether the property has been transferred and, if so, who now owns it. Furthermore, a change in ownership (and/or operational control) is not the only permit change sought by GE. As discussed above, GE is also seeking to change the requirements applicable to Outfalls 028, 030 and 031. Finally, GE is not proposing to terminate discharges from these outfalls. Rather, these outfalls will continue, at a minimum, to discharge stormwater and infiltrated groundwater to the Saugus River. If EPA eliminated these outfalls from GE's permit, however, then the discharges would not be authorized under the CWA and would not be subjected to proper controls under the statute.

In summary, EPA concludes that the three drainage system outfalls on the Gear Plant property (Outfalls 028, 030, and 031) cannot be removed from GE's Final Permit. Available data suggests that, for the purposes of this NPDES permit, there is a potential for contaminated groundwater to infiltrate the stormwater drains and discharge directly to the Saugus River. Under the BAT analysis in support of the Final Permit limits, EPA determined that BAT for the drainage system outfalls, including the three outfalls on the River Works South property, is to continue to collect and convey dry weather flows to the CDTS for treatment and to pump down the drainage vaults prior to a storm event likely to trigger the tide gates (see Attachment A). If, in the future, sufficient information is available to support either the direct discharge of stormwater and/or infiltrated groundwater directly to the Saugus River from these outfalls consistent with the CWA and Massachusetts antidegradation requirements, or the transfer of responsibility for these outfalls to a new owner of the Gear Plant property, EPA would consider modifying the Final Permit to address these outfalls in a different manner.

3. EPA's Assumptions about Groundwater Contamination are not Accurate; as a Result, EPA's Limits and Conditions Derived from these Assumptions are not Appropriate.

Comment 3.1: EPA's Assumptions

EPA assumed that (1) contaminated groundwater infiltrates all of GE's drains and outfalls; (2) the contaminated groundwater contains any and all pollutants ever detected through the Facility's remedial activities at levels that present water quality problems; and (3) a significant but indeterminate amount of contaminated groundwater commingles and is discharged with stormwater. EPA relied on these assumptions to derive a host of different limits and conditions in the Draft Permit, including:

a) Monitoring requirements for numerous parameters, including 14 VOCs, 7 PAHs, BTEX, PCBs, whole effluent toxicity (WET) and metals;

b) Numeric and narrative limitations and conditions including those based on application of the RGP (VOCs, BTEX, TSS) and WQS (PAHs, metals);

c) Prohibitions, limitations and prescriptive BMPs to control discharges of dry weather flows; and

d) Bioaccumulation studies for PCBs and PAHs on blue mussels.

As described below, EPA's assumptions about contaminated groundwater are not accurate. Once these assumptions are corrected, the limits and conditions on which they are based are no longer supported or appropriate, and, in turn, should be removed.

Response to Comment 3.1:

GE's comment asserts that "EPA's assumptions about contaminated groundwater are not accurate" and that "[o]nce these assumptions are corrected, the limits and conditions [of the Draft Permit] on which they are based are no longer supported or appropriate, and, in turn, should be removed." More specifically, GE makes the following three specific points: "EPA assumed that (1) contaminated groundwater infiltrates all of GE's drains and outfalls; (2) the contaminated groundwater contains any and all pollutants ever detected through the Facility's remedial activities at levels that present water quality problems; and (3) a significant but indeterminate amount of contaminated groundwater commingles and is discharged with stormwater." Because GE's subsequent comments provide more detailed discussion of the general assertions made in Comment 3.1, EPA provides general information in response to Comment 3.1 here and provides more detailed responses later in response to GE's more detailed comments on the issues identified in Comment 3.1.

(1) Contaminated groundwater infiltrates GE's drainage system outfalls

Contrary to GE's comment, EPA's conclusions about the occurrence and potential for contaminated groundwater to infiltrate GE's drainage system and be discharged from the drainage system outfalls were not based merely on assumptions. EPA's conclusions were, instead, based on a substantial amount of information. As outlined in Technical Exhibit 2[7] to GE's comments on the Draft Permit, there are documented occurrences of contaminated groundwater discharging through drainage system outfalls at the Lynn facility. According to GE's Technical Exhibit 2, there are six active remedial areas (Building 66B, Building 32/41, Building 29GT, Building 33/35, Building 64, and Building 70 MNA) onsite where GE continues to conduct Massachusetts Contingency Plan (MCP) response actions related to contaminated groundwater. In October 2013, GE submitted a report entitled, "Site Assessment and Remediation Activities in Support of an MCP Class A-3 Partial RAO Statement for Former Gear Plant and Saugus River Areas," which describes closure of activities at the Gear Plant Bay 9 remedial area. Still, most of the facility is considered to be a disposal site under the MCP as a result of releases of oil and/or hazardous waste associated with historical facility operations. The Lynn facility site is listed under the MCP as RTN 3 – 0357, MCP Remedy Phase V Remedy Operation Status. Technical Exhibit 3[8], submitted with GE's comments, indicates that while remediation treatment has resulted in overall decreasing trends in groundwater contamination, elevated concentrations of VOCs remain in some areas (e.g., total VOC concentrations higher than 60 µg/L in 2010 and 2011 at Building 32/41).

GE has also submitted information demonstrating that contaminated groundwater infiltration is discharged into the Saugus River through the Lynn facility's outfalls. In Technical Exhibit 14[9] of GE's comments on the Draft Permit, GE states that "the drainage system serving each of the outfalls may receive groundwater that infiltrates through minor openings in pipe joints and drainage structures as the tidally influenced groundwater table fluctuates with each tidal cycle. Efforts to line and seal drainage lines and infrastructure have reduced rates of groundwater infiltration. Several of the outfalls (007, 010, 019, and 027) also receive process-related dry weather flows as described below:"

Outfall	Non-Stormwater Dry Weather Flows
001	Groundwater infiltration [and any dry weather flow routed to Outfall 007 vault]
007	Groundwater infiltration, steam heating and air conditioner condensate, steam conduit water, non-contact cooling water, dry weather flow from Outfall 001 vault
010	Groundwater infiltration, steam heating and air conditioner condensate, non-contact cooling water
019	Groundwater infiltration, steam heating and air conditioner condensate, non-contact cooling water[10]
027B	Groundwater infiltration, treated water from CDTS (from Outfall 027A)

[7] Chronological Summary of Response Actions Conducted at the GE Lynn River Works Facility to Minimize Groundwater Infiltration into the Storm Drain Network and Improve Site-wide Groundwater Quality
[8] Remediation System Groundwater Concentration Trends.
[9] GE Aviation River Works Dilution Evaluation of Drainage System Discharges to the Saugus River. Prepared by AECOM for GE Aviation. May 25, 2011.
[10] Chronological Summary of Response Actions Conducted at the GE Lynn River Works Facility to Minimize Groundwater Infiltration into the Storm Drain Network and Improve Site-wide Groundwater Quality

028	Groundwater infiltration [dry weather flow routed to Outfall 030 vault]
030	Groundwater infiltration, dry weather flow from Outfall 028
031	Groundwater infiltration

In an attempt to quantify the extent of pollutants entering the drainage system just from dry weather flows, EPA asked GE to sample the contents of all of the outfall vaults during dry weather conditions, taken after 72 hours of dry weather (no precipitation).[11] The sampling results indicated that contaminated water is present in the vaults and the specific pollutants discovered in the contaminated water are consistent with pollutants that historically have been found in the contaminated groundwater at the Lynn facility, the results of which are summarized in Table 3-1. Sampling of the drainage system outfall vaults during dry weather indicates the presence of various metals and other toxic contaminants (residual chlorine, PCBs, vinyl chloride, PAHs) at levels in excess of the Remediation and Miscellaneous Contaminated Sites General Permit's (RGP)[12] technology-based limits. In EPA's view, the data supports the assertion that, as stated in the Fact Sheet (p.12) "it is reasonably possible that one or more of these contaminants could be present in any discharges of untreated groundwater."

Table 3-1. Concentrations of various contaminants identified in dry weather flows at the drainage system outfalls. Samples collected on June 29, 2009 a minimum of 72 hours after a storm.

	001	007	010	019	027	028	030	031	RGP
Antimony (mg/l)	0.0079					0.0098			0.0056
Copper (mg/l)	0.0186	0.008	0.0049	0.0109		0.0084	0.0061	0.0068	.0037
Iron (mg/l)	1.66	1.21	1.42			2.48	3.2	1.19	1.0
Lead (mg/l)						0.0097	0.01		0.0085
Nickel (mg/l)			0.11	0.019		0.0092		0.029	0.0082
Zinc (mg/l)	0.093					0.145		0.102	0.0856
Residual Chlorine[1] (mg/l)		0.03		0.03	0.04	0.02	0.02	0.02	0.02
PCBs[1] (μg/l)	*								
Vinyl chloride	2.6						2.0		2.0
PAHs[1, 2] (μg/l)	16, 18	*	*	*		*		*	5.0

* Denotes parameter detected but below minimum detection level (ML)
[1] RGP limit presented as compliance limit (equal to ML)
[2] dibenzo(a,h) anthracene, and indeno(1,2,3-cd)pyrene detected above ML at Outfall 001, benzo(k)fluoranthene detected below ML at Outfall 019 and Outfall 028, benzo(b)fluoranthene detected

[11] Response to Request for Information, Section 308(a) of the Clean Water Act (CWA), July 10, 2009, Table 2: Summary of Outfall Analytical Data.
[12] In writing the Draft Permit and Fact Sheet, EPA referred to the 2005 RGP and fact sheet. The 2010 RGP, effective September 10, 2010, used the same basis in deriving limits for each of the parameters as the 2005 RGP (*see* Attachment A to the 2010 RGP)

below ML at Outfall 028, and indeno (1,2,3-cd)pyrene detected below ML at Outfall 007, 010, 019, 028, and 031

EPA does not agree with GE that the Agency assumed "contaminated groundwater contains any and all pollutants ever detected through the Facility's remedial activities at levels that present water quality problems." As stated above, the contaminants identified in Table 3-1 were detected in dry weather flows in the drainage system outfall vaults in 2009. EPA is concerned about the potential discharge of these contaminants to the receiving water without treatment during storm events when stormwater accumulating in the vaults overwhelms the transfer pumps to the CDTS and triggers the vault gates to open. The Draft Permit included a combination of technology-based numeric limits, water quality-based numeric limits, monitoring requirements, and best management practices to address the potential for contaminated groundwater discharges to the receiving water.

In Attachment A hereto, EPA reevaluated the BAT analysis for the drainage system outfalls and determined that the BAT includes use of the existing CDTS, which was installed and is operated to treat dry weather flows, including infiltrated groundwater, prior to discharge through Outfall 027A. The technology-based limits for Outfall 027A in the Final Permit reflect the use of this technology. EPA also concluded that the BAT during wet weather is a BMP to minimize the volume of dry weather flow in the vaults when the gate is likely to be triggered due to a storm event. Because flows discharged from the vault outfalls during wet weather bypass the oil-water separator and the CDTS, numeric limits based on the use of these technologies are not appropriate for wet weather flows. Therefore, the Final Permit includes monitoring requirements for wet weather flows from the drainage system outfalls. In addition, only water quality-based limits carried forward from the current permit consistent with antibacksliding have been included for wet weather flows from the drainage system outfalls. See Attachment A for more discussion of the technology- and water quality-based limits at the drainage system outfalls.

> (2) Contaminated groundwater commingles with stormwater and is discharged with the storm's first flush, bypassing the treatment system specifically designed and installed to reduce contaminants in GE's dry weather flow

Pursuant to an Administrative Consent Order (ACO) between MassDEP and GE, GE designed its drainage system to "substantially eliminate" dry weather discharges from the drainage system outfalls. To meet this standard, GE installed equipment enabling it to close these outfalls during dry weather and convey non-stormwater from the drainage system vaults to the CDTS for treatment prior to discharge through Outfall 027A.[13] EPA summarized several ways in which dry weather flows could be commingled and discharged with wet weather flows in Part II.B.2 of the Draft Permit's Fact Sheet.

13 GE Aviation Comments on Draft NPDES Permit Technical Exhibit 15. Technical Evaluation of Commingled Dry Weather Flow and Wet Weather Flow Discharges.

GE's technical exhibits (15 and 17[14]), as well as EPA's analysis based on figures of the drainage system vaults submitted at EPA's request in November 2013, further confirm that, when a vault gate is opened due to an accumulation of wet weather flow, the initial volume of effluent is likely to contain both dry weather flow (including infiltrated groundwater) and stormwater. The limited available sampling data for the drainage system outfalls, and the information discussed above regarding dry weather sampling, suggests that there is potential for dry weather flows to include contaminated groundwater, although it is not presently possible based on existing information for EPA to develop a precise estimate of the proportion of groundwater in the flow from each outfall. GE also has not provided such an estimate.

However, under a worst-case scenario, nearly 23,000 gallons of dry weather flow could be released directly to the Saugus River. The percent of dry weather flow released when the tide gate opens ranges from 45% to almost 66% of the total initial volume released through the outfall gate. There is potential to release a considerable volume of dry weather flow that would otherwise be treated in the CDTS prior to discharge. The Final Permit includes a BMP seeking to minimize the volume of dry weather flow that would be released during wet weather. Reducing the volume in the vaults to the "low alarm level" prior to a storm event predicted to generate sufficient precipitation to open the tide gates (0.1 inches or more) would likely reduce the volume of dry weather flow released directly to the Saugus River to less than 10,000 gallons. Depending on the outfall, dry weather flows at the low alarm level comprise 5% to 35% of the total volume when the tide gates open, compared to 45% to 66% for dry weather flows at the "pump on level." Compliance with the Final Permit would reduce the volume of dry weather flow discharged to the river by nearly 13,000 gallons (57%) compared to the worst-case condition ("pump on") and by nearly 10,000 gallons (51%) compared to average operating conditions at no cost to the permittee.

Based on the information provided by the permittee, including characterization of the drainage system in the permit application and subsequent submittals and recent monitoring data, EPA has concluded that contaminated groundwater has the potential to infiltrate GE's drainage system and that dry weather flow, including contaminated groundwater, is reasonably likely to commingle with stormwater and be discharged directly from the drainage system outfalls to the Saugus River during wet weather without being treated at the CDTS. EPA's updated analysis of permit limits was based on, among other things, consideration of the BAT factors and GE's comments (see Attachment A). EPA concluded that the specified BMP to minimize the discharge of comingled dry weather flows from the drainage system outfalls during wet weather is the BAT and that, combined with monitoring of the drainage system outfalls, this BMP is currently the best approach for handling pollutant discharges from the drainage system outfalls in the Final Permit. This approach would also generally be consistent with the standard to "substantially eliminate" dry weather discharges set in the ACO.

[14] GE Aviation Comments on Draft NPDES Permit Technical Exhibit 17. Technical Evaluation of the Requirement to Collect, Convey, and Treat the First-Flush of Storm Water Commingled with Dry Weather Flow.

Comment 3.2: EPA's Assumptions Overlook GE's Extensive Pipe Relining and Replacement Effort

In describing its assumptions about the infiltration of contaminated groundwater, EPA mentions but then disregards the extensive drainage pipe relining and replacement efforts undertaken by GE. GE has relined or replaced 3.25 miles (26%) of the 12 miles of drainage pipe under its Facility at a cost of $5.1 million. GE focused this effort in areas where the piping was located below the groundwater table or subject to tidal influences, and where groundwater had been adversely impacted by historic operations based on characterization data from a network of over 150 monitoring wells and prior to extensive remediation activities under the MCP. More specifically, GE focused its lining efforts on drains to Outfalls 001, 007, 010, 027, 028 and 031. As a result of these extensive efforts, EPA cannot legitimately assume -- and the data simply will not support the conclusion that -- significant amounts of contaminated groundwater infiltrate and discharge through GE's drainage systems and outfalls.

Response to Comment 3.2:

EPA recognizes that the drainage pipe relining and replacement efforts undertaken by GE in the past have likely reduced, to some extent, the problem of contaminated groundwater infiltrating the Lynn facility's drainage system. Nevertheless, as already discussed in this RTC document, recent monitoring data and other information (*see*, generally, EPA's response to Comment 3.1), demonstrates that contaminated groundwater continues to infiltrate the drainage system. EPA's concerns about this are not based on mere assumptions, as the comment suggests.

The Lynn facility's drainage system is extensive, providing a large area with a network of main and lateral piping which handles certain process wastewater, stormwater and groundwater infiltration. GE's comment above states that it has relined or replaced "3.25 miles (26%) of the 12 miles of drainage pipe under its Facility," which is consistent with GE's representation of re-lining completed in 1991 in Technical Exhibit 2 of its Comments on the Draft Permit. Part 2 of Technical Exhibit 5 to GE's comments on the Draft Permit[15] indicates that the company has previously Insitu-lined 20% of the main pipes associated with the drainage system, but the laterals have not been lined. Given the distinctions in the terms used in these two statements, it is not entirely clear to EPA how these values relate to each other.[16] Regardless, taking the larger value of 26% would still mean that 74% of the drainage system pipe has neither been relined nor replaced. Given that approximately 10% of the drainage system pipes lie above the water table – and therefore should be unaffected by infiltration – approximately 64% of the drainage system pipes lie below the water table but have neither been relined nor replaced.

The Draft Permit's condition calling for the relining and/or repiping of dry weather flows was meant to reduce or eliminate the direct discharge of dry weather flows to the receiving water. However, EPA has carefully considered GE's comments expressing concern that the Draft Permit's requirements for drainage system pipe rehabilitation to reduce the infiltration of contaminated groundwater would prove very expensive and, in some cases, technically infeasible. Based on current information, EPA has been persuaded that eliminating groundwater

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[15] May 18, 2011 Memo from CH2MHill IDC RE: Video Storm Water Piping.

infiltration to the drainage system might be infeasible in some areas of the facility and would be extremely expensive and difficult in other areas (see Attachment A to this Response to Comments). Thus, EPA has not included that BMP in the Final Permit. Rather, the Final Permit includes BMPs that require the permittee to treat dry weather flows from the drainage system in the CDTS, and to minimize the volume of dry weather flows released with the stormwater when the tide gates open.

Comment 3.3: EPA's Assumption about Contaminated Groundwater at Outfalls 014, 018 and 020 do not Reflect Key Changes to the Facility

EPA assumes that groundwater commingles with the discharge from Outfalls 014, 018 and 020 (apparently based on statements ascribed to GE but for which neither EPA nor GE has any record). Based on this assumption, EPA has developed conditions that would force GE to inspect, reline and/or replace all of the pipes leading to these outfalls in order to eliminate the possibility of groundwater infiltration (and thereafter certify the elimination of all groundwater, even if uncontaminated). However, EPA's assumption ignores key changes by GE that obviate the need for any new conditions at these outfalls.

Outfall 014 was lined in 2002, as GE previously described in its July 2009 submittal. The outfall was internally sand blasted and "then completely sealed with applied liquid sealant, sheets of fiberglass type material were secured and a final layer of liquid finish coating was applied over that."

Outfall 018 is a salt water discharge structure/tunnel conduit constructed of concrete (10-12 inches thick) and roughly square. The top of the tunnel is just below the ground surface and extends to about 10 feet below grade. During high tide, water from the river raises the level of water in the tunnel because there is no gate valve. During low tide the river water level is below the bottom of the tunnel at the discharge. Water flows through the tunnel continuously (except for one day out of the year for maintenance) at a typical rate of about 13,000 gallons per minute to support power plant operations. At low tide with two turbines running, the water level at the outfall is approximately 3 feet deep and higher further upstream in the tunnel. Approximately 155 feet of the structure (~75%) runs parallel and immediately adjacent to the river. Therefore, the structure is impacted greatly by river water and minimally (if at all) by groundwater given tidal effects on the structure and the high flow of cooling water discharged through the system.

Outfall 020 conveys only unused river water from the cooling water reservoir for the Power Plant. This reservoir is drained, cleaned and inspected annually by licensed power plant operators and shows no signs of cracking or deterioration that would allow groundwater infiltration. In addition, the reservoir is always full of river (salt) water and as a result, the static pressure within the reservoir is higher than the hydraulic pressure from groundwater on the outside wall of the containment structure. Therefore, if the integrity of the reservoir were ever compromised, the pressure would cause river water to enter into the ground as opposed to groundwater infiltrating the reservoir. The "pipe" to Outfall 020 is essentially a concrete trough that returns the overflow water to the river. Any integrity problems would be readily visible because it is located aboveground. No such problems have been observed. The same hydrostatic pressure phenomena would apply to the trough to prevent groundwater infiltration if its integrity were compromised.

For these reasons, EPA's assumptions about groundwater infiltration into Outfalls 014, 018 and 020 cannot hold. The proposed conditions would, in effect, require GE to eliminate what has already been eliminated. Those conditions must be removed.

Response to Comment 3.3:

Upon review of additional information submitted by GE during the public comment period on the Draft Permit, and in response to GE's comment 3.3, EPA has revised its assessment of the potential for contaminated groundwater infiltration to drainage system pipes leading to Outfalls 014, 018, and 020. Accordingly, EPA has also revised the conditions applicable to Outfalls 014, 018 and 020, for the Final Permit.

GE comments that Outfalls 014, 018 and 020 do not experience groundwater infiltration, though GE also states that the outfall tunnel structure for Outfall 018 is affected "minimally (if at all)" by groundwater. GE's comment outlines different reasons why groundwater infiltration does not affect each of these outfalls. EPA has considered GE's comment in conjunction with a review of Figure 1 of GE's November 7, 2011, response to an EPA CWA Section 308 information request entitled "Underground Storm Drains and Active Remedial Areas," which further clarifies certain pipe lining efforts that GE has already completed. The figure also outlines the MCP-related active remedial areas (which contain contaminated groundwater) in relation to the Lynn facility's drainage system pipes.

Based on the new information provided by GE, EPA has concluded that the discharges from Outfalls 014, 018 and 020 are unlikely to receive contaminated groundwater infiltration. Specifically, Figure 1 (referenced above), shows that the drainage pipes associated with these three outfalls *do not* pass through locations at the Lynn facility identified as having groundwater attenuation or Light Non-Aqueous Phase Liquids (LNAPL) plumes. Additionally, these pipes are relatively short and do not protrude far into the site.

Based on GE's comment and the new information it submitted to EPA, the Final Permit has eliminated BMPs that would have required GE to, among other things, reline and/or replace pipes leading to Outfalls 014, 018, and 020. While the Draft Permit specifically authorized the discharge of minimal commingled contaminated groundwater from Outfalls 014, 018, and 020, the Final Permit authorizes only the discharge of process flows identified in the permit application consistent with the current permit and the permittee's comment regarding the absence of groundwater infiltration at these outfalls.

Comment 3.4: EPA's Assumptions about Groundwater Quality Overlook GE's Extensive Site Remediation Activities.

GE has been engaged in remediation activities for 28 years pursuant to Massachusetts General Law 21E and the Massachusetts Contingency Plan [MCP; 310 CMR 40.0000] promulgated in

1993, one of the most stringent state remediation programs in the country. Please refer to Technical Exhibit 2 for a chronology of these activities.

The majority of treated groundwater from the remediation systems is directed to the LWSC municipal sewer system for further treatment. Groundwater extracted from one remedial area (Building 29G/T) and any residual groundwater that infiltrates into the drainage system is directed to the CDTS for treatment via overhead piping. Any groundwater infiltration that escapes treatment in the CDTS during a storm event is *de minimis* in volume; is substantially buffered by the commingled stormwater in the drainage system; and is even further diluted once it mixes with the receiving water. Moreover, GE's ongoing remediation work has resulted in and will continue to cause continuous improvement of groundwater quality such that contaminant concentrations are expected to diminish over time to inconsequential levels under the MCP program.

Technical Exhibit 3 depicts the groundwater concentration trend graphs for key remedial areas of the site and show generally declining concentrations of contaminants from 2000 to present. With specific reference to the contaminants listed by EPA as requiring monitoring and/or numeric limits, the results of GE's extensive site groundwater monitoring and remediation confirm that the following constituents either have not been detected in site groundwater, have been detected at a low frequency and/or at low concentrations below relevant water quality criteria (such as Acute Ambient Water Quality Criteria or Tier II Secondary Acute Values), or are not considered constituents of concern (for example, because they are naturally occurring constituents in groundwater):

> benzene, toluene, ethylbenzene, total xylenes, BTEX, Methyl tertiary butyl ether (MTBE), carbon tetrachloride, 1,4 dichlorobenzene, 1, 2 dichlorobenzene, 1,3 dichlorobenzene, 1,2 dichloroethane, 1,1 dichloroethylene, methylene chloride (dichloromethane), tetrachloroethylene, 1,1,2 trichloroethane, vinyl chloride, total VOCs, aluminum, antimony, arsenic, beryllium, cadmium, calcium, chromium, cobalt, copper, ferrous iron, iron, lead, magnesium, manganese, mercury, nickel, selenium, silver, sodium, thallium, titanium, and Group I and II PAH compounds.

In April 2001, GE conducted an Ecological Risk Assessment of the Saugus River as part of the MCP Phase II Comprehensive Site Assessment and concluded that a condition of *no significant risk of harm to the environment* existed. This assessment took into account historical facility operations and current site conditions including the potential for, and impact of, groundwater infiltration. In 2011, GE reevaluated and reconfirmed this *no significant risk* conclusion using the additional surface water data collected between 2000 and the present (Technical Exhibit 4). In short, groundwater conditions are not causing harm and continue to improve.

Even assuming some lingering potential for groundwater infiltration into certain drainage pipes, the amount of infiltration would be insignificant when compared to total flows in those pipes. The commingling of these flows would mitigate any water quality concerns at the point of discharge. And further mixing in the receiving river would render this a non-issue from a NPDES perspective. *See* Sections VI and IX.

For these reasons, GE disputes EPA's assumptions about contaminated groundwater and urges EPA to remove the monitoring requirements, limits and other conditions derived from them. Not only is EPA's approach inaccurate, it is also unreasonable.

For example, in Part I.B.9, EPA proposes that GE develop and implement a plan for controlling infiltration of groundwater…within six (6) months of the effective date of this permit, and thereafter submit a summary report annually. As described above, GE has already undertaken extensive effort to address groundwater where it has historically been a concern. Controlling the infiltration of *all* groundwater (even if uncontaminated) is simply untenable.

Historic drawings, circa 1910 indicate that there was a network of concrete roadways at the Facility that have been paved over. The roadways are 12-inches thick with two mats of rebar. In order to replace the drainage lines, the original concrete roadways would need to be removed. Taking into account site specific factors, the project to evaluate and replace just the lateral piping situated below the water table would be approximately $30.75 million. (*See* Technical Exhibit 5).

Even if the goal of eliminating all groundwater infiltration was appropriate and achievable (which we dispute), the requirement to produce a plan for doing so within 6 months of permit reissuance clearly is not. It would take years for GE to establish baseline conditions, assess areas of impact (if any), and then design and install controls to address those areas (if necessary).

Moreover, EPA's annual reporting requirement would force GE to provide data that GE cannot meaningfully collect. It appears that EPA wants GE to calculate the annual average infiltration and inflow, as well as maximum monthly infiltration and inflow, of groundwater alone for each reporting year. However, it is not possible to make such a calculation. While GE can estimate its dry weather flows collected for treatment at the CDTS, it is not technically feasible to distinguish between groundwater infiltration, other flows generated by facility operations, residual rain water, and tidal influence that are discharged to the plant-wide drainage system. The Facility is not configured to support such a monitoring effort and there is no valid method for calculating infiltration alone.

Finally, even assuming for the sake of argument that GE should or could control and/or eliminate all groundwater infiltration, we note that groundwater will continue its natural flow to the Saugus River directly by groundwater transport through soil and via tidal influences. So even if EPA's assumptions about the threat posed by groundwater contamination were correct, its approach in the Draft Permit would result in less collection and treatment of contaminated groundwater by GE and more natural recharge between groundwater and the Saugus River via processes not regulated or monitored under the NPDES program. Such a result would be inconsistent with our shared goal of eliminating pollution in the Saugus River, and would not result in any environmental benefit.

Response to Comment 3.4:

GE has acknowledged, and the evidence indicates, that groundwater infiltrates the Lynn facility's drainage system from which some portion of it can then reasonably be expected to be discharged to the Saugus River. During dry weather, this groundwater infiltration is expected to be treated at the CDTS prior to discharge, but during wet weather, some portion of it is expected to commingle with stormwater and be discharged to the river without treatment. Many of the pollutants listed above are *not* naturally occurring constituents in groundwater and *do* present environmental concerns. The above list of pollutants includes a variety of toxic compounds, including some known to bio-accumulate in aquatic organisms (e.g., mercury). As Table 3-1 illustrates, many of these contaminants have been detected in recent sampling of dry weather flows at the outfalls. At the same time, however, there is a dearth of monitoring data to characterize wet weather discharges from the drainage system outfalls. Moreover, the nature of the contaminated groundwater infiltration problem is that it is an uncontrolled situation that is likely to be subject to variability in terms of which contaminants are present in the groundwater at any particular time and at what concentrations. As a result, there is unavoidable uncertainty about how clean or how contaminated the flows in the drainage system vaults may be during wet weather.

Therefore, it makes sense for the Final Permit's requirements to address discharges from the drainage system outfalls with technology-based limits and to try to ensure that an appropriate amount of dry weather flow from the drainage system is sent to the CDTS for treatment prior to discharge to the river. Furthermore, it makes sense to monitor the wet weather discharges to develop data to help to characterize this flow. Even assuming that efforts to remedy the groundwater contamination at the Lynn facility have resulted in improvement, it simply does not follow that no contaminated groundwater infiltrates the drainage system or that the amounts that do so are inconsequential. Moreover, it does not establish that the Final Permit's technology-based requirements are inappropriate or inconsistent with the requirements of the CWA.

GE's comment appears to object to the following requirements in the Draft Permit: 1) the requirement that GE reduce to the maximum extent practicable the infiltration of contaminated groundwater into the drainage system (along with related monitoring requirements); 2) the monitoring requirements, limits, and other conditions related to discharges of groundwater; and 3) the requirement that during wet weather conditions GE treat in the CDTS the first flush of commingled stormwater and dry weather flows (including groundwater).

In response, and as has been noted a number of times elsewhere in this RTC document, EPA's Final Permit has not retained the Draft Permit's requirement that GE eliminate, to the maximum extent practicable, the infiltration of contaminated groundwater into the Lynn facility's drainage system. (EPA's Draft Permit did not require the elimination of "all groundwater infiltration," as GE's comment suggests.) The Final Permit also has not retained a requirement that during wet weather the first flush from the drainage system be sent to the CDTS for treatment. EPA has dropped these conditions on the grounds of technical infeasibility and high cost. (EPA is not persuaded by GE's comments that potential discharges of contaminated groundwater infiltration pose no environmental concern for the Saugus River.) In addition, EPA has dropped any requirement for GE to attempt to measure and report the amount of groundwater infiltration that is occurring. In making that change for the Final Permit, EPA has considered and is persuaded by GE's comments about the practical difficulties of trying to satisfy such a monitoring requirement.

GE also comments that if groundwater infiltration into the drainage system was prevented, groundwater would still continue its natural flow to the Saugus River directly by groundwater transport through soil and via tidal influences. GE comments, therefore, that even if EPA's assumptions about the threat posed by groundwater contamination were correct, its approach in the Draft Permit would result in less collection and treatment of contaminated groundwater by GE and more transmission of contaminated groundwater to the Saugus River via natural processes not regulated or monitored under the NPDES program.

GE does not provide quantitative data to demonstrate that its prediction regarding groundwater travel to the river is correct. Moreover, that groundwater may travel through the ground to the river is not by itself a reason not to try to prevent it from infiltrating the drainage system from where it will be discharged directly to the river without treatment during wet weather. Nevertheless, there is a logic to GE's argument that instead of trying to preclude all groundwater infiltration, it might be better to allow it because at least some of that infiltration will receive treatment at the CDTS. In any event, GE's comment is no longer relevant because it was based on the Draft Permit's requirement to eliminate, to the extent practicable, the infiltration of contaminated groundwater into the Lynn facility's drainage system, and that requirement was not retained in the Final Permit. Instead, groundwater infiltration into the drainage system will be addressed by the Final Permit's requirement that the dry weather flows continue be treated at the CDTS, and that the volume of dry weather flow in the drainage system vaults be minimized prior to a storm event. These requirements should help to minimize any effect of groundwater infiltration into the drainage system on water quality in the river (albeit in a different manner than proposed in the Draft Permit). As noted earlier, this change was made in order to accommodate GE's concerns about the cost and feasibility of the BMPs contained in the Draft Permit, while also ensuring that the Saugus River's water quality is protected and that available technology is implemented by GE.

As to GE's other two objections in this comment, EPA's view is that the CWA and its NPDES permitting requirements require, at a minimum, that GE's point source discharges of contaminated wastewater (made up of commingled stormwater, groundwater infiltration and certain process waters) from the drainage system outfalls must satisfy applicable technology and water quality standards. GE is not excused from these requirements because it mixes the contaminated groundwater with stormwater, or because it has conducted its own site assessment and concluded that the site does not pose significant environmental hazards under the Massachusetts Contingency Plan.

The NPDES permitting program is designed to be "technology-forcing." In a general sense, the statute calls for EPA to consider available technology (and BMPs) that can be implemented by permittees to reduce or eliminate pollutant discharges to waters of the United States and to set permit limits that are, at a minimum, based on the use of these treatment technologies (or BMPs). As explained elsewhere in this RTC document, the record shows that groundwater infiltrates the Lynn facility's drainage system and GE itself has acknowledged this fact in its comments on the Draft Permit and various other documents submitted to EPA. Monitoring data indicates that this groundwater may contain contaminants such as hydrocarbons and VOCs. Indeed, this contamination led to GE being required to implement contaminated groundwater remediation activities under the ACO. During dry weather, groundwater infiltration into the drainage system collects in the drainage system vaults and is transferred to the CDTS for treatment and discharge through Outfall 027A. However, during wet weather, the current outfall drainage system is unable to convey all these flows to the CDTS. Instead, wet weather flows overwhelm the system's capacity to pump wastewater flow to the CDTS, the tide gates open and the commingled flows in the vaults and drainage system are discharged directly to the Saugus River through the vault outfalls while the gates remain open. This occurs for approximately one hour each time that inflow exceeds the transfer pump capacity and the gates open. During wet weather, the flow discharged to the river includes dry weather flows (including groundwater infiltration), particularly during the first flush of wet weather flow, during which the outfall gates open and any flow accumulated in the vault prior to the storm is discharged.

For GE's drainage system outfalls, EPA has determined that the BAT for treating dry weather flows, including infiltrated groundwater, is the continued use of the CDTS system, which GE supports in its comments. Therefore, the Final Permit retains the technology-based effluent limitations for Outfall 027A based on the use of activated carbon treatment at the CDTS. (*See* Attachment A to this RTC document for a more detailed explanation of the CWA's BAT and BCT requirements and the determinations made by EPA applying these standards on the basis of best professional judgment.) However, based on the operation of the vaults, this technology does not provide treatment for the dry weather flows, including infiltrated groundwater, during wet weather.

The Draft Permit's conditions calling for treatment of the first flush of wet weather flow at the CDTS, and to which GE objects in the comment, have been eliminated from the Final Permit (see Attachment A for discussion of the technology-based limits in the Final Permit). The Final Permit meets the technology-based requirements of the CWA by requiring GE to: 1) convey flows from the outfall vaults during dry weather to the CDTS for treatment; and 2) minimize the volume of dry weather flows left in the drainage system outfalls vaults prior to the onset of a storm forecasted to trip the outfall gates. In short, GE is being required to, and should be able to, implement BMPs to operate the drainage system vaults to maximize the use of the current CDTS to treat dry weather flows and minimize the discharge of untreated pollutants into the Saugus River.

GE comments that the commingling of stormwater with dry weather flows will mitigate any water quality concerns and that further mixing with the receiving water would render this a non-issue from a NPDES perspective. EPA does consider the issue of receiving water dilution (or stormwater dilution) and the predicted effects of particular pollutant discharges on the water quality of the receiving water when establishing water quality-based effluent limits, but these are not pertinent considerations when setting the technology-based limits that constitute the minimum requirements that must be met by every discharger. *See* 40 C.F.R. § 125.3(f).

In this case, EPA expects that the discharge of dry weather flows will be minimized through the technology-based requirements in the Final Permit, which EPA believes will also satisfy water quality standards. The Final Permit retains only those water quality-based limitations at the drainage system outfalls that are needed to comply with antibacksliding regulations. In addition, the Final Permit includes limited monitoring for wet weather discharges from the drainage system outfalls to ensure that the BMPs adequately minimizes discharges from the outfall vaults and to obtain data to confirm the permittee's statements that there is no reasonable potential for the wet weather discharges from the drainage system outfalls to cause or contribute to water quality impairments.

Finally, notwithstanding the points discussed by EPA above, GE comments that "any groundwater infiltration that escapes treatment in the CDTS during a storm event is *de minimis* in volume …," and that "[e]ven assuming some lingering potential for groundwater infiltration into certain drainage pipes, the amount of infiltration would be insignificant ...." GE also comments that contaminant concentrations in the groundwater "are expected to diminish over time to inconsequential levels," and that contaminated groundwater infiltrating the drainage system will be "buffered" by other wastewater and "diluted" by flows in the Saugus River.

Under the worst-case scenario, EPA estimates that nearly 23,000 gallons of dry weather flow per rainstorm could be released directly to the Saugus River. The percent of dry weather flow released when the tide gate opens ranges from 45% to almost 66% of the total initial volume released through the outfall gate. While the precise proportion of contaminated groundwater and process wastewater in the dry weather flow is uncertain, EPA believes that this potential volume of untreated dry weather flows (including process water and infiltrated groundwater) is not *de minimis*, as GE claims.

Further, the CWA and its implementing regulations do not expressly allow for the discharge of pollutants into waters of the United States in "de minimis" and/or "insignificant" amounts. Indeed, the statute states that "it is the national goal that the discharge of pollutants into the navigable waters be eliminated by 1985;" 33 U.S.C. § 1251(a)(1), and that the discharge of any pollutant except in compliance with various statutory provisions is unlawful. 33 U.S.C. § 1311(a). Such pollutant discharges must satisfy federal technology standards at a minimum, as well as any more stringent state water quality standards-based requirements that apply.

Even if EPA read an implied exception to these CWA requirements for de minimis discharges of pollutants – an issue which EPA need not, and does not, take a position on here – we would not do so in this case. GE has neither explained on a technical basis the volume of groundwater that it regards to be *de minimis* or insignificant, nor has it demonstrated that the amount of groundwater currently infiltrating the drainage system is below such a level. Furthermore, pollutant discharges are not excused from regulation under the CWA because it is suggested that contaminant levels might become "inconsequential" *at some time in the future*. Moreover, GE has not defined what it considers inconsequential levels of contamination or demonstrated that infiltrating pollutants are below those levels now or will be at any particular time in the future. This is not surprising, of course, because the data demonstrates that groundwater infiltrates the drainage system and gets discharged from the drainage system outfalls, and that this wastewater stream is by its nature variable and unpredictable.

4. Numeric Limits Applied to Wet Weather Flows are not Appropriate.

Comment 4.0:

EPA proposes to impose numeric limits on wet weather flows from a number of GE outfalls. *See* Part I.A.1 (pH, Oil & Grease, TSS, BTEX, Benzene and Cyanide); Part I.A.5 (pH, Oil & Grease, TSS). EPA attempts to justify these limits on the basis of both water quality and technology considerations. *See* Fact Sheet at pp. 28-48 (Drainage System Outfalls); pp. 63-70 (Outfall 018B). But EPA's justification is infirm. On the water quality side, numeric limits are not feasible or necessary and, in any event, are premature. On the technology side, EPA's references to standards in other sectors and settings (i.e., steam electric effluent guidelines and remediation general permit) are inapposite. And EPA has not otherwise considered the factors necessary to support a BPJ determination.

Response to Comment 4.0:

GE comments that the numeric limits contained in Table Part I.A.1 and Table Part I.A.5 of the Draft Permit are inappropriate and EPA has not adequately justified them. GE's comment 4.0 states its objections somewhat generally but provides more detailed comments in subsequent comments. Accordingly, EPA's Response to Comment 4.0 is somewhat brief and general in comparison to the Agency's later responses to GE's more detailed comments.

As described elsewhere in this RTC document and in Attachment A, the Final Permit relies primarily on technology-based effluent limits for discharges from the CDTS and technology-based best management practices (BMPs) to address the discharges from GE's drainage system outfalls to the Saugus River. These requirements include a prohibition on discharges from those outfalls during dry weather and a requirement that the level of dry weather flow in drainage system outfall vaults be minimized prior to forecasted wet weather conditions.

The Final Permit does also include water quality-based, numeric effluent limits for pH (monthly average and maximum daily limits)and Oil & Grease (O&G) (monthly average limit) that apply to discharges from the drainage system outfalls, but these limits are based on the anti-backsliding requirements of the CWA and EPA's NPDES permitting regulations. The Final Permit's numeric daily maximum limit for O&G is also consistent with the narrative requirement in both GE's current NPDES permit[17] and the Massachusetts Surface Water Quality Standards pertaining to discharges of oil and grease,[18] which prohibit discharges that would cause, among other things, a visible sheen or film on the water's surface. (Effluent data also suggests that GE can meet these limits with its existing technology.)

[17] "There shall be no discharge of floating solids, oil sheen, or visible foam in other than trace amounts." *See, e.g.,* 1993 GE NPDES Permit, §§ I.A.1.c; I.A.11.c.

[18] 314 CMR 4.05(4)(b)(7) states for Oil and Grease, "These waters shall be free from oil, grease and petrochemicals that produce a visible film on the surface of the water, impart an oily taste to the water or an oily or other undesirable taste to the edible portions of aquatic life, coat the banks or bottom of the water course, or are deleterious or become toxic to aquatic life."

Elsewhere in its comments on the Draft Permit, GE states that there is no wet weather discharge through Outfall 018B. Accordingly, the Draft Permit limits at Part I.A.5 (Outfall 018B) have been eliminated, including the effluent limitations and monitoring requirements for that outfall.

GE also comments that EPA's references to standards used for other industrial sectors and settings (i.e., steam electric effluent guidelines and remediation general permit) are inapposite. EPA disagrees. In the Agency's view, we have made appropriate use of these (and other) materials. EPA explained the manner in which it was using these materials in the record for the Draft Permit. Moreover, these issues are discussed in more detail in Attachment A hereto as well as in other responses to GE's comments, such as the response to comment 4.2.2 concerning the application of the Steam Electric ELGs and the response to comment 4.2.3 concerning application of the RGP.

Finally, GE comments that "[o]n the water quality side, numeric limits are not feasible or necessary …." Yet, neither technical nor economic feasibility are factors to be considered in determining water quality-based permit limits needed to comply with CWA 301(b)(1)(C). *See, e.g., In re Town of Westborough and Westborough Treatment Plant Board*, 10 E.A.D. 297, 312 (EAB 2002).

Comment 4.1: Numeric Water Quality-based Limits are not Feasible or Necessary and in any Event are not Justified Here.

Before imposing new, water quality-based effluent limits, EPA must first perform a "reasonable potential" analysis, and then determine and document the need for such limitations on the basis of this analysis. EPA's record does not reflect any such analysis or determination.

The mandate to perform a "reasonable potential" analysis derives from 40 C.F.R. §122.44(d)(1)(i), which requires EPA to determine whether a discharge "will cause, have the reasonable potential to cause, or contribute to, an excursion above any State water quality standard." In making this determination, EPA must "use procedures which account for existing controls on point and nonpoint sources of pollution, the variability of the pollutant or pollutant parameter in the effluent, the sensitivity of the species to toxicity testing (when evaluating whole effluent toxicity), and where appropriate, the dilution of the effluent in the receiving water. 40 C.F.R. §122.44(d)(1)(ii).

In this proceeding, the factors that EPA must consider include: (1) control of point source discharges through the CDTS, (2) control of nonpoint source discharges through the remedial activities under the MCP, (3) the extensive buffering of the effluent with stormwater or noncontact cooling water, and (4) the mixing capacity of the receiving waterbody. As described elsewhere in these comments and supporting technical exhibits, EPA has failed to consider these factors.

As part of this NPDES renewal, GE provided EPA with effluent data that preceded the installation of the CDTS and, therefore, are no longer representative. *See* Section V. GE also provided, at EPA's request, data from sampling dry weather flows entering the drainage system prior to treatment. These limited data are also not representative, because they do not reflect (1) treatment, (2) reconfiguration of portions of the drainage system, (3) dilution and mixing, or (4) continuing reduction in concentrations as a result of the MCP-related activities. *See* Sections II.C and III.D. Absent representative data for the commingled flows from GE's outfalls, EPA cannot legitimately conduct a reasonable potential analysis or assign water quality-based limits. Rather, EPA must allow GE to perform reasonable and representative monitoring so that EPA has an adequate basis to conduct a reasonable potential analysis in the next permit renewal or as part of a re-opener.

Even if EPA determines that a water quality-based limit is required as a result of a reasonable potential analysis (which arguably is premature), the Agency must document this determination. *See In the Matter of Broward County, Florida*, 4 EAD 705, 713 (EAB 1993) ("[EPA] must provide a detailed explanation of the factual basis for concluding that [the permittee's] effluent has the reasonable potential for causing or contributing to a violation of [water quality standards], thus requiring regulation in accordance with 40 C.F.R. §122.44(d)(1)."). The lack of a documented reasonable potential analysis (including the evaluation of effluent variability) is in itself "clear error and grounds for a remand." In *re Wash. Aqueduct Water Supply Sys*., 11 EAD 565, 585 (EAB 2004).

Numeric Water Quality-based Limits are not Feasible.

Site-specific constraints render numeric limits infeasible given the size, nature and cost of a treatment system capable of capturing, collecting and treating all stormwater discharges to achieve end-of-pipe numeric targets. *See* Section IX.E and the accompanying Technical Exhibit.

Numeric Water Quality-based Limits are not Necessary. Non-numeric Limits (i.e., BMPs) are Adequate to meet Water Quality Requirements. EPA Lacks any Basis in Fact, or in the Permit Record, to Refute this.

As required by its existing NPDES permit, GE has developed a Stormwater Pollution Prevention Plan ("SWPPP") and implemented a range of best management practices designed to minimize the impacts of its wet weather discharges. These practices are complimented by others maintained under GE's remedial program and other voluntary environmental management systems. GE respectfully submits that its BMP-based approach is successful in achieving compliance with existing permit requirements, as well as meeting any future water quality- or technology-based expectations. Technical Exhibit 6 describes GE's current suite of BMPs.

The use of BMPs in lieu of numeric limits is explicitly authorized by federal law and is consistent with EPA's long-standing approach to water quality based effluent limitations in stormwater permits. Section 502 of the Clean Water Act defines "effluent limitations" generally as a "restriction," thereby offering permit writers the flexibility to impose non-numerical limitations like BMPs. EPA has long endorsed this flexibility, both as a matter of regulation and policy. *See* Questions and Answers Regarding Implementation of An Interim Permitting Approach for Water Quality-Based Effluent Limitations in Stormwater Permits, Guidance for Fiscal Year 1997, 61 Fed. Reg. 57,425, 57,426 (Nov. 6, 1996):

Section 502 defines "effluent limitation" to mean any restriction on quantities, rates, and concentrations of constituents discharged from point sources. The CWA does not say that effluent limitations need be numeric. As a result, EPA and States have flexibility in terms of how to express effluent limitations. EPA has, through regulation, interpreted the statute to allow for non-numeric limitations (e.g., "best management practices" or BMPs, see 40 C.F.R. § 122.2) to supplement or replace numeric limitations in specific instances that meet the criteria specified at 40 C.F.R. § 122.44(k)…. [Also] EPA has defended use of BMPs as a substitute for numeric limitations in litigation involving stormwater discharges….

The validity of the BMP-based approach has also been confirmed by case law. *See, e.g., NDRC v. Costle*, 568 F.2d 1369 (D.C. Cir. 1977) (prompting EPA's promulgation of 40 C.F.R. 122.44(k)); *In re: Arizona Municipal Stormwater NPDES Permits for City of Tucson, Pima County, City of Phoenix, City of Mesa, and City of Tempe*, NPDES Appeal No. 97-3 (EAB 1998) (upholding permit writer's decision not to impose numeric limits on grounds of infeasibility, in particular due to the unique nature of stormwater discharges) (subsequently appealed and decided on other grounds).

GE is aware of EPA's recent revisions to a 2002 Agency memorandum entitled, *"Establishing Total Maximum Daily Load (TMDL) Wasteload Allocations (WLAs) for Stormwater Sources and NPDES Permit Requirements Based on Those TMDLs."* GE notes that the revisions are in flux as a result of a recent public comment process and EPA's commitment to take action by August 15, 2011, to either retain the memorandum without change, to reissue it with revisions, or to withdraw it. Until then, it would be premature for EPA to apply the memorandum, as revised. In any event, GE does not believe that the memorandum is directly relevant to this proceeding. Nor does GE believe that the memorandum disrupts EPA's longstanding approach to, and support for, BMPs where numeric limits are shown to be infeasible. That is clearly the case here, where numeric limits are infeasible due to site constraints and GE's BMP-based approach is demonstrated to be effective in lieu of such numeric limits.

Numeric Water Quality-based Limits are Premature.

EPA cannot calculate or confirm the need for numeric stormwater limits until "background" conditions are established, and those conditions will not be known until the ongoing remediation work is completed. As described in Section II.C and III.D, this work proceeds apace with continuing progress toward the applicable remedial goals and endpoints, all of which have the potential to affect water quality conditions. Until the remediation is complete, any decision on numeric limits is premature. Deferring this decision is consistent with other relevant NPDES permit decisions involving ongoing remediation work within EPA Region 1.

Response to Comment 4.1:

This comment by GE raises several objections to the inclusion in the permit of any water quality-based effluent limits on discharges from the drainage system outfalls. First, the Draft Permit included numeric limits for pH and Oil and Grease for discharges from the drainage system outfalls consistent with the CWA's antibacksliding requirements, *see* 33 U.S.C. § 1342(o) and 40 C.F.R. § 122.44(l), though EPA confirmed that these limits are also consistent with water quality standards. The Draft Permit did include numeric, water quality-based limits at the drainage system outfalls for total suspended solids (consistent with the narrative requirement in the water quality standards) and total cyanide at Outfall 001 (consistent with the acute national water quality criteria for cyanide) (Fact Sheet p. 36-37 and 40-41). All other numeric limits for drainage outfalls in the Draft Permit were technology-based and are discussed in response to Comments 4.2 (below) and in Attachment A.

Regarding the few numeric, water quality-based limits in the Draft Permit, EPA responds that in both cases, application of a water quality-based limit was based on analysis of wet weather sampling data submitted by GE in support of its application for renewal of its NPDES permit. In both cases, the data indicated a potential to exceed limits based on narrative (for TSS) or numeric (for cyanide) water quality criteria. Having said that, EPA has eliminated new numeric, water quality-based limits at the drainage system outfalls from the Final Permit based on GE's comments, supporting information, and more recent wet weather monitoring data. The Final Permit retains only those water quality-based limits included to satisfy the anti-backsliding requirements of the statute and regulations. *See* 33 U.S.C. § 1342(o)(1); 40 C.F.R. § 122.44(l). These anti-backsliding-based requirements are also discussed in Response to Comment 4.0, above.

For reasons discussed elsewhere in this RTC document and in Attachment A, the water quality-based effluent limits from the Draft Permit not based on anti-backsliding have not been included in the Final Permit and have been replaced by monitoring requirements. EPA has determined based on current information that the Final Permit's technology-based BMP requirements should be effective for reducing the levels of pollutants discharged and meeting water quality standards. Monitoring data collected for the wet weather discharges from the outfalls will support a more rigorous analysis of reasonable potential in the future. Authority for the monitoring requirements is provided by CWA §§ 308(a) and 402(a)(2), 33 U.S.C. §§ 1318(a) and 1342(a)(2), and 40 C.F.R. §§ 122.44(i) and 122.48. GE's comments emphasize that the water quality data it has submitted is not representative of current discharge conditions. GE was in the best position to be aware of ongoing changes to the treatment system and other circumstances at the Lynn facility and it could have taken action to collect and submit timely data representative of discharges from the drainage system outfalls under varying weather conditions. In the absence of such data, however, it makes sense for EPA to impose monitoring requirements in the permit to try to ensure that such data will be collected in the future. Indeed, GE's comments state that "EPA must allow GE to perform reasonable and representative monitoring so that EPA has an adequate basis to conduct a reasonable potential analysis in the next permit renewal or as part of a re-opener."

Having obviated GE's concerns regarding numeric water quality-based limits for the drainage system outfalls, EPA responds to two additional points raised by GE.

(1) Numeric Water Quality-based Limits are not Feasible

As explained previously, the Final Permit has taken a primarily technology-based approach to addressing drainage system discharges to the Saugus River. That technology-based approach calls for a prohibition on dry weather discharges from the drainage system outfalls, treatment of dry weather flows at the CDTS, and a requirement that drainage system outfall volumes be minimized prior to a precipitation event that is forecasted to trigger the opening of the tide gates. As also noted earlier, EPA has carefully considered GE's comments about cost and feasibility with regard to the full suite of technology-based BMPs contained in the Draft Permit (see Attachment A). That said, and as explained above, neither cost nor technological or economic feasibility are factors to be considered in determining whether water quality-based effluent limits would be appropriate in a particular permit. *See, e.g., In re Town of Westborough*, 10 E.A.D. at 312. Therefore, EPA disagrees with GE's comment to the extent that it argues that water quality-based effluent limits should not be included in the permit because it would be infeasible to meet them.

(2) Numeric Water Quality-based Limits are Premature

GE also comments that "EPA cannot calculate or confirm the need for numeric stormwater limits until 'background' conditions are established, and those conditions will not be known until the ongoing remediation work is completed." Assuming that such water quality-based limits were at issue here – which they are not – EPA disagrees that it could issue an NPDES permit without limits needed to satisfy state water quality standards on the grounds that the results of an ongoing remediation project should be assessed once it is completed at some time in the future. CWA § 301(b)(1)(C), 33 U.S.C. § 1311(b)(1)(C), plainly requires that a permit include any requirements needed to satisfy state water quality requirements. *See also* 33 U.S.C. § 1341(a)(1) (state water quality certification requirements). In the NPDES permitting context, background pollutant concentrations refer to those found in ambient conditions of the receiving water at the time of permit development.

Finally, EPA agrees with GE's comments regarding the use of BMPs in lieu of technology-based numeric limits. Indeed, EPA has largely relied upon BMP requirements in the Final Permit to address the discharges from the drainage system outfalls. EPA believes that transferring flows to the CDTS for treatment during dry weather, combined with minimizing the volume of dry weather flow in the vault released with stormwater when the outfall gate is triggered, meets the BAT standard for the discharges from the drainage system outfalls. The Final Permit includes monitoring during wet weather to ensure that the BMPs are sufficient to meet water quality standards.

Comment 4.2: EPA Lacks a Legitimate Technical Basis to Derive or Impose Numeric Technology-Based Limits.

Where, as here, a limit is not required by EPA's national effluent guidelines, then a case-by-case technology-based limit, based on best professional judgment ("BPJ"), may be imposed only if the permit writer performs the analysis required in 40 C.F.R. § 125.3. Under that regulatory provision, the permit writer must consider the factors in § 125.3(c):

(i) The appropriate technology for the category or class of point sources of which the applicant is a member, based upon all available information; and

(ii) Any unique factors related to the applicant.

The permit writer also must consider the factors in § 125.3(d), which are different for BPT, BCT or BAT requirements. For example, the factors for BPT requirements are:

(i) The total cost of application of technology in relation to the effluent reduction benefits to be achieved from such application;

(ii) The age of the equipment and facilities involved;

(iii) The process employed;

(iv) The engineering aspects of the application of various types of control techniques;

(v) Process changes; and

(vi) Non-water quality environmental impact (including energy requirements).[19]

When conducting the required § 125.3 analysis, the permit writer must look at both the industry as a whole and the particular facility.[20] In other words, before imposing a BPJ limit on GE, EPA must conduct a reasoned analysis of control technologies available for pollutant removal at jet engine manufacturing facilities in general, and at the Lynn Facility in particular. Moreover, that analysis must be included in the fact sheet for the Draft Permit. Here, it was not. Rather, EPA simply assumed, without any supporting analysis, that the proposed technology-based limits would be technically and economically feasible.

Notwithstanding the absence of the required BPJ analysis, EPA proposes to impose a number of new technology-based numeric effluent limits on wet weather discharges from the Facility. For example, EPA says that "consistent with the RGP and individual permit effluent limits for contaminated groundwater discharges and combined discharges at similar facilities in Massachusetts, EPA has on a BPJ basis established limits for benzene of 5.0 µg/L and total BTEX of 100 µg/L in wet weather discharges from the Drainage System outfalls." EPA claims that these technology limits are "based on treatability using carbon adsorption, a proven technology capable of removing benzene and other petroleum hydrocarbons from water." The fundamental flaw in EPA's analysis is that the technology basis for the proposed limits is active treatment, which does not currently exist for wet weather discharges from the Facility. As EPA states in its Fact Sheet, such a system is infeasible/cost prohibitive to install.

Response to Comment 4.2:

GE comments that because there is no NELG that applies directly to pollutant discharges from the facility's drainage system, any technology-based requirements imposed in the NPDES permit by EPA must be based on a BPJ application of the relevant technology standards. GE also points

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[19] 40 C.F.R. § 125.3(d)(1).

[20] *See U.S. Steel Corp. v. Train*, 556 F.2d 822, 844 (7th Cir. 1977); *Alabama v. EPA*, 557 F.2d 1101, 1110 (5th Cir. 1977).

to the criteria to be applied in such a BPJ determination, as per EPA regulations at 40 C.F.R. §§ 125.3(c) and (d). EPA agrees with GE's comment up to this point. It is consistent with EPA's explanation of how technology standards would be applied for the GE permit, as presented in Part I.V.B.1 of the Fact Sheet to the Draft Permit (*see* pp. 16 – 23). As EPA has also explained, the Agency may also look to a variety of other sources (e.g., NELGs for other analogous industries, permit limits for other analogous facilities) to support its development of site-specific limits on a BPJ basis.

GE's comment goes on, however, to state that EPA "simply assumed, without any supporting analysis," that the proposed technology-based limits could be met at GE. EPA disagrees with this comment. EPA provided its BPJ determination of technology-based permit limits for both dry weather and wet weather pollutant discharges from the drainage system outfalls in the Fact Sheet for the Draft Permit (*see* pp. 28-48), and the Agency's conclusions were not based on mere assumptions. Moreover, after considering the comments and supporting information received on the Draft Permit, EPA has revised and improved its BPJ analysis and appended it as Attachment A to this document.

GE also comments that EPA's BPJ determination of technology-based requirements for its facility must include an investigation of other *jet engine facilities* as well as an assessment of the facts of the GE facility, itself. As to the latter point, EPA agrees that it must consider the relevant factors for determining technology-based requirements, such as cost and engineering issues, in terms of the specific facts of the GE facility. EPA clearly has done so in the Fact Sheet and the revised analyses supporting the Final Permit. As to the former point, EPA also agrees with GE that in determining technology-based limits on a BPJ basis, it is appropriate to consider approaches to controlling pollution used by, and effluent limits set for, other facilities that are similar or analogous in pertinent ways to the subject facility. At the same time, however, EPA disagrees that it was required to investigate other jet engine facilities in order to develop technology-based limits for this permit on a BPJ basis. EPA explained, and GE has agreed, that there are no NELGs directly applicable to the GE facility's drainage system discharges. EPA also explained its view that it in determining limits for GE, it was relevant to consider requirements in place for other facilities dealing with similar water pollution issues to those presented at GE's facility, such as the management of contaminated groundwater that has potentially been commingled with process wastewater and/or stormwater prior to discharge. EPA identified a number of such facilities and discussed them in its analysis. In setting limits to control this type of discharge of pollutants, EPA regards these facilities to be more relevant to the BPJ analysis than would be a jet engine facility without similar pollution problems. Furthermore, while EPA would gladly have considered a pertinent jet engine facility, the Agency is not aware of another jet engine facility presenting similar pollutant discharge problems as those presented at GE and the company has not identified one that it believes EPA should evaluate.

EPA also explained its view that it made sense to consider the NELGs for Steam Electric Power Plants, 40 C.F.R. Part 423, given the similarities between GE and Steam Electric Power Plants associated with equipment containing fuel oil and/or the leakage associated with the storage of oil. EPA has provided these explanations in the Fact Sheet as well as in Attachment A hereto.

GE goes on to comment that "[n]otwithstanding the absence of the required BPJ analysis, EPA proposes to impose a number of new technology-based numeric effluent limits on wet weather discharges from the Facility." Upon further review of all relevant information, however, EPA's Final Permit makes a number of changes to the numeric effluent limits that were proposed in the Draft Permit to control drainage system discharges during wet weather. As explained in Attachment A hereto, EPA has determined that the BAT and BCT for managing the commingled flow of stormwater, groundwater, and process wastewater that discharges through the Drainage System Outfalls is a package of BMPs that require GE to continue to transfer and treat flows at the CDTS during dry weather and to take steps to minimize the volume of dry weather flow contained in the vaults prior to a forecasted precipitation event.

The Final Permit includes numeric, technology-based limits for dry weather flows from Outfall 027A following treatment in the CDTS. These BPJ-based numeric limits are consistent with technology-based limits for activated carbon treatment at the CDTS (see Attachment A). These effluent limits are already in the existing NPDES permit and GE has not opposed retaining them in the new permit. The Final Permit, however, eliminates technology-based numeric limits for wet weather discharges from the drainage system outfalls, including the Draft Permit's proposed technology-based effluent limits for discharges of BTEX and benzene. As GE comments, "active treatment … does not currently exist for wet weather discharges from the Facility." Because even minor stormwater flows overwhelm the vaults' transfer pumps and trigger the tide gates to discharge commingled stormwater and dry weather flows to the Saugus River in a relatively short period (from 2 to 24 minutes depending on the outfall and drainage pipe flow), these discharges do not receive treatment either at the CDTS or through the oil water separator. As a result, GE may, as its comment indicates, not be able to meet the limits that were proposed Draft Permit. Therefore, EPA has concluded that the numeric, technology-based effluent limits contained in the Draft Permit that were based on treatment with an oil water separator and/or activated carbon should not be applied for wet weather discharges from the drainage system outfalls. The Final Permit includes monitoring requirements for BTEX and benzene, among other constituents, in place of the Draft Permit's technology-based numeric effluent limits for the Drainage System Outfalls. Monitoring is necessary to confirm that the BMPs in the Final Permit address wet weather discharges from the Drainage System Outfalls in a way that is adequate to meet water quality standards. *See* Attachment A for the BAT analysis for the drainage system outfalls.

Comment 4.2.1: EPA is Required to Regulate Similar Facilities Similarly but has Failed to do so Here.

EPA indicates that GE's Drainage System Outfalls are in many ways similar to Conoco Phillips Stormwater Outfall 001 and ExxonMobil Outfall 01A; however, monitoring requirements for the GE Drainage System Outfalls are in many ways more stringent. Examples include:

- Monitoring frequency for most GE parameters is monthly as compared to quarterly for Conoco Phillips and ExxonMobil;
- Total BTEX (100 μg/L) and benzene (5 μg/L) limits in the Draft Permit are more stringent than those for the other two facilities;

- Draft Permit requires quarterly chronic WET testing, whereas no WET testing is required for either Conoco Phillips 001 or ExxonMobil 01A;
- Draft Permit requires monitoring for PCBs, Total VOCs, 14 specific VOC parameters and 8 specific metals parameters, whereas there are no similar monitoring requirements for Conoco Phillips 001 and ExxonMobil 01A.

With regard to total BTEX and benzene, we note that in the ExxonMobil proceeding, EPA initially proposed technology limits on commingled discharges dominated by stormwater using a treatment technology developed to treat low-flow discharges of contaminated groundwater (i.e., similar to what EPA proposes here). However, ExxonMobil appealed those limits on grounds that EPA failed to determine that the technology was feasible at its facility for the particular commingled flows at issue. Based on this appeal, EPA later withdrew the contested limits.

We urge EPA to be consistent in its approach to similar facilities and discharges. Toward that end, EPA should remove the proposed limits for both total BTEX and benzene. Furthermore, we urge EPA to revisit the need for, types of, and frequency of the monitoring requirements for the other parameters noted above to ensure consistency among similar facilities.

Response to Comment 4.2.1:

In this comment, GE agrees that it makes sense for EPA to look to the Exxon/Mobil and Conoco Phillips permits in conducting the BPJ analysis, but, according to GE, the Draft Permit's requirements are inconsistent with NPDES permit requirements applied to those facilities. GE comments that EPA should rectify this problem first by removing the Draft Permit's proposed numeric limits for total BTEX and benzene in drainage system outfall discharges of groundwater commingled with stormwater. The Final Permit satisfies GE's comment in this regard because EPA has, for the reasons described above, removed these numeric effluent limits for wet weather discharges from the drainage system outfalls in the Final Permit. (While numeric effluent limits for these constituents are retained in the Final Permit for dry weather discharges from the CDTS (Outfall 027A), GE does not object to those limits.)

GE also asks EPA to "revisit the need for, types of, and frequency of the monitoring requirements for … [a variety of] parameters … to ensure consistency among similar facilities." GE points to a variety of monitoring requirements in the Draft Permit that it suggests are more stringent than, and inconsistent with, the NPDES permits issued to the ExxonMobil and Conoco Phillips facilities. Consistent with these permits, GE urges that the Draft Permit's conditions calling for monthly monitoring for a variety of constituents in wet weather discharges from the Drainage System Outfalls should be revised for the Final Permit to require only quarterly monitoring. EPA considered the ExxonMobil and Conoco Philips permits during its development of the GE Draft Permit and has considered them again in response to GE's comments and to aid in the development of GE's Final Permit. EPA has also considered GE's comments regarding the relationship of its permit to the permits for these other facilities.

At the outset, EPA notes that there is no requirement that monitoring requirements for different, though similar, facilities must be identical. Monitoring requirements should be reasonable in light of the facts of each case and this standard allows for reasonable variation between the requirements for similar facilities. Moreover, even similar facilities may have differences that lead to different monitoring requirements or effluent limits. EPA has properly developed the monitoring requirements for the GE, ExxonMobil and Conoco Phillips permits on a case-by-case basis. EPA includes the monitoring requirements in the Final Permit under the authority provided by CWA §§ 308(a) and 402(a)(2), 33 U.S.C. §§ 1318(a) and 1342(a)(2), and 40 C.F.R. §§ 122.44(i) and 122.48.

In the case of the permit for GE, the monitoring frequencies were set in an effort to produce sufficient data to reasonably characterize the discharges from the drainage system outfalls without imposing an overly burdensome monitoring program. The monitoring requirements in NPDES permits are always important, but they are particularly important with regard to GE's drainage system outfalls for several reasons. First, the wastewater in the drainage system consists of a mixture of process water, potentially contaminated groundwater infiltration, and stormwater and the latter two flows are variable in quality and uncontrolled prior to entry into drainage system. In other words, the wastewater in the drainage system can contain a changeable mixture of contaminants. Additional representative monitoring data will help EPA better characterize the identity and concentration of pollutants in the discharge. This will enable a determination of whether there is a reasonable potential to violate, or contribute to a violation, of water quality standards to be made with greater confidence. Second, sampling of the infiltrated groundwater has revealed a wide range of pollutants that may be present, including a number of toxic constituents. Monitoring data will help reveal whether any discharges of these toxins are occurring during wet weather. Third, while the Final Permit requires BMPs both to eliminate drainage system outfall discharges during dry weather and to minimize discharges of dry weather flows during wet weather, which EPA believes collectively meet technology-based standards and will protect water quality, untreated commingled flows from the drainage system outfalls will discharge to the Saugus River during wet weather (see Attachment A). Therefore, further characterization of this wastewater is needed and monitoring is critical to ensure that the BMPs sufficiently address wet weather discharges.

That said, GE comments that the monitoring requirements for the drainage system outfalls are more stringent than similar outfalls at Conoco Phillips and Exxon Mobil, which EPA agrees are similar in that outfalls at all three facilities discharge stormwater commingled with groundwater and have similar constituents of concern (e.g., VOCs and PAHs). Despite this similarity, there are also, however, substantial differences between the discharges from the three facilities which affect the monitoring requirements. Most importantly, both ExxonMobil and Conoco Phillips capture and treat stormwater and commingled groundwater up to and including the 10-year, 24-hour storm prior to discharge. In contrast, GE treats flows in its CDTS only during dry weather, while wet weather flows, which include a portion of dry weather flows (i.e., commingled infiltrated groundwater and process water), are discharged untreated to the Saugus River. Thus, while effluent monitoring is very important at all three facilities, it is of heightened importance at GE. While EPA has concluded based on current information that the BMP approach required by the Final Permit for wet weather discharges from the drainage system outfalls will meet technology- and water quality-based standards, further monitoring is required to characterize this wastewater and demonstrate whether water quality standards are being satisfied.

At the same time, consistent with the thrust of GE's comment, EPA has reconsidered the number of samples for both the effluent and the receiving water necessary to increase the data quality, reduce the standard deviation (i.e., variability), and increase the confidence level of the data set. In general, a larger sample size results in a greater confidence level that the sample collected is representative of the actual concentration of a parameter in the effluent at any given time. EPA's *Technical Support Document for Water Quality-based Toxics Control* recommends 8 to 12 samples for a chemical-specific effluent characterization process. However, because wet weather discharges from GE's drainage system outfalls are intermittent and likely to be highly variable, EPA believes that a higher number of samples is warranted to reduce uncertainty and more accurately characterize the effluent. Over a five-year permit term, quarterly sampling will yield 20 data points, rather than the 60 data points that would be collected from the monthly sampling proposed in the Draft Permit.

After reconsidering the issue, EPA has reduced the monitoring to a quarterly requirement, as GE requested, because the 20 data points will likely be sufficient to characterize the effluent and enable a robust analysis of the "reasonable potential" for a discharge to cause "an excursion above any State water quality standard …." 40 C.F.R. § 122.44(d)(1)(i). The Final Permit has changed the Draft Permit's monthly monitoring requirements to quarterly monitoring requirements (*without* effluent limits) for wet weather discharges from the Drainage System Outfalls for TSS, BTEX, benzene, toluene, ethylbenzene, total xylenes, VOCs, individual VOCs, TRC, total PAHs, individual Group I PAHs, metals, and PCBs. In addition, in the Final Permit, EPA has dropped the Draft Permit's numeric limits for wet weather discharges, including the limits for BTEX and benzene, with the exception that the Final Permit has retained the effluent limits for the conventional pollutants pH and O&G, which are carried forward consistent with anti-backsliding (quarterly monitoring is also required for these constituents).

With regard to the whole effluent toxicity (WET) testing requirements for the drainage system outfalls at GE, WET testing requirements have been reduced to two per year and limited to the static 48-hour acute WET test. Due to the intermittent nature of the discharges during wet weather, EPA has dropped the requirements for chronic WET testing from these outfalls. This monitoring frequency is consistent with both the Conoco Phillips permit, which requires twice yearly acute WET tests for discharges from Outfall 001 (treated effluent), and the ExxonMobil permit, which requires twice yearly acute WET tests for discharges from Outfall 01C (continuous treatment effluent).

Regarding the other parameters that GE mentions in its comment (PCBs, total VOCs, individual VOCs, metals), EPA responds again that there is limited data representative of wet weather discharges from the drainage system outfalls at GE, but the data that is available indicates that these constituents may be present (see response to Comment 3.1). In response to GE's concerns, however, EPA has reduced the monitoring frequency in the Final Permit for these parameters to quarterly.

Comment 4.2.2: In the Absence of any Directly Applicable Effluent Guidelines, EPA Borrows from the Steam Electric Industry Sector based on a Comparison that is not Borne out by the Facts.

GE is a jet engine manufacturer. None of the wastewater streams at issue in this permit proceeding are subject to national effluent limitations guidelines (NELGs). Absent any directly applicable NELGs, EPA proposes to borrow from the steam electric NELGs. EPA's proposal extends beyond GE's Power Plant to other outfalls that have nothing to do with power generation. Even at the Power Plant, application of the steam electric NELGs would be inappropriate.

At the time EPA developed the steam electric NELGs, the Agency was aware that many manufacturing plants generated power for their operations, but EPA specifically decided to exclude them from coverage under the rule by focusing on facilities primarily engaged in the generation of electricity for distribution and sale. As a result, EPA did not develop any kind of record of evaluation for manufacturers like GE.

GE's Power Plant is distinguishable from commercial power production facilities because electricity generation is not its primary mission. The GE Power Plant is more aptly termed the "GE Steam Plant" because it was designed primarily to produce various levels of steam pressure for site operations, including 650 psig steam needed for specialized and intermittent aircraft engine and component testing. Due to the critical nature of process steam at the site as well as operational issues relating to starting boilers and time to reach required pressure/temperature, the GE Power Plant operates a minimum of two boilers at all times.

The boilers produce significantly more steam than is required to support site steam consumption external to the GE Power Plant, and in order to avoid venting excess steam, the GE Power Plant uses the excess steam to produce electricity. Thus, electrical generation at the GE Power Plant frequently is driven by the need to condense steam generated by boilers operating at minimum turndown. It does not produce all the electrical power needed at the Facility, and GE purchases the other electrical power it needs from the local grid at a lower cost.

The GE Power Plant serves an ancillary and support function for the manufacturing operations; it covers only 1.4 % of the space at the Facility. For the last two years, GE has received essentially zero revenue from selling or exporting electric power to the local grid.

In the steam electric NELGs, EPA predicated the numeric limits for total suspended solids (TSS) and oil and grease on data from many facilities in the industry that burn coal and oil to produce steam, which in turn produces fly ash and bottom ash that may contaminate various wastewaters. By contrast and as noted previously, the GE Power Plant essentially burns only natural gas.

Low volume waste streams considered in the steam electric NELGs included boiler blowdown, wet air scrubber pollution control systems, ion exchange water treatment system discharges, water treatment evaporation blowdown, laboratory and sampling waste streams, floor drains, cooling tower basin cleaning wastes, and discharges from house service water systems. By contrast at GE, many of these wastestreams are not present or, alternatively, discharge to the LWSC, which is the local POTW.

The only wastewater streams discharged by the GE Power Plant that fit the stream electric NELGs profile are boiler blowdown and ion exchange regeneration water that discharge through Outfall 018 and Outfall 019, respectively. Outfall 019 also receives a stormwater component, so it and all of GE's other wastewater and stormwater streams are fundamentally dissimilar discharges from those contemplated by EPA in adopting the NELGs.

In EPA's 2009 detailed study of the steam electric industry, the Agency found that the steam electric NELGs are rarely applied as BPJ to facilities such as the GE Power Plant. *Steam Electric Point Source Category: Final Detailed Study Report* (EPA 821-R.-09-008), p. 7-19 Oct. 2009. As a part of its study, EPA reviewed a category of facilities it terms "industrial non-utilities" which includes "cogenerators, small power plants, and other non-utility generators [that] generally do not produce electric power for distribution and/or sale." *Id.* at 7-10. This group of facilities included NAICs 336 (Transportation Equipment Manufacturing) among many other types of manufacturing categories. *Id.,* Table 7-3, p. 7-14. Thus, EPA's consideration of industrial non-utilities likely included the GE Power Plant.

In summary, there is no requirement to -- and no justification for -- applying the steam electric NELGs through BPJ to the GE Power Plant (let alone any of the other outfalls at the Facility).[21] Any BPJ application of the guidelines would be grossly inappropriate because the nature and kind of discharges from this facility are not at all analogous to the discharges contemplated by the Part 423 guidelines, as demonstrated above. Additionally, EPA has determined that a similar group of plants rarely has BPJ steam electric limits applied, which demonstrates that it would be unfair to apply them to the Facility.

Finally, EPA is planning to revise the existing steam electric NELGs, and has agreed to propose its revisions by July 2012. As a part of that rule, EPA may clarify regulation of small power plants at industrial non-utilities. EPA's focus on industrial non-utilities in the 2009 detailed study shows that EPA is aware of the issue and is very likely to address it. In the meantime, it would be premature to apply the existing steam electric NELGs.

Response to Comment 4.2.2:

GE comments that the Draft Permit's requirements were improperly based upon the National Effluent Limitations Guidelines for the Steam Electric Power Generating Point Source Category, 40 C.F.R. Part 423 (Steam Electric NELGs). GE's comment argues that the Power Plant (which GE now suggests would be better labeled as the "GE Steam Plant"), and its discharges, are different from those that EPA developed the Steam Electric NELGs to address. For example, GE states that unlike the facilities addressed by the Steam Electric NELGs, its Power Plant does not sell electric power to a significant degree (noting that it has received no revenue from any such sales for the prior two years), serves only a supporting, subsidiary role at the GE Aviation facility, occupies only a small fraction of the total space at the facility, and provides only a

[21] This conclusion applies in equal measure to the steam electric BMPs that EPA borrowed from the MSGP for this proceeding.

portion of the overall facility's power needs. GE also argues that EPA applied the Steam Electric NELGs beyond GE's Power Plant to support permit requirements for discharges from other outfalls that have nothing to do with power generation.

GE states that at the time EPA developed the Steam Electric NELGs, the Agency was aware that many manufacturing plants generated power for their own operations, but that EPA specifically decided to exclude those manufacturing plants from coverage under the NELG, deciding, rather, to focus on facilities primarily engaged in the generation of electricity for distribution and sale to other parties. Moreover, GE suggests that EPA "may clarify," and "is very likely to address," the regulation of power plants at industrial non-utilities when it updates the Steam Electric NELGs in July 2012, and that EPA should not apply these NELGs to GE prior to reviewing the updated regulations. In addition, GE also argues that the waste streams that the Steam Electric NELGs were designed to address, such as discharges of TSS from coal-burning power plants, are different from the waste streams that its natural gas-burning facility produces.

While EPA agrees with certain aspects of GE's comment, the Agency disagrees with other aspects of the comment as well as its overall thrust. EPA has been clear that there is no ELG that strictly applies to GE's facility and dictates the new NPDES permit's limits.[22] As a result, and as was explained in the Fact Sheet for the Draft Permit, EPA considered the requirements contained in certain NELGs and NPDES permits for similar or analogous types of facilities or industries that could reasonably inform the development of NPDES permit conditions for GE's Lynn facility.

For example, the Steam Electric NELGs address certain pollutants commonly discharged by the Steam Electric Power Generating Point Source Category, *see* 40 C.F.R. Part 423, but these NELGs do not strictly apply to GE's Lynn facility. The Steam Electric NELGs are "applicable to discharges resulting from the operation of a generating unit by an establishment *primarily engaged in the generation of electricity* for distribution and sale which results primarily from a process utilizing fossil-type fuel … in conjunction with a thermal cycle employing the steam water system as the thermodynamic medium," 40 C.F.R. § 423.10 (emphasis added), but EPA expressly concluded in the Draft Permit's Fact Sheet that GE's Lynn facility is *not* primarily engaged in the generation of electricity for distribution and sale. Therefore, EPA also concluded that the GE permit's limits are not strictly governed by the Steam Electric ELGs. Nevertheless, EPA determined on a case-by-case, BPJ basis that it was reasonable to rely *in part* on the Steam Electric NELGs to help in the development of certain technology-based limits for GE's permit. This is because the discharges from the GE Power Plant raise largely the same water pollution control issues as those raised by facilities that *are* covered by the Steam Electric NELGs. Although GE Aviation is not "primarily engaged in the generation of electricity for distribution and sale,"[23] GE *does* operate an on-site steam-electric power plant (fired by natural gas) for the

[22] EPA has not promulgated NELGs for manufacturers of Aircraft Engine and Engine Parts (SIC 3724) and Speed Changers, or of Industrial High-Speed Drives, and Gears (SIC 3566).

[23] Although not primarily engaged in the generation of electricity for distribution and sale, GE has at times distributed and sold some of the electricity it generates at the Lynn facility.

production of steam and electricity. In other words, the facility has pollutant "discharges resulting from the operation of a generating unit . . . engaged in the generation of electricity . . . which results primarily from a process utilizing fossil-type fuel … in conjunction with a thermal cycle employing the steam water system as the thermodynamic medium."

As outlined in Chapter 7.2 of the Steam Electric Power Generating Point Source Category: Final Detailed Study Report:[24]

> The steam electric generating process used at industrial non-utilities is similar to that used by all steam electric plants, as described in Section 3.2. A boiler or Heat Recovery Steam Generator (HRSG) is used to generate steam that is in turn used (at least in part) to drive an electric generator or turbine. Finally, the steam is condensed through noncontact cooling before it is returned to the boiler. Additionally, some of the steam generated may be used by the plant for other process operations. Since the processes are similar, EPA expects that industrial non-utilities generate wastewater from the same sources as do steam electric plants regulated under the Steam Electric Power Generating effluent guidelines.
>
> Wastewater generated by the steam electric processes at industrial non-utilities is not currently regulated by the Steam Electric Power Generating effluent guidelines, because the plants are not "…primarily engaged in the generation of electricity for distribution and sale…" With the exception of certain instances (e.g., certain subcategories of the Pulp, Paper and Paperboard effluent guidelines; see 40 C.F.R. Part 430.01(m)), steam electric wastewaters from industrial non-utilities are not directly regulated by effluent guidelines. Information that EPA obtained during the detailed study indicates that industrial plants operating steam electric generating units use a similar process as those plants currently regulated under the Steam Electric Power Generating effluent guidelines. These industrial plants use both fossil and non-fossil fuels to generate the steam to drive the turbines.
>
> The electric generating units at industrial facilities are typically smaller than those at plants regulated under the Steam Electric Power Generating effluent guidelines. Additionally, the industrial non-utilities burning coal as the primary fuel source typically burn significantly less coal than the coal-fired steam electric plants regulated under the Steam Electric Power Generating effluent guidelines. Because industrial non-utilities tend to be smaller in terms of electric power production and coal usage, the relative volume of wastewater discharged by these plants associated with electricity generation is likely to be less than that discharged by steam electric plants regulated under the Steam Electric Power Generating effluent guidelines.
>
> The information collected during the detailed study indicates that most industrial plants commingle the wastewaters associated with the electric generating units with the other plant process wastewaters. Because the wastewaters are commingled, they may be treated in the plant's wastewater treatment system. These commingled wastewaters typically

[24] EPA 821-R-09-008

> have permit limits based on the industry-specific effluent guidelines; the Steam Electric Power Generating effluent guidelines limits are typically not used to set BPJ-based limits.

Based in part on the above analysis, GE suggests that EPA should not use the Steam Electric NELGs to help inform its BPJ-based limits for the GE permit. Yet, EPA does not agree. First, EPA's observation that the Guidelines have not "typically" been used to set BPJ-limits at subsidiary power plants at industrial facilities does not legally bar EPA from doing so for this permit. In addition, EPA states that commingled wastewaters typical of industrial facilities have permit limits based on industry-specific effluent guidelines. As EPA has indicated in this response and elsewhere in this document, EPA has not promulgated NELGs for manufacturers of Aircraft Engine and Engine Parts and Speed Changers, or of Industrial High-Speed Drives, and Gears. Therefore, there is no alternative NELG that would take precedence over the Steam Electric NELGs. At the same time, EPA's analysis quoted above indicates the areas of similarity between the industrial processes and wastewater generated by steam electric power plants regulated by the Steam Electric NELG and the industrial processes and wastewater generated by the steam electric processes at industrial non-utilities. This suggests that it may make sense to consider the NELGs for the purpose of developing BPJ-based limits for industrial non-utilities with steam electric generating units.

Finally, GE comments that it is premature for EPA to apply the existing steam electric NELGs, and that EPA should wait for revisions to these NELGs. However, although EPA proposed revisions to the NELGs on June 7, 2013, these revisions have not been finalized and are not in effect. At present, EPA plans to sign a decision taking final action on the rulemaking by September 30, 2015. The additional time will allow EPA to respond to the large volume of public comments received on the rule. *See* http://water.epa.gov/scitech/wastetech/guide/steam-electric/proposed.cfm. Therefore, not only is a new Final Rule not yet in effect, but it is presently unclear what the terms of such a Final Rule will be. Therefore, EPA concludes that it should not rely on the Proposed Rule in developing this BPJ permit, but that the existing Steam Electric NELGs, which are still in effect, can reasonably inform the development of certain NPDES permit conditions for GE's Lynn facility.

Having said that, these NELGs were used only to inform the BPJ limits for pH, oil and grease, and total suspended solids (TSS) at Outfall 018C and the numeric, technology-based TSS limit at Outfall 027A. According to GE, discharges from Outfall 018C include boiler startup/soot blower drains/boiler draining for maintenance, de-aerator storage tanks, and boiler blowdown. As GE states, boiler blowdown is considered a low volume waste consistent with the Steam Electric ELGs. Therefore, EPA does not believe that the limited use of the Steam Electric ELGs to inform the BPJ numeric limits for Outfall 018C is improper. Contrary to the suggestion in GE's comment, the TSS and O&G standards are not applied only to coal-burning power plants. The technology-based numeric effluent limit for TSS at Outfall 027A was based not on the similarity of wastestreams, but on the identification of TSS as a potential pollutant due to the drainage associated with equipment containing fuel oil and/or the leakage associated with the storage of oil (USEPA, 1982). In developing effluent limits for Steam Electric Source Category, EPA considered the level of treatment that could be technologically achieved for TSS using an oil/water separator and set corresponding limits in the guidelines. Given that GE uses oil/water separator technology in the drainage system vaults to treat the flow accumulated therein prior to conveying that flow to the CDTS for further treatment, EPA used the same TSS limits (BPT limits of 100 mg/L (daily maximum) and 30 mg/L (30-day average)) established for steam electric facilities for GE in the Draft Permit. Furthermore, the equalization tanks that GE uses in connection with the CDTS will also remove TSS. Indeed, if TSS levels were not adequately controlled, they could interfere with the effectiveness of the GAC units in the CDTS. In developing similar TSS limits for the RGP, EPA pointed out that TSS limits were particularly important for maintaining good operation of subsequent treatment units, such as carbon adsorption. EPA notes that the RGP's limits are consistent the TSS limits in GE's permit. The Final Permit retains this numeric, technology-based TSS limit at Outfall 027A. This TSS limit, and the consideration of the Steam Electric NELGs, is also consistent with NPDES permit issued to Conoco Phillips (NPDES Permit No. MA000406) (also see discussion of Final Permit limits for Outfall 027A in Attachment A). EPA is confident that GE will be able to meet the TSS limits in the Final Permit if it properly maintains and operates its existing treatment equipment.

EPA disagrees with GE's comment that the Agency applied or used the Steam Electric NELGs to develop limits for the numerous other discharges at the facility (e.g., the drainage system outfalls). As stated in the Fact Sheet, the numeric limits for pH and oil and grease at Outfalls 001, 007, 010, 014, 018B, 019, 027B, 028, 030, and 031 were based on water quality and/or carried forward consistent with anti-backsliding regulations.

Comment 4.2.3: Application of the RGP to the Facility's Discharges is Inappropriate.

EPA cites to the Remediation General Permit (RGP) as a basis for limits and monitoring conditions at a number of the Facility's wet weather outfalls based on the assumption that these outfalls "may discharge contaminated groundwater under certain circumstances." EPA used the RGP as justification to assign monitoring requirements and/or effluent limits for such parameters as TSS, BTEX (and specifically benzene), VOCs and PAHs.

The RGP provides NPDES permit coverage to sites discharging contaminated water (most often treated prior to discharge) associated with site remediation activities, construction dewatering of contaminated construction sites and "other miscellaneous contaminated discharges." Although remediation continues to occur at the Facility, as described in Sections II.C and III.D, the majority of wastewater from GE's remedial activities is routed to the LWSC municipal sewer system. Groundwater infiltration into the Facility's Drainage System is collected as dry weather flow and routed to the CDTS for treatment prior to discharge; therefore Outfall 027A is the only outfall that could be said to have a significant component of treated groundwater.

In spite of this, EPA chose to regulate other outfalls based on the RGP because minor quantities of dry weather flow are commingled with stormwater and discharged during storm events when the Drainage System gates are open. GE estimates that an inconsequential percentage of the wet weather discharge from the Drainage System Outfalls consists of dry weather flows over the course of any given wet weather event. These flows include not just groundwater but other authorized dry weather contributions. As a result, the percentage of groundwater is smaller than the percentage of dry weather flows, and the percentage of actually contaminated groundwater is even smaller (due to all of the pipe relining and replacement, as well as other remedial activities). In effect, EPA would require GE to achieve the technology standard for a 100% remedial wastewater stream at outfalls that receive a minimal amount of impacted groundwater. This is neither feasible nor appropriate.

Furthermore, any application of the RGP to outfalls such as Outfall 014 or other drains where groundwater infiltration has been excluded by pipe rehabilitation or relining would be even less appropriate. These outfalls exhibit none of the flows or characteristics that would make the RGP relevant.

In summary, the quantity and quality of GE's discharge is not consistent with the characteristics of discharges from a remediation site typically associated with coverage under the RGP. Therefore, it is inappropriate to use the RGP parameter lists and associated effluent limits as a BPJ basis for assigning monitoring parameters and/or effluent limits for GE's wet weather outfalls.

Response to Comment 4.2.3:

The Remediation and Miscellaneous Contaminated Sites General Permit (RGP) provides NPDES permit coverage to sites discharging contaminated water (most often treated prior to discharge) associated with site remediation activities, construction dewatering of contaminated construction sites and "other miscellaneous contaminated discharges."

GE objects to EPA's use of the RGP to help justify assigning monitoring requirements and/or effluent limits in GE's permit for such parameters as TSS, BTEX (and specifically benzene), VOCs and PAHs. While noting that groundwater remediation continues to occur at GE's Lynn facility, GE states that "the majority of wastewater from GE's remedial activities is routed to the LWSC municipal sewer system." GE also states that "groundwater infiltration into the Facility's Drainage System is collected as dry weather flow and routed to the CDTS for treatment prior to discharge; therefore Outfall 027A is the only outfall that could be said to have a significant component of treated groundwater."

EPA does not agree with GE's objection to the Agency's use of the RGP, but, as explained below, changes made by EPA from the Draft to the Final Permit may resolve GE's concern. EPA did not rely solely or strictly on the RGP in developing requirements for GE's permit. The RGP was but one of many reference points, including NPDES permits for other facilities dealing with similar water pollution issues (such as Exxon/Mobil and Conoco Phillips), that EPA looked to in developing GE's permit limits on a BPJ basis. Given the RGP's application to discharges of contaminated groundwater from remediation sites, EPA continues to view it as an appropriate point of reference for GE's permit given that GE's site has contaminated groundwater that infiltrates the drainage system and which is reasonably likely to be discharged to the Saugus River during wet weather.

That said, while the Draft Permit established numeric effluent limits for BTEX and benzene at the drainage system outfalls based on BPJ, referencing the RGP and similar NPDES permits (specifically ExxonMobil), EPA has dropped these effluent limits from the Final Permit. Instead, the Final Permit includes only monitoring requirements for these contaminants. Moreover, the Final Permit has not retained the Draft Permit's proposed requirement to treat the first flush of wet weather flow in the CDTS. Wet weather discharges do not receive treatment with activated carbon or an oil-water separator because the skimmer and transfer pumps to the CDTS are quickly overwhelmed by inflow during storms. Therefore, numeric limits based on these treatment technologies are not appropriate for wet weather drainage system discharges at GE (see Attachment A). EPA has determined that the BMPs in the Final Permit that are intended to minimize the amount of dry weather flow that is discharged from the drainage system vault outfalls during wet weather will meet the technology-based requirements of the CWA.

For the CDTS itself (Outfall 027A), however, the Final Permit retains the Draft Permit's effluent limitations based on BPJ, referencing the RGP and other sources of information, such as the ExxonMobil NPDES permit, for TSS, TPH, PAHs (Group I and Group II), BTEX, benzene, and various VOCs (See Attachment A). EPA considered the RGP,[25] and its supporting analysis, to assist in determining technology-based limits for the permit because the GE Lynn facility may discharge contaminated groundwater under certain circumstances. The RGP is therefore an appropriate source of information because the groundwater contaminants of concern at the GE Lynn facility are similar to those found in the groundwater at facilities surveyed in development of the RGP. Additionally, the activated carbon treatment technology and oil water separators that GE employs at the CDTS to treat its dry weather flows is similar to the technology upon which the RGP permit limits were based.

5. Monitoring Requirements are Burdensome and Unreasonable.

Comment 5.0:

Although GE is willing to conduct reasonable monitoring to demonstrate the quality of its discharges and the effectiveness of its treatment systems and controls, the monitoring regime proposed by EPA is unreasonable and should be revised. With respect to chemical parameters, EPA has assigned monitoring requirements that are not based on representative data, are not necessary, are impracticable or otherwise infeasible, are costly in comparison to any perceived benefits, and are not consistent with other relevant NPDES permits. Similarly, with respect to whole effluent toxicity, EPA's proposed testing parameters will not yield representative results, especially when based on wet weather flows; are otherwise unnecessary, impracticable and infeasible with disproportionate costs; and reflect dissimilar treatment of otherwise similar facilities. Finally, with respect to bioaccumulation, EPA's proposed study of blue mussels is inappropriate.

Response to Comment 5.0:

GE comments on the monitoring requirements in the Draft Permit, specifically for each parameter, WET testing, and bioaccumulation. EPA believes the monitoring requirements included in the Final Permit are reasonable, necessary and practicable to, as GE states, demonstrate the quality of the facility's effluent discharges and the effectiveness of its treatment

[25] In writing this fact sheet, EPA referred to the 2005 RGP and fact sheet. The 2010 RGP, effective September 10, 2010, used the same basis in deriving limits for each of the parameters as the 2005 RGP (*see* Attachment A to the 2010 RGP Fact Sheet for the applicable 2005 RGP Fact Sheet Excerpts: http://www.epa.gov/region1/npdes/remediation/RGP2010_FactSheet_AttachmentA.pdf)

systems. In particular, the wastewater in the drainage system can contain a changeable combination of contaminants from a mixture of process water, potentially contaminated groundwater infiltration, and stormwater. Additional representative monitoring data will help EPA better characterize the identity and concentration of pollutants in the discharge, which will in turn enable a determination of whether there is a reasonable potential to violate, or contribute to a violation of, water quality standards to be made with greater confidence. In addition, while the Final Permit requires BMPs both to eliminate drainage system outfall discharges during dry weather and to minimize discharges of dry weather flows during wet weather, which EPA believes collectively meet technology-based standards and will protect water quality, untreated commingled flows from the drainage system outfalls will discharge to the Saugus River during wet weather (see Attachment A). Therefore, further characterization of this wastewater is needed and monitoring is critical to ensure that the BMPs sufficiently address wet weather discharges.

In response to GE's comments, the Final Permit includes many changes to the monitoring requirements proposed in the Draft Permit, including a reduction in frequency for many parameters and elimination of many of the monitoring requirements to which GE objects. EPA does not believe that the Final Permit's monitoring requirements are inconsistent with other relevant NPDES permits or are costly in comparison to perceived benefits. EPA responds to each point raised by GE in the response to comments specific to each subject, below.

Comment 5.1: Chemical Monitoring.

Comment 5.1.1: EPA Relied on Non-Representative Data in Selecting the Parameters to be Monitored, Specifically, VOCs, Metals, PAHs, PCBs, TRC, BTEX and MTBE.

EPA assigned monitoring requirements based primarily on water quality data for dry weather and wet weather flows collected in February 1998; however, EPA failed to account for the fact that the operation and configuration of the dry weather and wet weather outfalls have changed significantly since these data were collected.

Most significantly, the February 1998 data set preceded the installation of the CDTS and Drainage System, vaults and gates. As a result, these data do not reflect the proven collection and treatment capabilities of the CDTS and related infrastructure.

In addition, several significant soil and groundwater remediation projects have been implemented at various locations across the GE property since 1998, resulting in significant improvements in groundwater quality, not to mention reductions in the quantity of contaminated groundwater infiltrating into the drainage system. As a result of these changes, the February 1998 wet weather and dry weather water quality data reflect much higher concentrations of constituents of concern than currently exist and are not representative of current conditions.

The February 1998 water quality data are also not representative of current conditions at the non-wet weather outfalls (014, 018 and 020). The infrastructure serving Outfall 014 (concrete vault and pipeline to the river) was lined and sealed in December 2002, and, in turn, receives minimal (if any) groundwater infiltration. In 1998, Outfall 020 received wet weather flow from a local storm drain; however, flow from this drain was re-routed to Outfall 027 after 1998. At present, the Outfall 020 discharge consists solely of excess river water not used by the power plant cooling system. Outfall 018 currently does not receive wet weather flows. All of these changes affect the quality of the discharges from Outfalls 014, 018 and 020, and render the earlier February 1998 data non-representative of current conditions.

In addition to changes at the Facility since 1998, GE questions the quality of the 1998 dataset and the possibility that the analytical results may be biased high as a result of analytical interference or other possible sampling/analytical errors or anomalies.

A separate set of dry weather samples was collected at Outfalls 010, 018 and 019 in September 1998 as part of an "ultra clean" outfall monitoring study (this study was provided in Appendix C of GE's May 2000 NPDES renewal application). Samples were analyzed for a subset of metals, with one group analyzed using the same conventional (EPA 200.7) method that was used in the February 1998 sample set. As indicated in Technical Exhibit 7 (dry weather samples), analytical results for metals in September 1998 were consistently and significantly less (typically by an order of magnitude) than the February 1998 results. A similar trend would have been expected for wet weather data. After reviewing the two data sets, GE believes that the differences may derive from errors in the February 1998 sampling or analysis.

There are also potential issues associated with "false positive" results due to interferences associated with analysis of certain parameters in a salt water sample. For example, copper and selenium are demonstrated to have the potential for "false positive" and/or elevated results due to matrix interference.[26] GE is concerned that both parameters were assigned limits at Outfall 018 in the Draft Permit, even though the basis for those limits may be "false positive" results in the application record.

"False positive" detection of cyanide is also a common occurrence, and GE believes that such a false positive detection occurred in the February 1998 Outfall 001 wet weather sample. As noted in EPA's "*Final Report: Low-Level Speciation of Cyanide in Waters*" (EPA 2001), "EPA-approved methods for the determination of weak associated cyanide (and total cyanide) typically are not sensitive enough in routine operation to yield reliable analytical results in the low µg/l concentration range." A presentation by William Telliard (retired from EPA) entitled "*Past and Present Approaches in Dealing with Cyanide*" (Telliard 2009) cites a 1994 report on cyanide

[26] Selenium and copper are considered "problem elements" whether done by furnace or hydride generation AA or traditional ICP and ICP MS techniques, and salt or brackish water can be a challenging matrix for the determination of metals. Elevated levels of sodium can make it difficult to accurately quantify metals present in trace quantities. However, chloride, sulfur, and calcium, in particular, can combine with the argon gas used in ICP determinations to form polyatomic ions with the same mass to charge ratio as various selenium isotopes to produce false positives. A similar effect can be seen with copper due to the combination of sodium with argon gas. EPA's "Recommended Guidelines for Measuring Metals in Puget Sound Marine Water, Sediment and Tissue Samples" (EPA 1997) and Thermo Fisher Scientific's "Rapid, Simple, Interference-free Analysis of Environmental Samples Using the XSERIES 2 ICP-MS with 3rd Generation CCTED (Thermo Fisher Scientific 2007), provided in Technical Exhibit 8 of these comments, provide supporting discussion of potential matrix interference issues associated with analysis of certain metals in a salt water matrix.

analysis that stated that there is "no sound" measurement technique for cyanide measurement. With consideration of these and other relevant factors, the February 1998 detection of cyanide at Outfall 001 was a false positive, potentially due to limitations of the analytical method used and/or laboratory error.

In addition, interferences due to the presence of bromine and manganese in a brackish water environment may cause "false positives" in total residual chlorine ("TRC") samples. EPA noted levels of TRC in 2009 sample data provided by GE at various outfalls, including some to which potable water is not discharged.[27]

Finally, GE questions EPA's use of untreated dry weather flow data from July 2009 as the basis for selecting monitoring requirements for wet and commingled wet/dry weather flows. The majority of the dry weather flow that was monitored in July 2009 would be collected and conveyed to the CDTS for treatment prior to discharge from Outfall 027A. Moreover, as described in more detail in Section IX.F, based on a conservative analysis of commingled volumes and pollutant concentrations in the vaults, considerable mixing occurs in the drainage system prior to discharge, leaving all but one parameter (copper) below applicable criteria at the initial point of discharge, and all parameters below applicable criteria within a few minutes of the initial point of discharge. In short, GE's existing data confirm that there are no water quality issues associated with discharges from the Drainage System Outfalls during wet weather. As a result, further monitoring of these discharges -- at the level and frequency proposed by EPA -- is neither necessary nor appropriate. Representative monitoring of a few indicator parameters at a few representative outfalls at regular quarterly or semi-annual intervals would be adequate to properly characterize and demonstrate the quality of these discharges.

Response to Comment 5.1.1:

GE's comment suggests that the data available to EPA at the time of the Draft Permit (which was provided by GE in the permit application and several later supplemental submissions) is not representative of the effluent from GE's outfalls. GE comments that EPA based its monitoring requirements on data from February of 1998 that is not representative because it does not account for changes in the operation and configuration of the outfalls, including the treatment capability of the CDTS (installed in 2000) and remediation projects that have decreased the infiltration as well as improved the quality of groundwater on the site.

First, EPA disagrees with GE's comment that monitoring frequencies were based primarily of permit application data from 1998. EPA consulted numerous sources of monitoring data submitted by GE, including data submitted with the permit application, groundwater sampling data submitted in May 2000 as part of GE's NPDES Permit Renewal Application Revision,[28] a list of constituents that have been detected in the groundwater at the site,[29] and wet weather and

[27] Oxidizing agents such as bromine in estuary and marine samples, oxidized forms of manganese as well as some other metals, peroxides, turbidity, and color are often found in wastewaters at levels that will interfere with residual chlorine analyses. http://www.lagoonsonline.com/laboratory-articles/total-chlorine-residual-2.htm.

[28] NPDES Permit Renewal Application Revision, May 2000.
[29] E-mail correspondence from Steven Lewis (GE Aviation) to Nicole Kowalski (EPA), March 25, 2009, Attachment: Complete list of constituents that have been detected in the groundwater at the site.

dry weather flow data collected by GE in 2009 pursuant to an EPA CWA Section 308 request for information. Moreover, the monitoring frequencies in the Draft Permit were set in an effort to produce sufficient data to reasonably characterize the discharges without imposing an overly burdensome monitoring program. EPA determined that a robust suite of monitoring requirements was particularly important with regard to GE's drainage system outfalls because the wastewater in the drainage system consists of a mixture of process water, potentially contaminated groundwater infiltration, and stormwater and the latter two flows are variable in quality and uncontrolled prior to entry into drainage system.

EPA agrees that the 1998 data would not be representative of treated effluent from the CDTS. However, the CDTS, as currently operated, does not eliminate the commingling of dry weather flows with the first flush of storm water flows for discharge through the Drainage System Outfalls during wet weather. When the inflow of stormwater to the drainage system vaults triggers the tide gates, the vaults discharge directly to the Saugus River. This wastewater can contain a changeable mixture of contaminants. Monitoring data will help EPA better characterize the identity and concentration of pollutants in the discharge. This will enable a determination of whether there is a reasonable potential to violate, or contribute to a violation, of water quality standards to be made with greater confidence.

In its comment, GE questions EPA's use of the 2009 dry weather flow data as a basis for wet weather monitoring requirements both because, according to GE, the majority of dry weather flow would be collected and treated in the CDTS and because considerable mixing in the drainage system prior to discharge would result in levels of all parameters below water quality criteria within a few minutes of the initial discharge. EPA acknowledges that there potential for considerable mixing of the first flush of commingled stormwater and dry weather flows prior to discharge, but believes that, at this time, there is not sufficient information to determine the magnitude of mixing and resulting effluent concentrations under the range of wet weather conditions that would trigger the tide gate. In response to GE's comment, EPA requested that GE submit additional monitoring results from three wet weather discharge events for each Drainage System Outfall. The additional data submitted by GE on May 31, 2012 in response to the information request dated October 19, 2011 indicates that the first flush of wet weather flow through Drainage System Outfalls may contain elevated levels of TSS, cyanide, and benzene. Furthermore, monitoring of dry weather flows in the outfall vaults indicates potentially elevated levels of TSS, antimony, copper, iron, lead, nickel, zinc, PAHs, vinyl chloride, and residual chlorine.[30] This limited monitoring confirms that a wide range of pollutants that may be present in the effluent that discharges from the drainage system outfalls to the Saugus River, including a number of toxic constituents. Additional monitoring will better characterize the wet weather discharges to confirm GE's claim that there are no water quality issues associated with discharges from the Drainage System Outfalls during wet weather.

Finally, in addition to ensuring that the discharge meets water quality standards, EPA is obligated to ensure that discharges from the drainage system are consistent with technology-based standards under BAT without consideration of any available dilution prior to discharge. As presented in Attachment A, the Final Permit requires BMPs both to eliminate drainage

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[30] Response to Request for Information, Section 308(a) of the Clean Water Act (CWA), July 10, 2009.

system outfall discharges during dry weather and to minimize discharges of dry weather flows during wet weather, which EPA believes collectively meet technology-based standards and will protect water quality. Still, untreated commingled flows from the drainage system outfalls will discharge to the Saugus River during wet weather; therefore, further characterization of this wastewater is needed and monitoring is critical to verify EPA's assessment of the effectiveness of the BMPs for controlling drainage system discharges.

GE also comments that the 1998 data is not representative of the discharges from Outfalls 014, 018, and 020. In particular, in this and other comments on the Draft Permit, GE clarifies that pipe re-lining and re-routing has eliminated wet weather discharges from these non-drainage system outfalls. After considering GE's comments and reviewing the available information for these outfalls, EPA agrees that these outfalls are unlikely to have wet weather discharges. The Final Permit has eliminated monitoring requirements related to commingled stormwater and infiltrated groundwater from these outfalls. Also see Response to Comments 7.1 and 7.2.

Finally, GE questions the quality of the available data and suggest that analytical interference, sampling error, or "false positives" may inaccurately characterize the effluent. While this may be possible, it has not been proven. Moreover, the data that GE questions has not been replaced with sufficient alternative data. Thus, while GE's comment suggests that the limited available monitoring data may not adequately characterize wastewater discharges, the uncertainty of the existing, limited data reinforces, in EPA's view, the need for additional monitoring of wet weather discharges from the drainage system outfalls at GE.

After reconsidering the issue, EPA has reduced many of the monitoring requirements in the Final Permit. As stated above, EPA has removed monitoring requirements associated with wet weather discharges from Outfalls 014. 018, and 020. In addition, EPA has changed the Draft Permit's monthly monitoring requirements to quarterly monitoring requirements (*without* effluent limits) for wet weather discharges from the Drainage System Outfalls for the majority of parameters and reduced WET testing requirements and frequency. EPA believes that the remaining monitoring requirements in the Final Permit are necessary to adequately characterize the wastewater discharges from GE's outfalls.

Comment 5.1.2: EPA's Proposed Monitoring Regime is Unnecessary.

There are no sources of cyanide at the Facility. As a result, the requirement to monitor for cyanide is unnecessary and inappropriate. Cyanide was detected in wet weather flow at one outfall (Outfall 001) at a level of 15 µg/l during the February 1998 sampling event; however, cyanide was not detected in any of the other February 1998 results for any of the other wet weather or dry weather discharges. Cyanide was also not detected in either of the dry weather samples collected in September 1998 (Outfall 010 and 018) or in any of the samples collected in 1990. As noted above, GE believes that the one "hit" from February 1998 was a false positive and should be rejected from the data set used by EPA to assess the need for limits and monitoring conditions in the permit.

Like cyanide, the proposed monitoring for TRC in GE's wet weather discharges is unnecessary and inappropriate. Some of GE's outfalls receive dry weather flow that originates from a municipal water supply system that may contain minor concentrations of chlorine. However, once commingled with other flows, chlorine is not a legitimate water quality concern at any of GE's outfalls. Moreover, not all of GE's outfalls receive municipal source water containing chlorine. Outfalls 001 and 030 fall into this category, as well as Outfalls 028 and 031 with the end of operations at the Gear Plant.

GE also questions EPA's decision to list the following, specific parameters for monitoring based on extremely limited or otherwise inappropriate data.

BTEX: The only recent analytical data for BTEX were collected in July 2009 and were non-detect (with detection limits in the range of 0.45 to 1.1 µg/l) at 7 of the 8 wet weather outfalls. The only exception was at Outfall 001, where BTEX was detected at a concentration of 3.1 µg/l (2.2 µg/l ethylbenzene and 0.96 µg/l benzene). The sample was collected from flow that would be diverted to the CDTS for treatment prior to discharge. Moreover, Outfall 001 drains a small area (~3.03 acres) comprised of storm catch basins and a small parking lot. The Outfall 001 sample had the highest concentration of TSS of all of the outfall samples collected (41.6 mg/l vs. <4 to 15.2 mg/l at the other outfalls), which suggests that the elevated BTEX concentration may have been anomalous. BTEX was not detected in any of the earlier sampling events at the Facility.[31]

MTBE: The only recent analytical data for MTBE were also collected in July 2009 at the same 8 wet weather outfalls. All results were non-detect (with a detection limit of 0.68 µg/l). MTBE is not a component of jet fuel, the primary petroleum product used and stored at the Facility, and there is no known source of MTBE elsewhere at the Facility, other than a small fuel station with one 10,000-gallon tank of diesel, and one 10,000-gallon tank of unleaded gasoline. The installation is a double-walled, poly tank, underground, and protected by continuous monitoring equipment, that signals an alarm in the event of any liquid detected within the interstitial spaces between the two walls. GE has uncovered no evidence of leakage, no loss of mass or volume, and nothing else to suggest a leak of any kind from this installation.

Metals: The Draft Permit would require GE to monitor for metals at the wet weather outfalls based on elevated metals concentrations reported in February 1998 (pre-CDTS) wet weather flow data and in the July 2009 dry weather data. Neither of these sets of data is representative of current wet weather flow conditions. The February 1998 data were collected prior to the implementation of the CDTS system and, therefore, over-represents the influence of dry weather flow (since this flow is now collected and treated at the CDTS). Likewise, the July 2009 data were collected prior to mixing with other wet weather flows and, in turn, over-represents the influence of dry weather flow at the point of discharge. Even if it were representative, examination of the original laboratory data shows EPA's analysis of the July 2009 metals data and associated conclusions about elevated metals levels to be inaccurate or overstated. *See* Technical Exhibit 9. In addition, as noted above, GE's comparison of February 1998 and September 1998 data suggests that analytical results for February 1998 may be biased high.

[31] The only historical contamination issue with BTEX at the Facility involved Building 64, west end. *See* Technical Exhibit 10.

PCBs: The Draft Permit includes monitoring and reporting requirements for total PCBs based on a single detection of a single PCB congener in the July 2009 dry weather flow data for Outfall 001. This detection represents the sole exception at any outfall over the last 21 years (if not more). GE respectfully submits that EPA should not require monitoring and reporting in the face of this one exception.

Many of the parameters selected for monitoring in the Draft Permit were monitored in previous permit cycles and then discontinued due to consistent non-detects or other Facility changes. For example, EPA previously agreed to discontinue monitoring of BTEX, MTBE and PCBs based on GE's redirection of certain flows to the LWSC and a review of analytical results from hundreds of older samples. Technical Exhibit 10 recounts the sampling and analysis required in earlier permits but then discontinued for good cause.

Response to Comment 5.1.2:

The monitoring parameters in the Draft Permit for the drainage system outfalls were included to address EPA's concerns about the discharge of infiltrated groundwater and process water directly to the Saugus River during wet weather. GE's Technical Exhibit 14 confirms that infiltrated groundwater from the site continues to collect at the drainage system outfalls, and other comments (and supporting information) confirm that dry weather flows that collect in the drainage system outfalls are released, untreated, directly to the Saugus River during wet weather.

EPA responds below to GE's comments on EPA's decision to include specific parameters for monitoring based on extremely limited or otherwise inappropriate data.

Cyanide: According to GE, there are no sources of cyanide at the facility and the single "hit" from February 1998 was a false positive and should be rejected from the data set used by EPA to assess the need for limits and monitoring conditions in the permit. EPA responds that the 2012 wet weather monitoring data submitted in response to the information request dated October 19, 2011, also indicated elevated levels of cyanide at Outfall 001 on one of the three sampling dates. The presence of cyanide in effluent can be associated with industrial processes and is common in steel, aluminum smelting, chemical production, and electroplating industries (2010 RGP Attachment a, p. 9). Petroleum refineries that use catalytic cracking and coking can also be a source of cyanide production. GE Aviation is or has been involved in the manufacture and testing of aircraft engines, and the manufacture of turbine engines, generators, gear parts, and marine propulsion units. Principal processes include machining, cleaning, descaling, coating, assembly and testing of engines and engine components. GE does not appear to be involved in industrial processes typically associated with the presence of cyanide in effluent, and it remains unclear what the source of cyanide at GE might be. Still, the limited available data suggests that monitoring for this parameter is warranted at Outfall 001 and at Outfall 027A since it receives and discharges dry weather flow from Outfall 001. EPA believes that the CDTS will enhance the removal of any cyanide from the effluent, and monitoring data will confirm that the water quality criterion is met. The Final Permit retains a requirement for quarterly monitoring of cyanide at Outfall 001 and 027A.

TRC: As stated in the Fact Sheet to the Draft Permit, at Part V.C.1.i, sampling results of non-stormwater flows in the Drainage System outfall vaults[32] indicate TRC concentrations in the vaults at Outfalls 007, 019, 027, 028, 030, and 031 greater than 13 µg/L, the acute saltwater National Recommended Water Quality Criteria for aquatic life. According to the Fact Sheet and confirmed in GE's comment, TRC may be present in city water used for cleaning the drainage system outfalls. Discharges from the drainage system cleaning collect in the outfalls and, although they are typically transferred to the CDTS for treatment during dry weather, may combine with stormwater and discharge, untreated, to the Saugus River during wet weather. GE proposes that levels of TRC are not a "legitimate water quality concern" but offers no data to support this claim. In fact, the data collected under the Final Permit will provide representative data to confirm that the Final Permit's BMPs to eliminate drainage system outfall discharges during dry weather and to minimize discharges of dry weather flows during wet weather collectively meet technology-based standards and protect water quality.

BTEX: As stated in the Fact Sheet to the Draft Permit, the traditional approach for limiting effluents contaminated with gasoline or other light distillates is to place limits on the individual BTEX compounds and/or the sum of total BTEX compounds. Since many petroleum spills involve gasoline or diesel fuel, a traditional approach for such spills has been to place limits on the individual BTEX components and/or the sum of total BTEX compounds.

GE asserts that, for the drainage system outfalls, there has been only one instance where BTEX has been detected (Outfall 001), and moreover, that the sample was collected from flow that would be diverted to the CDTS for treatment prior to discharge and had an elevated TSS concentration, which GE suggests could cause the elevated BTEX concentration to be anomalous. First, GE offers no support or explanation for its comment that elevated TSS would cause an anomalous value for BTEX. Second, as has been discussed at length in EPA's responses to GE's comments on the Draft Permit, although flows representative of the July 2009 samples are typically transferred to the CDTS during dry weather, these flows are also commingled and released, untreated, with stormwater from the drainage vaults during wet weather. EPA disagrees that this sample was collected from flow that would be diverted to the CDTS for treatment prior to discharge under every circumstance. Finally, EPA points to the need for monitoring at the drainage system outfalls for multiple reasons, including to provide sufficient representative data to enable EPA to confirm that the BMPs for the drainage system outfalls in the Final Permit collectively meet technology-based standards and protect water quality.

MtBE: The Draft Permit included a maximum daily limit of 100 µg/L for MtBE at Outfall 027A. No effluent limit or monitoring was required for MtBE at the drainage system outfalls, however, including Outfall 027B. According to the Draft Permit's Fact Sheet, the MtBE limit was continued from the current permit due to the anti-backsliding regulations at 40 C.F.R. § 122.44(l)(2)(i) and because monitoring for the contaminant would confirm whether it was present or absent in the effluent from Outfall 027A. In response to GE's comment questioning the appropriateness of this limit under existing conditions, EPA reevaluated the basis for the current limit and new information that has become available since the limit was first applied.

[32] *Response to Request for Information, Section 308(a) of the Clean Water Act (CWA)*, July 10, 2009.

The Fact Sheet for GE's 1993 permit indicates that the numeric limit for MtBE at Outfall 027D was specified by EPA as an addendum to the previous permit, and that it was retained in the current permit. A letter from David W. Tordoff (EPA On-scene Coordinator) to David A. Roberts (GE) dated June 10, 1991, confirms that the numeric limit for MtBE was applied as a condition of an emergency authorization to allow intermittent discharges of non-contact cooling water and wastewater from a sump collection system in the vicinity of a recovery and treatment system operation in Building 64 to Outfall 027. Subsequently, a letter from David Johnston (GE) to George Harding (EPA) dated April 16, 1999, confirmed that the discharge line from the Building 64 treatment system to Outfall 027D was capped and the discharge re-piped to the Bennett Street Sewer, which discharges to the Lynn Water and Sewer Commission's Wastewater Treatment Facility. In addition, GE stated that analytical results for the treatment system effluent sampling would no longer be reported on discharge monitoring reports (DMRs) at Outfall 027D. The permittee was directed by Robin Neas (EPA) to use the no discharge code "C" on the DMRs for Outfall 027D.

In addition, EPA agrees with GE's assertion that MtBE is not a component of jet fuel –which GE stores and uses on-site – and, to EPA's knowledge, the only potential source of MtBE expected at the facility would be the two fuel tanks described in GE's comment. A review of historic groundwater monitoring data from 1998 through 2008 indicated nine instances of MtBE in groundwater at the site, of which all were below the current numeric limit of 100 μg/L. Eight of the samples were below the 2010 RGP technology-based numeric limit of 20 μg/L and the most recent samples (in 2007) were less than 2 μg/L.

EPA concludes that because effluent discharges from the Building 64 treatment system, on which the current numeric limit for MtBE was originally based, have been eliminated and there is no other likely source of MtBE from the manufacturing facility, the MtBE limit should be eliminated from the limits for Outfall 027A in the Final Permit. Eliminating this permit limit is appropriate under an exception to the CWA's anti-backsliding requirements because the re-routing of the effluent from the treatment system in 1999 is a material alteration to the permitted facility that occurred after issuance of the existing permit. *See* 40 C.F.R. § 122.44(l)(1).

EPA notes that the other parameters associated with the batch discharge of effluent from the Building 64 treatment system (benzene and BTEX) are associated with jet fuel, and have at times been detected in the groundwater at the site at levels substantially above numeric limits. For these and other reasons discussed in response to GE's comments, EPA has retained the numeric limits at Outfall 027A for these constituents and applied monitoring requirements at the drainage system outfalls for these parameters.

Metals: First, GE is incorrect in assuming that EPA did not convert the National Recommended Water Quality Criteria to total recoverable metals. EPA did, in fact, convert these criteria to total recoverable metals to correctly compare these values with the results of GE's monitoring data. Second, the non-stormwater flow samples taken in 2009 from the individual outfall vaults are an indication of the quality of the dry weather flows that commingle with wet weather flows and are discharged through the Drainage System Outfalls when the tide gates open during wet weather. In response to GE's comments, the metals monitoring frequency at the Drainage System Outfalls has been reduced from monthly to quarterly, as EPA believes that frequency will generate sufficient data to enable EPA to confirm that the BMPs for the drainage system outfalls in the Final Permit collectively meet technology-based standards and protect water quality.

PCBs: Sampling results of non-stormwater flows in the Drainage System outfall vaults[33] (which are expected to commingle with the first flush of stormwater flows during wet weather) indicated a PCB concentration at the Outfall 001 vault of 0.11 μg/L, which is greater than EPA's National Recommended Water Quality Criteria (saltwater CCC) for PCBs of 0.03 μg/L. The monitoring results which support this determination are non-stormwater flow samples taken in 2009 from the individual outfall vaults. This data is representative of the quality of the dry weather flows that commingle with wet weather flows for discharge through the outfalls during wet weather. In response to GE's comments, monitoring frequency has been reduced from monthly to quarterly, as EPA believes that frequency will generate sufficient data to enable EPA to confirm that the BMPs for the drainage system outfalls in the Final Permit collectively meet technology-based standards and protect water quality.

Finally, GE states that "many of the parameters selected for monitoring in the Draft Permit were monitored in previous permit cycles and then discontinued due to consistent non-detects or other Facility changes. For example, EPA previously agreed to discontinue monitoring of BTEX, MTBE and PCBs based on GE's redirection of certain flows to the LWSC and a review of analytical results from hundreds of older samples. Technical Exhibit 10 recounts the sampling and analysis required in earlier permits but then discontinued for good cause." It is EPA's understanding that Technical Exhibit 10 describes the successful treatment and discharge of treated groundwater from the Building 64 Water Treatment System. Neither the Draft nor Final Permit includes any effluent limitations or monitoring requirements specific to the Building 64 treatment system to Outfall 027A, nor does EPA dispute the discontinuation of monitoring for discharges from the Building 64 treatment system to the Lynn POTW.

However, contrary to GE's assertions, EPA has never eliminated the monitoring requirements at Outfall 027D referenced by GE. The letter from GE to EPA[34] states that "the Building 64 treatment system effluent was re-piped to discharge to the LWSC, and that the analytical results from the treatment system effluent sampling [dry weather sampling from Outfall 027 (Outfall 027A in the Draft Permit)] will no longer be reported on NPDES Discharge Monitoring Reports (DMRs) for dry-weather flow at Outfall 027." GE goes on to state that a no discharge code of "C" will be reported for each of these sampling parameters. As discussed above, to the extent that re-piping of the discharge from the Building 64 treatment system was completed such that discharges to Outfall 027 from this system were, in fact, eliminated, this would be the correct procedure. However, Outfall 027 continues to receive dry weather and wet weather flows from other wastestreams and areas, therefore the reporting of "no discharge" is not consistent with GE's current permit. In addition, a permit modification would be required to remove the monitoring requirements for Outfall 027D for benzene, BTEX, MTBE, and PCBs from GE's current permit. As EPA has no record of a permit modification or request for a modification regarding these parameters, the monitoring requirements and effluent limitations at Outfall 027D have been administratively continued until a new permit is issued.

[33] *Response to Request for Information, Section 308(a) of the Clean Water Act (CWA)*, July 10, 2009.
[34] Letter from David G. Johnson (GE) to George Harding (EPA), Re: Discharge Modification – NPDES Outfall 027, April 16, 1999.

Comment 5.1.3: Monitoring is Impracticable and Infeasible.

GE is concerned that the monitoring regime proposed by EPA will be impossible to implement due to the frequency of monitoring and the sheer number of outfalls to be monitored after each and every qualifying wet weather event. These concerns are grounded in issues of staffing, access and safety, and sample holding times. The Draft Permit would require monthly wet weather sampling at all eight wet weather outfalls. This stands in stark contrast to the MSGP, which EPA cites as a relevant reference, and which only requires quarterly wet weather sampling at selected, representative outfalls.

If monthly wet weather sampling is required at all eight wet weather outfalls, then GE will need to enlist large crews to prepare, mobilize, execute, demobilize and document each and every sampling event over the course of the year.

EPA's *Industrial Stormwater Monitoring and Sampling* Guide (EPA 2009) encourages the use of representative outfalls where two or more outfalls are "substantially identical." EPA defines this phrase to mean "two or more outfalls that you believe discharge substantially identical effluents, based on the similarities of the general industrial activities and control measures, exposed materials that may significantly contribute pollutants to stormwater, and runoff coefficients of their drainage areas…." (Part 6.1.1 of MSGP-2008). Based on an evaluation of the types of flows that drain to each Drainage System Outfall (as shown in Technical Exhibit 14, Table 1-1) and even assuming a worst case scenario, GE respectfully submits that Outfalls 019, 027B, 007 and 030 are representative of all of the other wet weather outfalls, and are suitable for quarterly monitoring to characterize the wet weather discharges from the Facility.

Response to Comment 5.1.3:

GE states that "Outfalls 019, 027B, 007 and 030 are representative of all of the other wet weather outfalls, and are suitable for quarterly monitoring to characterize the wet weather discharges from the Facility … [b]ased on an evaluation of the types of flows that drain to each Drainage System Outfall (as shown in Technical Exhibit 14, Table 1-1)"

Technical Exhibit 14, Table 1-1 shows that Outfalls 019, 027B, 007, and 030 are listed as discharging similar non-stormwater dry weather flows as the other Drainage System Outfalls (001, 010, 028, and 031). Although EPA's 2008 Multi-Sector General Permit (MSGP) for Stormwater Discharges Associated with Industrial Activity does provide for limited monitoring of substantially identical outfalls as discussed in Part 6.1.1, the MSGP goes on to state, "The allowance for monitoring only one of the substantially identical outfalls is not applicable to any outfalls with numeric effluent limitations. You are required to monitor each outfall covered by a numeric effluent limit." Because the Final Permit has retained numeric effluent limitations for pH and O&G at the Drainage System Outfalls, GE shall be required to monitor each outfall individually for those parameters. Therefore, EPA does not consider it a significant additional burden to collect additional grab samples for other parameters on a quarterly basis at the drainage system outfalls.

EPA is not convinced that (in GE's words) "the monitoring regime proposed by EPA will be impossible to implement due to the frequency of monitoring and the sheer number of outfalls to be monitored after each and every qualifying wet weather event." First, monitoring is not required after "each and every qualifying wet weather event." The highest frequency of monitoring at the Drainage System Outfalls is quarterly, with the exception of reporting of flow, (a daily estimate), gate openings (a continuous count), and the volume of dry weather flow pumped to the CDTS (a continuous estimate). Therefore, GE does not have to monitor after "each and every qualifying wet weather event," only after one (1) qualifying wet weather event each quarter. EPA's view is that a requirement to monitor each of the eight (8) Drainage System Outfalls once every quarter is reasonable, justified, and not overly burdensome.

Second, as stated in an earlier response to one of GE's comments, monitoring for these parameters at each Drainage System Outfall is required in the Final Permit to assist EPA in evaluating the reasonable potential of these discharges to cause or contribute to exceedances of water quality standards. Thus, it is important that samples are representative of the commingled dry weather and wet weather flows discharged with the first flush from the drainage system outfalls. Given that, depending on the severity of the storm event, the vault gates can be triggered and emptied in a relatively short time frame (GE estimates within 2 to 24 minutes), automating the sampling of the outfall vaults would likely be the most feasible option. In this case, GE has already estimated the cost of automated sampling equipment for the drainage system outfalls (Technical Exhibit 13). This equipment should be capable of collecting grab samples from the first flush of wastewater discharged from the tidal gate during wet weather. Representative samples should be collected from the first flush of commingled stormwater and dry weather flow prior to discharging to the Saugus River. While automating sample collection will result in capital costs for equipment (GE estimates automatic samplers with enclosures at $5,000 for each of 8 drainage outfalls at a cost of $40,000), the automated equipment should reduce staffing costs for sample collection.

In response to GE's comments, and consistent with other similar NPDES permits,[35] the Final Permit has changed the Draft Permit's monthly monitoring requirements to quarterly monitoring requirements (*without* effluent limits) for wet weather discharges from the Drainage System Outfalls for TSS, BTEX, benzene, toluene, ethylbenzene, total xylenes, VOCs, individual VOCs, TRC, total PAHs, individual Group I PAHs, metals, and PCBs. In addition, in the Final Permit, EPA has dropped the Draft Permit's numeric limits for wet weather discharges, including the limits for BTEX and benzene, with the exception that the Final Permit has retained the effluent limits for the conventional pollutants pH and O&G, which are carried forward consistent with anti-backsliding requirements (quarterly monitoring is also required for these constituents). The Final Permit has also reduced toxicity requirements to twice yearly acute WET testing and only requires monitoring for cyanide at Outfall 001.

Comment 5.1.4: The Costs of Monitoring far Outweigh any Perceived Benefits.

The number of samples requiring laboratory analysis under the Draft Permit is more than 18 times higher than the existing permit. The sample count would increase from 96 to 1,748

[35] Final Permit for ConocoPhillips Company, signed August 25, 2006, MA0004006.

samples per year and the analytical cost alone would increase from $4,020 to $224,110 per year. An itemized analytical cost table is presented in Technical Exhibit 11.

In addition, to simultaneously complete the required monthly wet weather sampling within 30-minutes of discharge at eight wet weather outfalls, as well as to conduct the increased dry weather sampling and WET testing sampling requirements, GE would be required to hire contract staff at an annual cost of $161,460. The itemized manpower estimate is presented in Technical Exhibit 12.

Several of the proposed analytical requirements require instantaneous field measurement, including pH, specific conductance, temperature, and dissolved oxygen. To properly perform the wet weather sampling would, therefore, require purchase of handheld instruments for each of the eight wet weather outfalls. Furthermore, to collect the required composite samples for the proposed WET testing sampling would require purchase of 11 automatic samplers with refrigerated enclosures. The total cost to purchase the additional field instruments and the automatic samplers is itemized in Technical Exhibit 13 and is estimated to be $70,650.

GE submits that the extent and cost of sampling, as proposed by EPA, is not at all in line with the nature of the Facility or discharges as GE estimates that the total annual cost of sampling would be $385,570 along with a one-time cost of $70,650 for additional equipment.

Response to Comment 5.1.4:

EPA has broad authority to impose reasonable monitoring requirements on a case-by-case basis in light of the type of pollutant discharges at issue and in order to assess permit compliance and to produce sampling data that is representative of the discharges at issue. *See* 33 U.S.C. §§ 1318(a) and 1342(a)(2); 40 C.F.R. §§ 122.44(i) and 122.48(b). There is no specific economic or cost test that applies in the design of a permit's monitoring requirements. Again, the requirements should be reasonable under the facts of the matter at hand.

In prescribing the monitoring requirements for GE's permit, EPA was driven by several considerations. These have been discussed previously in these responses to comments and the Fact Sheet for the Draft Permit. EPA is concerned about GE's wet weather discharges from the Drainage System Outfalls to the Saugus River, within a state-designated ACEC, of untreated commingled stormwater, process wastewater and contaminated groundwater infiltration. The nature of this combined wastewater is that is uncontrolled and likely to be of variable quality. At the same time, site data indicates that the groundwater infiltration could contain a variety of toxic contaminants. Yet, the existing permit's monitoring requirements did not require monitoring for such contaminants from these discharges. In this regard, EPA's view is that the existing permit's monitoring requirements are not adequate. This is why the Agency has included more extensive monitoring in GE's new permit.

Having said that, EPA has taken GE's comments into account and has reduced the monitoring requirements for the Final Permit as compared to the Draft Permit. GE commented that EPA should reduce the monitoring of wet weather discharges from the Drainage System Outfalls from a monthly to a quarterly frequency. GE urged that doing so would be consistent with requirements in other permits. EPA has responded to these comments elsewhere in this document, but suffice to say that EPA has written the Final Permit to require quarterly monitoring for the discharges from the drainage system outfalls and reduced the frequency of WET testing at all outfalls. As explained in the response to Comment No. 4.2.1, EPA has determined that the number of samples produced by quarterly sampling should be sufficient to characterize the discharges from the drainage system outfalls and to support an assessment of the reasonable potential of such discharges to cause violations of water quality standards. (In the future, once these discharges have been better characterized, it may be possible to reduce the frequency of monitoring.)

As indicated above, the suite and frequency of monitoring requirements in the Final Permit have been substantially reduced compared to the Draft Permit. The Final Permit requires 578 analyses, which is less than half of the 1,768 analyses per year that GE estimated the Draft Permit required. The total analytical costs have been reduced from $224,110 per year (according to GE) to approximately $60,683 per year based on the analytical cost estimates provided in Technical Exhibit 11. Approximately half of this cost is associated with whole effluent toxicity (WET) testing. The Final Permit eliminated chronic WET requirements at the drainage system outfalls and Outfall 014, and reduced the frequency from quarterly to twice per year for all outfalls. The frequency, and therefore cost, of WET testing may be reduced further after two years and four consecutive sets of WET test results demonstrating no toxicity.

Regarding the additional contractor and manpower costs, it is unclear, and GE has not provided sufficient explanation, why it believes collecting wet weather samples would require 16 man-hours at each outfall (8 hours per outfall for each of the grab and composite samples). Each outfall is required to be sampled, at most, once per month with the exception of Outfall 027, which must be sampled in both dry and wet weather. EPA sees no reason why each grab sample would require 8 hours to collect and prepare for shipment for analysis. Collecting data with the proposed handheld instruments (e.g., pH and temperature) is relatively instantaneous and should take no more than 5 to 10 minutes per outfall. In addition, GE has included the cost of additional equipment capable of automating sampling, which may be used to automate grab sampling during wet weather at the drainage system outfalls, or composite sampling at outfalls sampled during dry weather. Use of the automated sampling equipment should decrease manpower even further, as staff would only be required to retrieve the collected samples from the equipment once sampling is complete. Therefore, while the one-time equipment cost of about $71,000 may be accurate, EPA believes that GE has largely overestimated manpower at an additional $161,000.

EPA believes that the monitoring in question will provide important benefits as it will allow EPA to better ensure protection of the Saugus River ecosystem by better characterizing the untreated wet weather discharges from the Drainage System Outfalls and enabling EPA to conduct a reasonable potential analysis with confidence, using appropriate statistical analysis. While EPA believes that GE overstated the costs of the Draft Permit's monitoring provisions, as explained above, GE did not establish that it could not afford those costs or that they were otherwise unreasonable. Moreover, EPA has reduced the monitoring requirements in the Final Permit, thus significantly lowering the costs of complying with the permit.

Comment 5.1.5: EPA's Proposed Monitoring Regime for GE Deviates from Monitoring Regimes Allowed for Similar Facilities.

The Draft Permit is much more stringent in terms of both monitoring parameters and monitoring frequency than the ConocoPhillips Everett Terminal and the ExxonMobil East Boston Terminal, both of which are referenced by EPA as relevant comparisons. GE urges EPA to treat similar facilities similarly by reducing the number of monitoring parameters to those reasonably expected to be present at detectable levels in GE's discharges and reducing the typical sampling frequency to quarterly.

Response to Comment 5.1.5:

The monitoring parameters and monitoring frequency contained in the NPDES Permits for ConocoPhillips and ExxonMobil are comparable to those contained in GE's Final Permit. Moreover, unlike those two facilities, which collect and treat all flows up to and including the 10-year, 24-hour storm, GE discharges untreated process and infiltrated groundwater flows from the drainage system outfalls directly to the receiving water (in GE's case, the Saugus River) during wet weather. Still, in consideration of GE's comments on costs and feasibility as discussed above, the monitoring requirements contained in the Draft Permit have been reduced in the Final Permit to frequencies that EPA believes will generate sufficient data to develop a characterization of each outfall, while at the same time not being unduly burdensome on GE.

The ExxonMobil NPDES permit, issued September 29, 2008, requires that the majority of stormwater flow be treated through an oil/water separator. Flows up to 280 gpm are treated via an oil/water separator and carbon. Flows from 280 gpm – 4000 gpm are treated via an oil/water separator and stored for eventual treatment with carbon. Flows > 4,000 gpm, but <13,600 gpm (10 year, 24 hour storm) are stored for eventual treatment through an oil/water separator. If the storage tank capacity of 2.1 million gallons is exceeded due to too many back-to-back storms, the water bypasses treatment.

The ExxonMobil NPDES permit allows the discharge of treated effluent from Outfall 001, comprised of storm water, groundwater, hydrostatic test water, boiler condensate, fire testing water, truck wash water and effluent pond water. The permit includes effluent limitations for TSS, O&G, pH, Whole Effluent Toxicity, each individual Group I PAH, each individual Group II PAH, benzene, BTEX, and MTBE, and sampling for flow rate, available cyanide, total aluminum, cadmium, chromium, copper, lead, mercury, nickel, zinc, hardness, total solids, ammonia, calcium, magnesium, total organic carbon, toluene, ethylbenzene, total xylenes, and ethanol. The Permit also requires an extensive SWPPP Plan, based on site specific conditions.

The ConocoPhillips NPDES Permit, issued August 25, 2006, allows the discharge of treated effluent through Outfall 001. The discharge is comprised of ground water from Outfall 002, stormwater and infrequent flows of hydrostatic test water. All of these waters are treated and the permit includes effluent limits for TSS, O&G, pH, PAHs (Group I, Group II, and the sum of all PAHs), Benzene, and Whole Effluent Toxicity. The permit also requires monitoring for flow rate, total flow, toluene, ethylbenzene, total xylenes, and ethanol. The Permit also requires an extensive BMP/SWPPP Plan, based on site specific conditions.

The Final Permit for GE includes effluent limitations at the Drainage System Outfalls for pH and O&G, monitored quarterly. In addition, as GE requests, the Final Permit also shifts to quarterly monitoring (without limits) at the Drainage System Outfalls for TSS, BTEX, benzene, toluene, ethylbenzene, and total xylenes, and quarterly monitoring (without limits) for VOCs, individual VOCs, TRC, total PAHs, individual Group I PAHs, metals, and PCBs. The rationale for the change to quarterly monitoring is explained above in the response to Comment 4.2.1.

As fully explained elsewhere in this RTC document, EPA has concluded that the Final Permit requirement to minimize the discharge of dry weather flow commingled with stormwater from the Drainage System Outfalls during wet weather, and zero discharge during dry weather, is reasonable and meets the technology- and water quality-based requirements of the CWA and its implementing NPDES permitting regulations (see Attachment A).

Comment 5.2: WET Testing.

Comment 5.2.1: The Wet Weather Toxicity Testing Proposed by EPA will not Yield Representative Results.

Whole Effluent Toxicity ("WET") tests are conducted by exposing test organisms to effluent for 48 hours or longer (for example, the chronic testing specified by EPA in the Draft Permit for inland silverside has a 7-day exposure time). However, storm events typically last only a few hours. In turn, any adverse effects observed in WET tests conducted on stormwater "effluent" are not representative of the effects that actually occur in the receiving waters over the course of the actual discharge event. In short, WET testing conducted on a composite stormwater sample (albeit commingled with dry weather flow over the first few minutes of discharge) collected over the few hours that stormwater discharges generally occur is not representative of instream aquatic life exposure for 48 hours or longer.

In storm events, the composite sample that is collected is representative of the average discharge quality experience over the limited duration (e.g., typically 2 to 12 hours) storm event. Even if organisms in the receiving water are exposed to elevated pollutant concentrations for only a few minutes or hours, organisms used in the WET test will be exposed to those concentrations for 2 or more days. Any adverse effects observed in such a test are not relevant to predicting instream effects. In other words, no valid inference can be drawn by exposing test organisms to the worst case stormwater quality for 48 hours (or longer), when the actual duration of a particular Drainage System discharge is not likely to exceed a few minutes, or a few hours at most.

Requiring 7-day chronic WET testing for a stormwater discharge is expected to result in a violation of the sample holding times required by EPA as described in "Short-term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Marine and Estuarine Organisms" (EPA 2002). For the chronic test with inland silverside (*Menidia beryllina*), fresh samples are required on days 1, 3, and 5 for renewal of test solutions, and samples must be first used within 36 hours of collection. A single stormwater event would not likely allow for collection of three samples. If, for example, a stormwater event was sampled on a Monday and used to initiate the toxicity test on Tuesday, unless the rain event continued well into that week, the initial sample would be needed in the final renewal on day 6 (168 hours after collection and

144 hours after first use). Although EPA allows permittees to request a variance from sample holding times, according to the methods document, "in no case should more than 72 hours elapse between collection and first use of the sample" (EPA 2002).

Response to Comment 5.2.1:

In consideration of GE's comment, EPA has reviewed the need for chronic WET tests of the wet weather discharges from the Drainage System Outfalls. Because the first flush of wet weather from the Drainage System Outfalls includes stormwater commingled with dry weather flows, EPA believes some WET testing is appropriate. However, GE correctly points out that storm events are intermittent (lasting hours or days), and in particular, the volume of dry weather flow, including infiltrated groundwater, would be greatest in the first flush of wastewater from the outfalls. Finally, EPA has carefully considered GE's concerns regarding the substantial costs of WET testing. The Final Permit eliminates the requirement for chronic WET testing at the Drainage System Outfalls and has reduced the frequency of the static, 48-hour acute testing from quarterly to twice per year. Sampling for WET testing at the drainage system outfalls has also been changed from a composite sample to a grab sample collected from the first flush of commingled stormwater and dry weather flows released at the first opening of the tidal gate. EPA believes this will be a representative sample of commingled stormwater and groundwater on which to conduct toxicity testing.

The Final Permit includes chronic and acute WET testing for the other outfalls from which discharges are not expected to be intermittent (Outfalls 018 and 027A) at a reduced frequency (twice per year) and has removed the requirement for chronic testing for twice yearly WET testing at Outfall 014 as discharges from this outfall are also largely intermittent and do not frequently last more than a few consecutive days.

Comment 5.2.2: Stormwater may be too Pure to Sustain WET Test Organisms.

Stormwater samples used for WET testing may not contain the basic metabolites (e.g., ionic balance) necessary for the survival of the test organisms (in other words, the samples may be too "pure"). As such, any adverse effects observed in the WET tests are not representative of the effects that actually occur when organisms are exposed to stormwater after mixing with the receiving waters.

The sea urchin (*Arbacia punctulata*) fertilization test proposed by EPA is a very sensitive test and negative outcomes would not necessarily be related to toxicity in the discharge but rather the turbid nature of stormwater. Recommended test salinities for inland silverside and sea urchin are 5-32 ppt and 30 ppt, respectively. While the wide range of salinities recommended for the inland silverside would likely capture the salinity of the stormwater discharge, it is unlikely that the 30 ppt recommended for sea urchin exposures would or could be achieved.

Response to Comment 5.2.2:

The Draft Permit requires chronic and acute WET testing for the discharges from the Drainage System Outfalls. As discussed above, the chronic WET testing requirements at the Drainage

System Outfalls have been removed from the Final Permit. The revised protocol for the Marine Acute Toxicity Test, available at http://www.epa.gov/region1/npdes/permits/generic/marinewateracutetoxtest-rev.pdf and included as Attachment 1 to the Final Permit, specifies test conditions for toxicity testing, including a salinity of 25 parts per thousand (ppt) 10 percent for all dilutions by adjusting with dry ocean salts. This adjustment is necessary for precisely the reasons that GE raises in its comment, and has been effective for toxicity testing for a host of facilities, including WET testing requirements for the stormwater discharges from the Conoco Phillips and ExxonMobil NPDES permits previously discussed as having similar discharges to GE elsewhere in this Response to Comments. Consistent with the protocol for the marine acute toxicity test, the test organism has been changed from the sea urchin to the mysid shrimp (*Americamysis bahia*).

Comment 5.2.3: WET Testing is not Appropriate for Discharges from Outfalls 014, 018A or 018B.

We note, at the outset, that there is no wet weather component at Outfall 018; therefore, there is no need for an Outfall 018B. In the fact sheet, EPA determines that WET testing is appropriate at Outfalls 014 and 018A "*based on the possibility of toxicity in the discharge…resulting from groundwater*." However, as discussed elsewhere in these comments, EPA's determination is not accurate.

The Outfall 014 infrastructure was lined in 2002 and, in addition, the length of pipeline from Building 29G to the river is relatively short (approximately 120 feet). For these reasons, groundwater infiltration to Outfall 014 is expected to be negligible.

Outfall 018 is a salt water discharge structure/tunnel conduit constructed of concrete (10-12 inches thick) and roughly square. The structure is impacted greatly by river water and minimally (if at all) by groundwater given tidal effects on the structure and the high flow of water through the system.

Response to Comment 5.2.3:

As stated in Part V.C.3 of the Fact Sheet, "Non-stormwater flows through Outfall 014 consist of NCCW from aircraft engine test facility heat exchangers, condensate blowdown, and engine and compressor test facility NCCW." As stated in Part V.C.4 of the Fact Sheet, non-stormwater flows through Outfall 018A consist of "NCCW (river water) from power plant generating equipment, turbine condensate, boiler startup/soot blower drains/boiler draining for maintenance, boiler filter backwash, ion exchange regeneration and backwash, de-aerator storage tanks, steam condensate return from steam users, and boiler blowdown." These non-stormwater flows currently discharge directly to the receiving water without treatment.

EPA remains concerned that there is a potential for the process water discharges through Outfalls 014 and 018 to cause toxicity to the Saugus River. GE, in its comments on the Draft Permit, has clarified that neither outfalls receives infiltrated groundwater flows, and in response, the Final Permit has removed the monitoring requirements associated with infiltrated groundwater. However, industrial process flows, particularly of mixed waste streams like that discharged from

Outfalls 014 and 018, have the potential to result in toxicity regardless of any component from contaminated groundwater. Industrial NPDES permits commonly require WET testing for process flows, and WET testing is recommended by the *Technical Support Document for Water Quality-based Toxics Control* (EPA 1991) as a useful parameter for assessing and protecting against impacts upon water quality and designated uses caused by the aggregate toxic effect of the discharge of pollutants. In this case, no WET testing has been performed at GE's outfalls under the current permit.

The Final Permit has retained the option to reduce frequency of WET testing "after submitting one year and a minimum of four consecutive sets of WET test results, all of which demonstrate no toxicity, the permittee may request a reduction in the WET testing requirements." In consideration of GE's comments, the WET testing frequency has been reduced in the Final Permit from quarterly to twice a year, therefore the above provision in the Final Permit is allowed after two years and a minimum of four consecutive sets of WET test results. In addition, the requirement to conduct chronic toxicity testing at Outfall 014 has been removed in the Final Permit given the intermittent nature of the discharge from this outfall.

Comment 5.2.4: WET Testing is not Appropriate for Discharges from the Drainage System Outfalls.

In this permit proceeding, EPA has assumed that stormwater from the Facility *"can contribute toxic pollutants to receiving water"* based on commingling with contaminated groundwater and, in turn, EPA proposes to require WET testing at GE's Drainage System Outfalls. As noted elsewhere in these comments, the data on which EPA relies are not representative of discharges from these outfalls because they predate the installation of the CDTS or otherwise fail to account for mixing that occurs within the Drainage System and the receiving waterbody.

While some quantity of dry weather flow commingled with stormwater is discharged during storm events when the gates to the Drainage System Outfalls are open, the volume of this commingled flow in the vault and drainage system is relatively small (estimated to range from 7,000 to 126,000 gallons) and the duration of discharge is brief (estimated to range from approximately 2 to 24 minutes). In proper context, it is evident (and demonstrated in GE's Technical Exhibits) that discharges from these outfalls do not cause or contribute to toxicity in the receiving water body. Consequently, consistent with EPA's approach in other relevant permit proceedings, WET testing should not be required for discharges from the Drainage System Outfalls.

Response to Comment 5.2.4:

As discussed in Response to Comment 5.2.1, the requirement to perform chronic WET testing at the Drainage System Outfalls has been removed from the Final Permit. The Final Permit includes a requirement to conduct acute toxicity testing at a reduced frequency (from quarterly to twice yearly). There is currently no available WET data or sufficient representative data for these discharges to support GE's comment that the discharges do not cause or contribute to toxicity in the receiving water. EPA has established elsewhere in these responses to comments that, although flows may be transferred to the CDTS for treatment during dry weather, a portion of these same flows are discharged without treatment with stormwater during even minor precipitation events (accumulation of 0.1 inch or more of precipitation).

EPA believes that the requested monitoring will help to ensure that the Final Permit's requirement to minimize the amount of dry weather flows that become commingled with stormwater during wet weather conditions and discharge directly to the receiving water without treatment adequately addresses the potential for toxicity from commingled process, groundwater, and stormwater discharges. The Final Permit authorizes the permittee to request a further reduction in the frequency WET testing after two years and four consecutive tests indicating no toxicity.

Comment 5.2.5: EPA's WET Testing Requirements may be Infeasible to Implement.

Collecting samples for WET testing at eight stormwater and two non-stormwater outfalls may be infeasible due to the nature of stormwater sampling (i.e., the need to collect a first-flush sample early in the event), the large volumes of water needed for analysis and renewal, and the large size of the sampling crew required to execute such an effort. Consistent with GE's comments on EPA's chemical monitoring requirements, the Agency should recognize the representative status of certain outfalls and otherwise moderate its test requirements and frequencies to ensure that they can be implemented.

Response to Comment 5.2.5:

EPA does not agree with GE that WET sampling at the non-stormwater outfalls (027A, 018A, and 014) at the Lynn facility would be impacted by the "nature of stormwater sampling." Neither the Draft nor Final Permits identify stormwater as an authorized discharge through Outfall 014 or 018A. Additionally, the Draft Permit did not contain sampling requirements tied to wet weather conditions at Outfall 027A, as it is a batch treatment process.

Therefore, because the Final Permit does not authorize the discharge of stormwater from these outfalls, WET testing in connection with these outfalls in the Final Permit does not specify weather conditions. As noted earlier in this RTC document, however, the frequency of WET testing has been reduced in the Final Permit to twice a year, one test during each of the time periods October 1st - March 31st and April 1st- June 30th, which allows GE some flexibility in scheduling when samples would be collected.

EPA disagrees that sample volumes would be so large as to render sampling infeasible. According to EPA's Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms (http://water.epa.gov/scitech/methods/cwa/wet/disk2_index.cfm), one gallon of effluent is generally sufficient for testing. GE's drainage system outfalls, when the tide gate opens, discharge variable quantities of effluent but all are on the order of thousands of gallons, while Outfalls 014, 018, and 020 generally discharge on the order of millions of gallons per day. Clearly all of GE's outfalls generate sufficient effluent for WET testing when monitoring is required (i.e., when Outfall 014 is operating or when the tide gates for the drainage system outfalls are triggered). As discussed in response to Comment 5.1.4, GE has included the cost of additional equipment capable of automating sampling, which may be used to automate sampling for WET testing at drainage system outfalls during wet weather. Use of the automated sampling equipment should decrease manpower even further, as staff would only be required to retrieve the collected samples from the equipment once sampling is complete.

Comment 5.2.6: The Costs of WET Testing far Outweigh any Perceived Benefits.

Analytical costs for the WET testing specified in the Draft Permit would be significant. These costs would be approximately $2,350 per outfall. Analytical costs for WET testing of 11 outfalls (eight wet weather plus Outfalls 014, 018A and 027A) four times per year would total more than $100,000 per year (these costs are included in the estimate shown in Technical Exhibit 11). Note that these represent analytical costs only and do not include labor and other direct costs associated with the actual execution of the quarterly sampling proposed by EPA (these costs are included in Technical Exhibits 12 and 13). These costs are excessive in comparison to the limited utility/applicability of the test results and GE's demonstrated concerns about their representativeness to the discharges and impacts at issue in this proceeding.

Response to Comment 5.2.6:

As explained earlier in this RTC document, the Final Permit requires WET testing during dry weather conditions for Outfalls 014, 018A, and 027A and during the first flush of stormwater at the drainage system outfalls. However, in response to GE's concerns about the burden and cost of WET testing, while ensuring that sufficient WET data is collected to support future permit requirements, the Final Permit requires chronic testing only at Outfall 018 and 027A, and has reduced the frequency of WET testing from quarterly to twice per year. Accordingly, the costs associated with the WET testing required by the Final Permit will be substantially less than under the Draft Permit. Finally, the Final Permit includes a condition that allows GE to request a further reduction in frequency of WET testing at all outfalls following two years and four consecutive tests exhibiting no toxicity.

Comment 5.3: Bioaccumulation Study.

The Draft Permit would require GE to conduct a "bioaccumulation study to examine the bioaccumulation of metals, polycyclic aromatic hydrocarbons (PAHs), and polychlorinated biphenyls (PCBs) in blue mussels (*Mytilus edulis*) resulting from the discharge of stormwater commingled with infiltrated groundwater."

EPA cites to GE's July 2009 data set to justify this study, but the data do not support EPA's proposal. The July 2009 data were derived from sampling dry weather flows that were later sent to the CDTS for treatment prior to discharge. The data did not include any wet weather component. As a result, they are not representative of the commingled flows actually discharged from the Drainage System Outfalls during wet weather conditions.

In any event, the available data for PAHs and PCBs do not support EPA's concerns. PCBs have been detected in only one sample over time, and then at low levels. Elevated PAHs have not been detected in any of GE's wet weather samples. Absent a record of detections and exceedances, it is inappropriate for EPA to require further study, especially when the pollutants of interest are ubiquitous in the environment and likely derive, if at all, from background sources like asphalt paved roads and atmospheric deposition.

EPA's NPDES Permit Writers' Manual (EPA, 2010) addresses if and when to require bioaccumulation studies as special conditions in NPDES permits. However, none of the grounds for such studies are present in this proceeding. Moreover, there is no precedent for such studies in relevant EPA Region 1 NPDES permitting actions. In the MWRA NPDES proceeding, EPA Region 1 required a bioaccumulation study of discharges from the Deer Island Wastewater Treatment Plant. The flows from this plant are 450 million gallons per day on average with peak flows approaching a billion gallons per day. This plant is in no way comparable to the Facility. EPA also required a bioaccumulation study as part of the Brayton Point Power Plant NPDES proceeding. Brayton Point is the largest fossil fuel plant in New England and is in no way comparable to the Facility. EPA has not imposed bioaccumulation study requirements in proceedings more similar to this one, such as the NPDES proceedings for Logan Airport, Mirant Canal Station, Mirant Kendall Station, or the bulk petroleum storage facilities in Chelsea, Massachusetts.

Moreover, due to the tidal nature of the Saugus River, it is not possible to attribute bioaccumulation, if any, to a specific GE outfall for the following reasons:

a) Wet weather discharges are by nature episodic events, and measurement of bioaccumulation by nature requires long-term, continuous exposure such that biological tissue reaches a dynamic equilibrium with the ambient water quality. This cannot happen with a wet weather discharge.
b) The receiving waters are tidal with a large reversing flow. Thus any in situ testing exposes animals to flows from both up-stream and down-stream sources. This exposure is much greater than any episodic wet weather exposure. Thus, measurement of bioaccumulation at a wet weather outfall and not at an upstream control does not demonstrate that the wet weather outfall is the source (it could be coming from a different downstream source). The same is true for a downstream control.
c) There are numerous other potential sources of contamination in the immediate vicinity of the GE outfalls, including runoff from industrial and urbanized paved surfaces (which typically include PAHs and metals) and RESCO, which is located directly across the river. Thus it is not possible to attribute elevated concentrations in mussels to any single source.
d) The Saugus River has a history of over 100 years of industrial activity (U.S. National Park Service, *Environmental assessment/Environmental Impact Report for Restore Saugus River Turning Basin and Dock* (October 2006)); Massachusetts Division of Marine Fisheries, *Technical Report TR-30, Rainbow smelt (Osmerus mordax) spawning habitat on the Gulf of Maine coast of Massachusetts* (Chase, 1992); New England Natural Resources Center and Massachusetts Public Interest Research Group, *Baseline Assessment of the Saugus River Basin Massachusetts* (Tashiro et al., 1991). The footprint of this activity is likely preserved in the sediments, and the residue would be expected to periodically re-suspend in the water column. This would occur with the top few centimeters at peak monthly tidal flows, during storm events, and due to boat prop-wash.

> Mussels feed by filtering particles from the water column, thus they ingest the re-suspended historic sediment particles and any contaminants associated with those particles. It would be impossible to distinguish between a particular wet weather discharge and re-suspended sediment as the source of any accumulation in the mussel tissue.

Response to Comment 5.3:

GE's comment opposes the Draft Permit's requirement for a bioaccumulation study to help assess the effects of wet weather discharges from the drainage system vaults. After considering this comment, in conjunction with other comments and in light of other provisions to be included in the Final Permit, EPA has decided to drop the bioaccumulation study requirement from the Final Permit. The Final Permit requires steps to minimize discharges of dry weather from the drainage system vaults during wet weather. This requirement should minimize the discharge of the pollutants of concern during the wet weather conditions that would have been assessed in the bioaccumulation study. At the same time, required monitoring and reporting of any discharges of PCBs, PAHs, and metals from these outfalls during wet weather events will enable EPA to determine if the effluent contains these contaminants of concern at concentrations that pose a threat to aquatic life. As a result, EPA decided that the bioaccumulation study could be left out of the Final Permit. If, however, monitoring of wet weather effluent discharges suggests that pollutants that bioaccumulate in aquatic organisms are present at levels presenting a concern to aquatic life or human health, EPA may require a bioaccumulation study in the future.

Dropping the bioaccumulation study requirement at this time meets GE's concern, in effect, and will contribute to reducing the overall cost of permit compliance. Having said that, EPA does not agree with the entire line of analysis presented in GE's comment. EPA explains its views below.

As explained in the Fact Sheet (see pp. 11, 12, 42-46), EPA has reason to suspect that contaminated groundwater at the site contains heavy metals (e.g., mercury), polychlorinated biphenyls (PCBs), and polycyclic aromatic hydrocarbons (PAHs), which are pollutants that bioaccumulate in the tissue of aquatic organisms. This contaminated groundwater can infiltrate the facility's drainage system and could end up being discharged from the drainage vaults to the Saugus River. Monitoring results representative of dry weather discharges from the drainage system outfalls in 2009 detected PCBs at Outfall 001, some outfalls with concentrations of PAHs above the technology-based limits in the 2010 Remediation and Miscellaneous Contaminated Sites General Permit (RGP), and some outfalls with concentrations of metals higher than RGP limits. The Draft Permit required wet weather effluent monitoring in an effort to determine if any of these pollutants are being discharged with wet weather flows and, as explained in the Fact Sheet (at p. 85), the bioaccumulation study was included to support this effluent monitoring by identifying potential biological impacts from any discharge of bioaccumulating pollutants.

EPA's 2010 NPDES Permit Writers Manual (Chapter 9) indicates that special conditions, such as additional monitoring studies, are included in permits in order to supplement numeric effluent limitations or to support future permit development activities. Specifically, the Permit Writers Manual indicates that bioaccumulation studies "might be required in a permit to determine whether pollutants contained in wastewater discharges bioaccumulate in aquatic organisms…" (p. 9-2). At GE, several pollutants known to bioaccumulate in aquatic tissues have been reported in effluent from the drainage system vaults. Thus, the study was included to determine if wet weather discharges at GE contained metals, PCBs, or PAHs at levels resulting in bioaccumulation in the test organisms. EPA believes that GE makes a fair point when it suggests that if bioaccumulation was found in the test organisms in the proposed *in situ* study, it might have been impossible to determine with certainty whether the pollutants came from the facility's discharges or from other pollutant discharges to the river, or from exposure to re-suspended sediments containing pollutants from past pollutant discharges from other sources.[36] At the same time, however, the permit did not make it a violation if bioaccumulation tests were positive, and test results, whether positive or negative, could provide useful information when considered in conjunction with effluent monitoring data and other information. Thus, EPA concludes that requiring a bioaccumulation study in the Draft Permit was not inconsistent with the guidance included in the Permit Writers' Manual.

Nevertheless, for the reasons outlined above, EPA has dropped the bioaccumulation test requirement from the Final Permit.

6. EPA's Assumption that there is no Available Dilution in the Receiving Water is Overly Conservative and not Supported Factually.

Comment 6.0:

In determining the need for water quality-based limits, EPA "conservatively assumed no dilution" based on "the tidal nature of the receiving water and the dearth of flow available at low tide, the value of the resource, and the assumption that non-allowable, non-stormwater discharges receive internal dilution via commingling with stormwater in the Drainage System." *See* Fact Sheet at p. 24. GE respectfully submits that EPA's assumption is overly conservative. Dilution occurs as a matter of physical fact in the river. Accounting for this dilution is authorized by applicable federal law and is not prohibited by applicable state law. From both a qualitative and quantitative perspective, such an accounting is appropriate in this proceeding.

EPA's regulations specifically allow for dilution to be considered in the reasonable potential analysis and, as a matter of Agency practice, it is commonplace for EPA to do so. EPA's Technical Support Document for Water Quality-Based Toxics Control (March 1991) (TSD) provides in-depth Agency perspective on dilution and mixing zones. The TSD sets forth specific conditions under which denial of mixing zones would be appropriate, but none of these conditions has been articulated by EPA here. Moreover, the TSD specifically acknowledges that dilution in marine and estuarine systems may be greater due to large and/or complex mixing than most freshwater systems. This potential for greater mixing and dilution is borne out by AECOM's evaluation, which is included as Technical Exhibit 14.

[36] Of course, any sediment contamination might also have resulted from discharges by the GE facility, which is undoubtedly one of the significant historical sources of contamination to this part of the Saugus River.

MADEP follows an older Implementation Policy for Mixing Zones (MADEP 1993). This policy describes circumstances where mixing zones may or may not be appropriate.[37] Two of these circumstances may be relevant here. The first is for shellfish harvest waters (Class SA and SB), where mixing zones are not authorized "unless it is affirmatively demonstrated that the mixing zone does not encompass important shellfish harvest areas and will not adversely diminish the established pollution of shellfish in this segment." GE's affirmative demonstration is presented below and in the accompanying Technical Exhibit. The second is for Areas of Critical Environmental Concern (ACECs) and other refuges, sanctuaries and special habitats, where mixing zones are not authorized without a case-specific determination. Again, GE's affirmative demonstration is presented below and in the accompanying Technical Exhibit.[38]

With this demonstration, GE encourages EPA to account for the dilution that is, in fact, occurring in the receiving water without any adverse impact to shellfish waters or other ACECs.

Response to Comment 6.0:

GE objects to the fact that EPA did not account for dilution in the Saugus River in determining the Draft Permit's water quality based effluent limitations for the Lynn facility's Drainage System Outfalls.

For reasons explained earlier in this RTC document, the Final Permit does not contain water quality-based effluent limitations, except where necessary to satisfy the anti-backsliding requirements of the CWA and its implementing NPDES regulations. As dilution is a relevant factor only in relation to development of water quality-based effluent limitations, not technology-based effluent limitations, GE's Comment 6.0 is no longer pertinent. The water quality-based limits contained in the Draft Permit have been replaced in the Final Permit with a requirement to monitor for specific pollutants without numeric effluent limitations, for the reasons discussed elsewhere in this RTC document and its attachments.

Comment 6.1: Qualitative Assessment Supports Allowance for Dilution and Mixing.

Wet and dry weather discharges from the Facility are subject to physical mixing and dilution within the Saugus River. The entire stretch of river is designated by MassDMF as a shellfish growing area (part of area N26.0) and has been assigned a "shellfish" qualifier as part of its MADEP Class SB water quality classification for segment MA93-44. However, the only local area where commercial shellfish harvesting is allowed (albeit conditionally restricted) is along

[37] MADEP defines a "mixing zone" as "an area or volume of a waterbody in the immediate vicinity of a discharge where the initial dilution of the discharge occurs. Within a mixing zone excursions from certain water quality criteria may be tolerable, provided they do not interfere with the existing or designated uses of the segment. Water quality criteria apply at the boundary of the mixing zone. Where mixing zones are not permitted, water quality criteria apply at the outfall structure."

[38] It is important to note that MADEP interprets its policy to apply to the relevant portion of a critical use area. "For the purpose of this policy a critical use may include all or a discrete portion of a segment. For example, a bathing beach in a Class B segment or a shellfish bed in a Class SA segment may be deemed critical while other areas of the same segment are eligible for mixing zones."

the Pines River. While tidal reversals do bring Saugus River water into the Pines River, due to the location of the outfalls, pollutants potentially present in the Facility's discharges will be subject to significant physical mixing such that any "mixing zone" associated with those discharges would not be expected to "encompass" the Pines River shellfish harvest area or "adversely diminish the established population of shellfish in the segment."

Moreover, the most significant concern related to shellfish contamination and the closure of local shellfish harvest areas has been bacterial contamination (e.g., fecal coliform) associated with stormwater runoff and, to a greater degree, local CSO discharges. A 2006 sanitary survey report for area N26.1 (MassDMF, 2006) indicated that historic bacterial contamination in this area was due to degraded water quality from rain runoff transported to the area by the Saugus River, Town Line Brook and Diamond Creek. The report indicated that the Saugus River Watershed Council had documented that "the most significant contributors of this pollution to the Saugus River are Shute Brook in Saugus, the Town of Saugus Pump Station at Lincoln Street and [LWSC] CSO #003 (Summer Street Overflow in Lynn). The 2006 sanitary survey indicated that metals and PCBs concentrations in shellfish in area N26.1 had been evaluated in 2005 and that significant levels were not encountered. The report indicated that both MassDMF and the Massachusetts Department of Public Health reviewed the analytical results of these studies and determined that "results were below US Food and Drug Administration's Action and/or Guidance Levels for Poisonous or Deleterious Substances in Seafood."

As EPA is well aware, GE is not a source of fecal coliform or other bacterial contaminants, and its discharges have not been shown to adversely affect the relevant shellfish harvest area. As a result, GE would not be precluded from a mixing zone under the state's implementation policy.

GE is also not precluded from a mixing zone due to the presence of the Rumney Marshes ACEC. These marshes are located in Saugus and Revere, beginning south of the Saugus side of the river (opposite the Facility) and extending to the south and southwest. The Pines River runs through the Rumney Marshes and supports shellfish beds. In establishing the ACEC, MADEP extended the northern boundary across the Saugus to the north bank (on the Lynn side). Although the river has tidal flats that could possibly serve as suitable habitat for shellfish, GE believes that the extension of the ACEC to the full width of the river was likely made in recognition of the tidal nature of the river and the fact that tidal flows infringe on the Pines River and Rumney Marshes. The Gear Plant portion of the Facility abuts salt marshes that are included in the ACEC; however, the Gear Plant is shut down and GE's other, remaining discharges are not expected to impact the marshes because of their characteristics, fate, transport and physical mixing in the river. GE submits that EPA should account for this mixing and dilution based on the affirmative demonstration presented below and in the accompanying Technical Exhibit, supported by the qualitative assumption that GE's outfalls are sufficiently far removed from the critical portions of the ACEC (thus allowing for segmentation as provided in MADEP's policy).

Response to Comment 6.1:

Dilution is only taken into consideration when developing water quality-based effluent limitations. The water quality-based effluent limitations in the Final Permit have been retained based on anti-backsliding. All other water quality-based limits have been replaced with a requirement to monitor without effluent limitations, for reasons discussed elsewhere in this response to comments document and Attachment A.

In the case of this receiving water, EPA conservatively assumed no dilution in evaluating the water quality-based criteria for toxic and non-conventional pollutants for the Draft Permit, given the tidal nature of the receiving water and the dearth of flow available at low tide, the value of the resource, and the assumption that non-allowable non-stormwater discharges receive internal dilution via commingling with stormwater in the Drainage System (Part V.B.2 of the Fact Sheet).

After reviewing the CORMIX model and resultant dilution proposed by GE in Technical Exhibit 14, EPA is still not convinced that the discharges from GE warrant any dilution for the following reasons.

Model calibration was not demonstrated

Site specific field measurements of discharge and ambient parameters were not used to calibrate the model. Examples of these parameters include channel geometry at the outfalls, ambient current velocity for worst case scenarios, the duration of slack tide, an ambient density profile, and instantaneous discharge flow rates.

Unsteady analysis was not completed

The near field mixing zone at the facility is in an unsteady environment. Steady state discharge conditions may apply in some instances but limitations of the steady state modeling assumptions of discharge induced mixing used in CORMIX become less applicable as steady state conditions break down.

Discontinuous, variable discharges and tidal ambient conditions do not warrant evaluation exclusively in CORMIX 1 using the steady-state mode. In addition, the unsteady analysis tool in CORMIX (which was not utilized) was developed in later versions of CORMIX not supported by EPA. In general, unsteady coastal environment conditions typically require a sophisticated 3-dimensional ocean-circulation type model or computational fluid dynamics model with the capacity to solve 3-dimensional and time critical unsteady condition equations in worst case slack conditions.

Complete worst case conditions were not evaluated

The discharge scenarios considered demonstrate adequate sensitivity analysis; however, the worst case scenario near-field mixing zone case was not demonstrated. The worst case mixing zone scenario in a tidal environment typically occurs just after slack tide, when ambient current velocity is 0 cm/s. When this occurs, steady state assumptions become less applicable and the CORMIX interface issues warnings regarding the instability of the discharge and the unreliability of steady state predictive factors such as dilution. The duration of slack tides were also not considered.

A single, worst case dilution factor was not presented

A range of mixing-based dilution is not applicable. The combined dilution factor presented in regard to the overall facility discharge flow is accompanied by no justification. In addition the worst case ambient flow is not the combined average tidal flow rate and freshwater flow rate. For analyses at the acute and chronic boundaries in tidally-influenced water, it is acceptable to use the critical 10th percentile and 50th percentile current velocities, respectively, derived from a cumulative frequency distribution analysis.

CORMIX assumes steady state is reached by the end of the near-field boundary. Since worst case conditions were not presented, it is unclear if the discharge duration is greater than or equal to the time it takes for the discharge plume to reach the near field boundary. If the discharge duration is less, the dilution factor is not reliable.

Depth limitations were not fully evaluated

CORMIX must be used advisedly when the depth is less than 5 times the plume diameter. In addition, in the case of shallow ambient depth (low slack tide), the ambient depth for one or more outfalls is less than 3 times the height of the discharge pipe. Under this condition, CORMIX will not execute. Intentional changes in dimensional parameters to force CORMIX to execute, even relatively small in magnitude, can greatly affect the mixing zone properties and resulting dilution factor.

Water quality based limitations have been removed from the Final Permit except where retained consistent with anti-backsliding regulations. Still, EPA does not accept the estimated dilution factors presented in the CORMIX evaluation. Please refer to EPA 823-R-06-003, and CORMIX documentation provided by Mixzon Inc. for additional technical information. An updated mixing evaluation depicting dilution under worst-case conditions would be required to consider dilution in the calculation of water quality-based numeric effluent limitations for future permit issuance.

Comment 6.2: Quantitative Evaluation Supports Allowance for Dilution and Mixing.

GE retained AECOM to evaluate the dilution of commingled dry weather flow and stormwater from the Drainage System Outfalls. AECOM's evaluation is presented as Technical Exhibit 14. This evaluation demonstrates that discharges from the outfalls are both brief in duration and subject to significant mixing-based dilution within the river. Predicted "effective dilution" factors are substantial -- for worst case surface discharges in a low current velocity environment they range from 4.2:1 (at Outfall 031) to 20.5:1 (at Outfall 001). Effective dilutions are even greater during higher current velocity environments and submerged outfall scenarios.

The "effective dilution" concept takes into account the limited volume and associated limited time duration of the commingled water discharge. When vault gates open, commingled water is discharged from the Drainage System to the Saugus River over a 2 to 24 minute period (varies by outfall and discharge scenario). EPA's Technical Support Document for Water Quality-Based Toxics Control (EPA 1991) indicates that acute ambient water quality criteria are based on a 1-hour average exposure time. The effective dilution factors noted above represent the dilution of commingled water in the discharge as it relates to a 1-hour average instream exposure time, in order to enable direct comparison to acute ambient water quality criteria.

When these dilution factors above are applied to estimated water quality data from the commingled flows within the vaults (as presented in Technical Exhibit 15), it is clear that any potential for an exceedance of the 1-hour average acute ambient water quality criteria is very small (in fact, it is predicted that such exceedances do not occur). While GE believes that chronic instream criteria are not applicable to the discrete, brief duration commingled water discharges, it is clear that the combination of commingling-based dilution within the Drainage System and instream dilution upon discharge to the Saugus River obviate any potential for exceedance of the 4-day average chronic criteria.

GE's affirmative demonstration affects the manner in which EPA assessed the need for, and in fact derived limits, conditions and prohibitions in the Draft Permit, all of which need to be revisited in order to properly account for the demonstrated effects of mixing and dilution in the receiving water. In addition, GE's demonstration directly affects EPA's narrative prohibition on discharges that "cause a violation of applicable Massachusetts Surface Water Quality Standards." (Part I.A.1.b; Part I.A.2; Part I.A.3; Part I.A.4; Part I.A.5; Part I.A.6; Part I.A.7). EPA cannot legitimately impose such a prohibition end-of-pipe but rather must allow for a mixing zone.

Response to Comment 6.2:

Dilution is considered only for water quality-based effluent limitations. As explained elsewhere in this response to comments document, the only water quality-based effluent limitations retained in the Final Permit for the drainage system outfalls are based on the anti-backsliding permitting requirements of the CWA and its implementing NPDES regulations (pH and oil and grease). All other water quality-based limits at the Drainage System Outfalls from the Draft Permit have been eliminated and replaced with monitoring requirements.

For the reasons provided in RTC 6.1, an acceptable evaluation of dilution representative of worst-case conditions has not been provided at this time. Therefore, the water quality-based limits for pH and oil and grease from commingled dry weather flow and stormwater must be met end of pipe, prior to dilution by the receiving water. In the future, the numeric, water quality-based limits for pH and oil and grease at the drainage system outfalls may account for dilution provided that a state-approved mixing zone is authorized.

The requirement that the discharge "shall not cause or contribute to the violation of a water quality standard" is retained in the Final Permit. If monitoring completed through the Final Permit suggests that the effluent from the drainage system outfalls may contribute to or cause a violation of water quality standards, EPA and MassDEP would consider dilution through an approved mixing zone when determining reasonable potential provided that sufficient information is available to evaluate dilution in the receiving water.

7. EPA must Correct Errors in its Approach to Assigning Limits and Monitoring Conditions on GE's Noncontact Cooling Water and Unused River Water Discharges.

Comment 7.1: Outfall 018 does not Discharge Stormwater and, in Turn, Should not be Assigned Wet Weather Limits or Conditions.

EPA relied on outdated information suggesting that Outfall 018 has a stormwater component, which it does not. Consequently, there is no need for "wet weather" discharge Outfall 018B.

In addition to noncontact cooling water (NCCW), EPA assumed that Outfall 018 receives dry weather flows such as boiler filter backwash and ion exchange regeneration and backwash, which it does not. The only flows other than NCCW to Outfall 018 are turbine condensate (intermittent), boiler startup/soot blower drains/boiler draining for maintenance (intermittent), discharges from deaerator storage tanks (intermittent), steam condensate return from steam users (seasonal) and boiler blowdown. Except for boiler blowdown, all of these flows are either intermittent (related to a specific maintenance activity) or seasonal. Assigning a single internal outfall (018C) is both unnecessary (due to the intermittent and infrequent nature of the discharges) and impracticable (no single monitoring point exists that would capture these various wastestreams). Monitoring of Outfall 018 (combined NCCW and other wastestreams) will effectively capture the quality of the discharge to the river.

Response to Comment 7.1:

As explained earlier in this response to comment, in consideration of the fact that GE has provided information indicating that storm water discharges do not occur at Outfall 018B, the Final Permit has eliminated Outfall 018B, including wet weather limits and conditions. The Final Permit does not authorize stormwater discharges from Outfall 018A.

GE additionally comments that flows to Outfall 018 other than NCCW should not be required to be monitored internally because these flows are intermittent and no single point exists that would capture the various waste streams. First, EPA disagrees that an internal outfall would be unnecessary because flows are intermittent. The dry weather flows to Outfall 018 are similar in nature to the "low volume waste sources" in the Steam Electric effluent limitations guidelines, defined at 40 C.F.R. §423.11(b) to be "taken collectively as if from one source, wastewater from all sources except those for which specific limitations are otherwise established in this part. Low volume wastes sources include, but are not limited to: wastewaters from wet scrubber air pollution control systems, ion exchange water treatment system, water treatment evaporator blowdown, laboratory and sampling streams, boiler blowdown, floor drains, cooling tower basin cleaning wastes, and recirculating house service water systems. Sanitary and air conditioning wastes are not included." Given the similarity in these waste streams, both the Draft and Final Permits include BPJ-based effluent limitations for these waste streams informed by the technology-based standards in the Steam Electric ELGs. These limitations apply prior to mixing with NCCW, and therefore must be monitored internally. Monitoring of these flows is required on a monthly basis, and should be timed to capture peak flows, including intermittent discharges. At a minimum, boiler blowdown (a continuous discharge) will be monitored.

Regarding the monitoring location, the flow diagram for Outfall 018 provided with the 1998 permit application (Figure 3-7) indicates that there would be a single monitoring location just prior to mixing with NCCW that would capture all these internal waste streams. GE has not, in its subsequent submissions nor in its comments on the Draft Permit, provided any information to contradict the flow diagram or to support its claim that waste streams at Outfall 018 cannot be monitored internally.

Comment 7.2: Any Groundwater Infiltration into Outfalls 014, 018 and 020 is *de minimis*.

Even assuming that contaminated groundwater could be present at Outfalls 014, 018 and 020 (which we dispute), the amount of infiltration would be *de minimis* in comparison to the main source of flow. The pipes leading to these outfalls are lined, sealed, inspected or otherwise used in a manner that precludes the potential for significant infiltration. In addition, there are no stormwater connections into these pipes. GE submits that it was inappropriate for EPA to impose numeric limits and monitoring requirements in the absence of any data or analysis to suggest that discharges from these outfalls in fact cause or contribute to an exceedance of applicable water quality standards.

The situation at Outfall 020 is perhaps the most extreme. Outfall 020 discharges unused river water that is collected in a reservoir that is drained, cleaned and inspected annually by licensed power plant operators. The reservoir shows no signs of cracking or deterioration, and GE does nothing to the water other than pump it in and then allow the water to overflow back to the Saugus River. No limits or monitoring requirements should be imposed on this activity.

Response to Comment 7.2:

GE comments that “it was inappropriate for EPA to impose numeric limits and monitoring requirements [on Outfalls 014, 018, and 020] in the absence of any data or analysis to suggest that discharges from these outfalls in fact cause or contribute to an exceedance of applicable water quality standards” on the basis that groundwater infiltration at these outfalls, if any, is de minimis. The Final Permit has eliminated the monitoring requirements related to the discharge of infiltrated groundwater at Outfalls 014, 018, and 020 on the basis that these outfalls do not receive these flows. The Final Permit authorizes only discharges of flows specified by the permittee in the permit application and comments for these outfalls.

Comment 7.3: The Copper and Selenium Limits at Outfall 018 limits are not Appropriate.

GE presented information in Section V.A above that calls into question earlier sampling results for copper and selenium. Even if these results were accurate (which we dispute), EPA cannot derive limits without factoring in the presence of these pollutants in the Facility’s intake water.

The table in Technical Exhibit 16 provides river water quality samples collected in September 1998 (west of the Route 1A bridge) and September 2000 (approximately midway between the power plant and test cell intakes), as well as samples collected in September 1998 at Outfall 018.

The copper concentration observed in the river in September 2000 was almost half of the acute criterion.

Per the discussion above, even if imposition of these numeric limits could be justified, EPA failed to provide a "credit" for pollutants not added by the Facility, which EPA should have done by expressing the limits on a net basis. As EPA is well aware, under the Clean Water Act, the permit writer may regulate only "discharges of pollutants," which are defined as "any *addition* of any pollutant to navigable water." CWA §§301(a) and 502(12). Moreover, courts have held that constituents occurring naturally in navigable waters or occurring as a result of other permittees' discharges do not constitute an addition of pollutants. *See National Wildlife Federation v. Gorsuch*, 693 F.2d 156, 173-75 (D.C. Cir. 1982); *Appalachian Power Co. v. Train*, 545 F.2d 1351, 1377 (D.C. Cir. 1976). EPA's regulations specifically allow credit for intake pollutants in setting technology-based effluent limits. 40 C.F.R. 122.45(g). And EPA has opined that permit writers "may take into account the presence of intake water pollutants" in setting water quality-based effluent limits, as well. 49 Fed. Reg. 38,050, 38,027 (Sept. 26, 1984). This opinion underlies EPA's Water Quality Guidance for the Great Lakes System, and has served as a model for permit decisions all around the country. *See generally* 40 C.F.R. Part 132, App. F. Importantly, EPA has allowed the consideration of intake pollutants both in determining the need for limits and deriving those limits. EPA should do no less here.

Response to Comment 7.3:

As discussed earlier in this RTC document, the numeric effluent limitations for copper and selenium at Outfall 018A have been eliminated in the Final Permit. EPA has made this change in consideration of the fact that the information demonstrating that elevated levels of these metals were present in the discharge from Outfall 018A was derived from monitoring data gathered in 1998, while more recent sampling data submitted by GE in response to an EPA CWA Section 308 information request indicated that these metals were non-detect in the discharge. Limited monitoring for copper will be conducted and reported twice per year as part of the WET testing requirements. This data will enable EPA to determine the reasonable potential for the discharge to cause or contribute to an exceedence of water quality standards for these metals.

Technical Exhibit 16 indicates that slightly elevated concentrations of metals were observed at the sampling location between the Power Plant and Test Cell intakes, but not west of the Route 1A Bridge. The sampling location between the intakes is not precisely defined, but EPA notes that Outfall 018 also discharges at a location between the Power Plant and Test Cell intakes. The sampling data provided does not appear to rule out the possibility that the elevated copper and selenium levels are due to the discharge from Outfall 018 and not to background concentrations in the river. A more representative sample of the presence of background metals in the intake would be collected from the intake to the Power Plant (i.e., "bathtub"). EPA agrees that, where warranted based on representative data, credit for pollutants present in intake water can impact technology-based effluent limits. In this case, the existing data is insufficient to support the application of intake credits and is not applicable because the Final Permit does not include numeric limits for either parameter.

8. Antidegradation Authorization is Neither Necessary nor Appropriate for this NPDES Renewal Proceeding.

Comment 8.0:

EPA references the State's antidegradation policy in support of several of the proposed limits and conditions in the Draft Permit, and provides a detailed analysis of the State's policy and implementation procedures in the Fact Sheet. *See* Fact Sheet at pp. 24-26, 29 (relating to the prohibition on dry weather discharges), and 33 (relating to the combination of permit conditions targeting non-allowable, non-stormwater flows). However, it is not clear from the record whether EPA is in fact recommending that the discharges undergo the State's antidegradation authorization process.

GE notes that EPA specifically requested an antidegradation study in connection with the last NPDES renewal proceeding in 1992-93. The resulting study concluded that the thermal discharges associated with the Facility do not result in an impairment of existing water quality and are protective of indigenous aquatic life. Thermal discharges have decreased since the time of the study due to the inactivity of the Gear Plant intake and associated discharge at Outfall 029.

Based on the prior record and the fact that the Facility is an existing source that has been in place for over 100 years with no changes in operations or discharges that would lead to degradation, GE submits that additional antidegradation authorization at this time is neither necessary nor appropriate. Moreover, even if antidegradation authorization was purely a discretionary decision under the State's antidegradation implementation procedures, that decision would nevertheless need to be justified and explained in the permit record. Nothing of the sort has been done here.

Response to Comment 8.0:

GE's comment points to passages from the Fact Sheet in which EPA generally discussed the antidegradation provisions of the state's water quality standards, as well as passages in which EPA explained that it had concluded that the limits in the Draft Permit would satisfy the state's water quality standards, including the antidegradation provisions. GE also comments that "it is not clear from the record whether EPA is in fact recommending that the discharges undergo the State's antidegradation authorization process." Furthermore, GE comments that an antidegradation review was conducted by the state in 1993 with regard to thermal discharges and that the state concluded that thermal discharges would not impair water quality or harm indigenous life in the water body. Moreover, GE states that thermal discharges have decreased since that time. GE further states that "the Facility is an existing source that has been in place for over 100 years with no changes in operations or discharges that would lead to degradation." Finally, GE states that even if the state's antidegradation procedures were entirely discretionary, an antidegradation review could not be undertaken by the state without some justification being provided in the record for doing so, and no such justification has been provided.

EPA does not agree with several aspects of this comment. GE's comment seems to suggest that unless it has increased or otherwise changed its discharges, state antidegradation requirements do not apply to its discharges. This is incorrect. Thus, while GE's statement that it has made no changes in its operations or discharges for over 100 years that would lead to degradation of water quality strains credulity – and certainly GE has not documented this claim – EPA's response to this comment does not turn on this point.[39]

NPDES permit limits issued by EPA must satisfy not only federal technology standards, but also state water quality standards. *See, e.g.*, 33 U.S.C. § 1311(b)(1)(C). Part of this is satisfying the antidegradation provisions which are part of the state's water quality standards. *See* 40 C.F.R. §§ 131.12(a). In Massachusetts, the state's antidegradation regulations and procedures apply to existing discharges undergoing NPDES permit renewal under certain circumstances, including in this case. *See* 40 C.F.R. § 4.04(1), (3)(a), and (6). *See also* Massachusetts Department of Environmental Protection (MassDEP), "Implementation Procedures for the Antidegradation Provisions of the Massachusetts Surface Water Quality Standards, 314 CMR 4.00" (Oct. 21, 2009) (MassDEP's 2009 Antidegradation Procedures), p. 1 ("Finally, as explained below, in certain circumstances, these procedures apply to existing discharges undergoing the permit renewal process."). EPA explained this in the Fact Sheet for the Draft Permit, at pp. 24-26.

GE discharges pollutants into a segment of the Saugus River that is part of the state-designated Rumney Marshes Area of Critical Environmental Concern (ACEC). As a result, these waters are considered to be outstanding resource waters (ORW). As EPA explained in the Fact Sheet (at p. 24):

> The State's antidegradation requirements restrict both new (or increased) and existing discharges of pollutants to ORWs. While GE Aviation is not proposing new or increased pollutant discharges, its existing discharges still must satisfy the antidegradation requirements.

See also 40 C.F.R. § 4.04(3)(a); MassDEP's 2009 Antidegradation Procedures, pp. 6-7. In addition, the antidegradation requirements also apply to the review of existing discharges to ensure the protection of existing uses of a water body. *See* 40 C.F.R. § 4.04(1); MassDEP's 2009 Antidegradation Procedures, pp. 3. While GE points to a prior antidegradation analysis concerning thermal discharges, a prior analysis exempts neither continued thermal discharges nor discharges from the drainage system from the antidegradation requirements applicable to existing discharges to an ORW. Of course, this is not to say that a prior analysis could not be used in an antidegradation assessment to the extent that it remained scientifically appropriate.

Under the state's antidegradation requirements, new, increased and existing discharges must not cause a violation of "existing uses." *Id.* Furthermore, the state's requirements specify with regard to ORWs, that:

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[39] While EPA does not have direct knowledge of all the changes that may been made in GE's discharges and other operations in over a century of industrial activity at the company's site along the Saugus River, EPA is aware that discharges from the CDTS and the Drainage System Outfalls began within the last 100 years. EPA also suspects that other new discharges commenced, or new pollutants have been added to existing discharges, within the last century. As GE states in its Comment 13.2.4, "… the vaults are centralized collection points for a large complex drainage system in a manufacturing facility where things can change."

The quality of these waters shall be protected and maintained.

(a) Any person having an existing discharge to these waters shall cease said discharge and connect to a Publicly Owned Treatment Works (POTW) unless it is shown by said person that such a connection is not reasonably available or feasible. Existing discharges not connected to a POTW shall be provided with the highest and best practical method of waste treatment determined by the Department as necessary to protect and maintain the outstanding resource water.

In the Fact Sheet for the Draft Permit, EPA specifically concluded that the permit limits on GE"s thermal discharges and dry and wet weather drainage system discharges would satisfy the state's water quality standards, including its antidegradation provisions. *See* Fact Sheet at pp. 29, 33. As EPA explained for the Draft Permit, the Agency's authorization of thermal discharges pursuant to a CWA § 316(a) variance, is deemed to satisfy the state's water quality standards in their entirety, including the antidegradation provisions. *Id.* at pp. 24-26, 79 n. 70. While the thermal discharge limits in the Final Permit are less stringent than those in the Draft Permit, they are still authorized under CWA § 316(a) and, in EPA's view, they still satisfy antidegradation requirements. With regard to the drainage system outfall discharges, EPA explained for the Draft Permit that the permit's requirements were based on BAT and BCT and that, as a result, these discharges to the ORW could continue under the antidegradation provisions. Fact Sheet, at pp. 29, 33. Again, although the Final Permit's requirements for these discharges are less stringent in some respects than the Draft Permit's requirements, the permit's limits are still based on BAT and BCT standards and EPA concludes that these discharges may continue under the antidegradation provisions.

While GE's comment complains that it is unclear whether EPA is requesting MassDEP to perform an antidegradation assessment, this comment does not identify any infirmity in EPA's NPDES permit. In fact, EPA did not ask MassDEP to perform an antidegradation assessment. EPA appropriately considered the antidegradation issue itself – given the Agency's obligation to ensure that its NPDES permit limits satisfy state water quality standards – and explained its conclusion that the antidegradation requirements were satisfied. Thus, EPA disagrees with GE's comment that undertaking such a consideration of the antidegradation requirements was unnecessary and inappropriate, and also disagrees with GE's comment that EPA failed to explain or justify why it was considering the state antidegradation requirements. MassDEP determined that the Final Permit conditions are sufficient to comply with the antidegradation provisions in the context of its certification under CWA § 401(a). 33 U.S.C. § 1341(a).

9. The Draft Permit would Result in Redundant and Internally Inconsistent Requirements that do not Reflect best Professional Judgment, are not Necessary in Order to Achieve Water Quality Objectives, and are Infeasible to Implement.

Comment 9.0:

EPA's approach to the Drainage System Outfalls is predicated on:

- a prohibition on discharges during dry weather conditions;

- a prohibition on discharges during the first 30 minutes of wet weather conditions; and
- a limited authorization to discharge stormwater and "allowable non-stormwater" (commingled with "minimal non-stormwater flows of other types") after the first 30 minutes of wet weather conditions, qualified by a requirement to eliminate "non-allowable non-stormwater discharges" to the "maximum extent practicable" (MEP).

EPA repeats these prohibitions at least three times in the Draft Permit (Part I.A.1.a, Part I.A.11 and Part I.B.10). EPA also repeats the MEP requirement at least four times in the Draft Permit (Part I.A.1.b, Part I.A.15, Part I.B.9 and Part I.B.10.b).

Both the prohibitions and the MEP requirement are predicated on definitions and assumptions that EPA contrived for this particular proceeding, but that are flatly inconsistent with conditions at the Facility, not to mention relevant precedent. The fundamental problem with EPA's approach is that it cannot be implemented and, even if it could be, it is not necessary.

Response to Comment 9.0:

GE's Comment 9.0 contains certain statements that are more fully explicated in GE's subsequent Comments 9.1 through 9.6, below. Accordingly, EPA's response to Comment 9.0 is a general one, and EPA later responds, in greater detail, to GE's Comments 9.1 through 9.6. GE asserts that the provisions of the Draft Permit regulating discharges from the Lynn facility's drainage system outfalls "are predicated on definitions and assumptions that EPA contrived for this particular proceeding, but that are flatly inconsistent with conditions at the Facility, not to mention relevant precedent" and that "[t]he fundamental problem with EPA's approach is that it cannot be implemented and, even if it could be, it is not necessary."

In essence, the Final Permit contains BMPs designed to ensure that: 1) untreated flows (including infiltrated contaminated groundwater) are not discharged into the Saugus River during dry weather; and 2) that dry weather flows which, during wet weather conditions, commingle with stormwater and are released, untreated, from the drainage system into the Saugus River, are minimized prior to a precipitation event. See Attachment A for a more detailed discussion of the technology-based requirements of the Final Permit.

Comment 9.1: Wet and Dry Weather Flows.

EPA defines *"wet weather" in Part I.A.1 footnote 1 as "any time period that begins with an hour that received 0.1 inches or more of rainfall (or equivalent precipitation) and continues until two hours past the last hour that precipitation is recorded."* EPA defines *"dry weather"* as *"any time which is not wet weather."*

GE urges EPA to revise these definitions to more accurately and fairly reflect the nature of stormwater controls that are already in place at the site. Those controls affect both "how" and "how long" wet weather discharges occur.

For Outfall 027B, runoff from the newly installed retention pond can continue for up to 48 hours after a measurable storm event. Moreover, for all of the Drainage System Outfalls, the design and operation of the stormwater outfall gates dictate the occurrence and duration of wet weather discharges.

As a matter of both design and operation, an outfall gate begins to open when the accumulation of stormwater flow in the vault causes the water to reach a designated "gate open" level. The gate slowly rises (opens) over a 5-minute period, gradually releasing accumulated water so as not to create excessive turbulence and stir up water in the vault during the release. After 5 minutes, the gate is completely open and remains this way for a 1-hour period. After an hour, the gate rapidly closes and remains closed until the "gate open" level is again triggered. If the vault begins to refill with stormwater, the transfer pumps will turn on and will route the accumulated water to the CDTS until such a time as water level either drops to the "pump off" level or rises to the "gate open" level.

Based on the manner in which the stormwater outfall gates operate, discharges from the vaults are related to runoff flow rates into the vaults instead of when precipitation begins or ends. For this reason, it would be more appropriate to define "*wet weather*" in Part I.A.1 footnote 1 as "*any time period that begins with an hour that received 0.1 inches or more of measurable rainfall (or equivalent precipitation, including snowmelt) and continues until two hours past the closing of the last of the outfall gates (excluding Outfall 027B due to the upgradient stormwater detention pond, which can take up to 48 hours to fully drain).*"

Response to Comment 9.1:

EPA notes that the definition of "wet weather" in the Draft Permit is based on actual weather conditions, not on the way in which GE currently operates the Drainage System Outfall gates. Under the Draft Permit, the permittee was required to transfer all flows during the first 30 minutes of wet weather to the CDTS for treatment. For this reason, it was important to define when "wet weather" would begin and end as a function of actual weather conditions. The Final Permit has eliminated the requirement to treat the first 30 minutes of wet weather flows in the CDTS. The Final Permit includes BMPs to reduce the volume of dry weather flows in the vault prior to a forecasted storm event likely to trigger the vaults, and to eliminate the discharge of dry weather flows with the exception of weeping around the bottom of the gate (see BAT analysis in Attachment A for a more detailed discussion of this permit requirement). For the purposes of the Final Permit, the operation of the gate (and likelihood of the vault gate being opened and discharging to the receiving water) is the critical factor.

Therefore, Part I.A.1, footnote 1 of the Final Permit states:

For the purposes of this permit, at any one time, weather conditions are considered either "wet weather" conditions or "dry weather" conditions. "Wet weather" is defined as any time period that begins with the first opening of any drainage system outfall gate due to the addition of stormwater to the drainage system and continues until two hours after the last closing of the last drainage system outfall gate with the exception of Outfall 027B. "Wet weather" at Outfall 027B continues until 48 hours after the last closing of the last drainage system outfall gate. "Dry weather" is defined as any period of time that does not meet the definition of "wet weather." The permittee may either collect rainfall data at the facility, or use rainfall data from a nearby source, however, the data source shall be consistent throughout the effectiveness of the permit.

Comment 9.2: Allowable and Non-Allowable Stormwater.

EPA defines "*allowable non-stormwater discharges*" as "uncontaminated groundwater, steam condensate, turbine condensate, and condensate from air receivers." By contrast, EPA defines "*non-allowable non-stormwater flows*" as "contaminated groundwater, cooling water, condensate blowdown, steam conduit blowdown, boiler startup/soot blower drains/boiler draining for maintenance (intermittent), boiler filter backwash, ion exchange regeneration and backwash, de-aerator storage tanks (intermittent), boiler blowdown, building 64-A sump (intermittent), steam conduit water, cooling tower blowdown, stormwater collected in the secondary containment dikes and truck loading areas, test cell washdown water (intermittent), hydrant testing, sprinkler system testing water, potable water used upon NCCW system failure, drain cleanouts (including drainage system cleaning), roof mounted air conditioner wash water (no detergent), excavation dewatering, and stormwater dye tracing." For "non-allowable non-stormwater flows," EPA has proposed (a) a number of additional control measures, (b) a novel MEP standard for eliminating the discharge of these flows, and (c) numeric effluent limits and monitoring requirements for any non-allowable non-stormwater discharges that cannot be fully eliminated.

EPA justifies these definitions in the Fact Sheet on the basis of the MSGP. However, the MSGP is not a valid point of differentiation. The MSGP was developed as a "general permit" to accommodate thousands of permittees in different regions of the country operating in a range of different industrial sectors. The "allowable non-stormwater" discharges identified in the MSGP simply reflect the most common and recurring types of non-stormwater discharges within that large class of general permittees deemed to be acceptable by EPA. Many facilities elect individual permit coverage over the MSGP and hold permits that authorize different and/or additional "allowable non-stormwater" discharges. In short, the MSGP does not set a floor or ceiling for these types of discharges. Rather, it provides a convenient permitting vehicle with terms and conditions designed to accommodate common conditions among thousands of permittees. GE has not sought coverage under the MSGP here and, in turn, there is no basis to differentiate GE's discharges pursuant to the MSGP.

Moreover, as applied to this particular proceeding, EPA's definitions would have the effect of prohibiting certain non-allowable non-stormwater flows that GE cannot feasibly eliminate and, in any event, do not result in any water quality impacts that would necessitate elimination. These flows are addressed in more detail in Section XIII of these comments.

Response to Comment 9.2:

In response to GE's assertion that it was inappropriate for EPA to use the MSGP for the purpose of defining different kinds of flows regulated under the permit, EPA notes that the MSGP was only used as reference to determine which non-stormwater flows should be allowed under the permit to be discharged with commingled stormwater. As indicated in numerous places in this RTC document, the approach taken by EPA in the Final Permit is to regulate the discharges at the Drainage System Outfalls by a requirement to implement best management practices as opposed to establishing water quality-based numeric effluent limits.

The intent behind the Draft Permit as a whole was to require GE to reconfigure the Lynn facility's drainage system in order to remedy the current problem whereby "non-allowable non-storm water flows" are being discharged into the Saugus River without treatment due to the fact that the capacity of the facility's drainage system pumps cannot accommodate stormwater flows. That is, during wet weather events, dry weather flows (including "non-allowable, non-stormwater flows" as defined in the Draft Permit) commingle with stormwater flows, and the added volume exceeds the capacity of the transfer pumps, resulting in a bypass of the CDTS. The flows characterized as non-allowable non-stormwater flows in the Draft Permit are those flows for which the CDTS was specifically designed and installed to treat prior to discharge.

During the course of its comments on the Draft Permit, GE has stated that it is not possible to meet the requirements relating to the elimination of infiltrated groundwater into the Lynn facility's drainage system. As indicated elsewhere in this RTC document and based on GE's comments and supporting documentation, the Final Permit has made substantial changes to the technology-based, BMP approach to addressing commingled dry weather and wet weather flows from the drainage system vaults. In particular, the Final Permit has eliminated the requirement to treat the first flush of stormwater at the CDTS (see Attachment A). EPA expects that the proposed BMPs to minimize the discharge of dry weather flows will ensure the majority of dry weather flows are collected and treated at the CDTS.

However, because the Final Permit authorizes the discharge of minimal dry weather flows comingled with stormwater, there is no longer any need to make a distinction between "allowable" and "non-allowable" non-stormwater flows. The Final Permit has effluent limitations and monitoring requirements for the drainage system outfalls that apply during wet weather and limitations and requirements for treated effluent from Outfall 027A during dry weather. The Final Permit eliminates the definitions of non-stormwater flows to which GE objects in its comment.

Comment 9.3: MEP.

EPA's MEP requirement is entirely novel in this permitting context. It is true that Section 402(p) of the Clean Water Act sets out a similarly worded MEP standard for discharges from municipal separate storm sewer systems. However, this standard is not carried forward to industrial discharges, like GE, in either the statute or EPA's regulations. EPA has not defined MEP as it would apply to the Facility, and in fact has conceded that it "is presently unable to determine all the specific steps that should be taken to reduce [let alone eliminate] the non-allowable non-stormwater flows of concern commingled with stormwater."

Instead of imposing a new, *ad hoc* and entirely subjective standard to address a perceived problem for which EPA has no known or ready solution, EPA must provide GE with the opportunity to investigate the source(s) of any flows of concern, monitor the impacts of those flows, and implement reduction/mitigation measures where feasible. This, in fact, is already occurring through the clean-up and restoration work being conducted under authority of the

Massachusetts Contingency Plan, as described in Sections II.C and III.D above. Moreover, as demonstrated elsewhere in these comments, the flows subject to the prohibitions and MEP requirement do not present water quality concerns at the point of discharge, let alone when mixed with the receiving waterbody. In short, EPA would have GE chase a problem that does not exist.

Response to Comment 9.3:

As noted earlier in this RTC document, including in response to Comment 9.2, the Final Permit does not require the elimination of non-allowable non-stormwater flows, including groundwater infiltration, to the maximum extent practicable, but instead prohibits the discharge of such flows through the Drainage System Outfalls during dry weather with minimal exceptions as defined by GE ("weeping around the bottom edge of the vault due to hydrostatic pressure").

Because the Draft Permit conditions that included to "maximum extent practicable," were eliminated from the Final Permit, this phrase, to which GE objects in its comment, was also eliminated from the Final Permit. (EPA notes that it continues to believe that "to the maximum extent practicable" may be an appropriate permit condition for describing BMPs under certain circumstances, although for the purposes of this permit, EPA chose instead to implement alternative BMPs to minimize the discharge of dry weather flow.) Additionally, the requirement to develop and implement a plan "for controlling infiltration of groundwater and inflow of non-allowable non-stormwater flows to the Drainage System," is not included in the Final Permit. Removal of these requirements alleviates many of the cost and feasibility concerns raised by GE in its comments on the Draft Permit in relation to eliminating the infiltrated groundwater.

Comment 9.4: During Dry Weather Conditions, the CDTS Reflects Best Available Technology and is Protective of Water Quality.

Following the opportunity for review by EPA and approval by MADEP, GE installed the CDTS in 1999 at a cost of $3.1 million. The CDTS collects and treats dry weather flows with a state-of-the-art granular activated carbon treatment system. The vaults and gates associated with the collection system help to minimize the potential for untreated dry weather discharges. However, the gates are not hermetically sealed. As a result, some incidental dry weather discharge (i.e., weeping) is possible.

In other relevant permit proceedings, EPA has cited to the CDTS as a "model" for other permittees to follow. For example, in the 2008 NPDES renewal proceeding for ExxonMobil, EPA reported as follows:

Other industrial facilities in the area are in the process of, or have completed renovations to their stormwater collection and treatment systems to prevent untreated contaminated groundwater from co-mingling with stormwater, as shown by the following examples…At General Electric in Lynn… dry weather flows, which include groundwater infiltration and process (cooling) water are collected and treated in the consolidated drains treatment system, which includes carbon adsorption capability. In addition, various sections of storm drain and other buried gravity discharge pipes have been lined to prevent contaminated groundwater infiltration.

The CDTS continues to reflect the best available technology. It has proven to be effective at collecting and treating dry weather flows, as well as any residual stormwater and groundwater captured in the drainage system. However, since the gates are not hermetically sealed and some incidental dry weather discharge is possible, EPA cannot simply prohibit all dry weather discharges. To do so would set GE up for failure based on a design that EPA has held out as a model for others.

Given the manner in which the CDTS was designed, EPA's prohibition cannot stand. Instead, EPA should focus on that which GE can meaningfully control -- operation of the gates. Toward that end, we recommend that EPA revise the prohibition in Part I.A.1.a to read: *"The gates for the Drainage System Outfalls (except outfalls 028, 030, and 031) shall remain closed during dry weather conditions."* We also urge EPA to remove the redundant prohibitions in Part I.A.11 and Part I.B.10.

Response to Comment 9.4:

EPA issues NPDES permits that meet technology- and water quality-based requirements of the CWA and the NPDES regulations. EPA agrees that the CDTS, as currently designed and operated, reflects the "best available technology" for treatment of contaminated groundwater and other dry weather flows. Attachment A provides a detailed BAT analysis in which EPA concludes that BAT for dry weather flows is the CDTS.

However, as noted in earlier responses to GE's comments on the Draft Permit and summarized in Attachment A, the CDTS provides for treatment of process water and infiltrated groundwater only during periods of dry weather. During wet weather, stormwater accumulates in the Lynn facility's drainage system and quickly exceeds the capacity of the transfer pumps to the CDTS. The vault gates open and untreated dry weather flow, comingled with stormwater, is discharged directly to the Saugus River without treatment. Under some conditions, EPA concludes that dry weather flows, including infiltrated groundwater, could comprise a substantial portion of the volume of effluent initially discharged to the river (See Attachment A and response to comment 3.1). To address these commingled flows, the Final Permit requires the permittee to reduce the volume of dry weather flows in the drainage system outfall vaults down to the "low alarm" elevation prior to a storm event, thereby substantially decreasing the volume that would be discharged to the river when the gate opens.

The Final Permit retains the proposed BMP to eliminate the discharge of dry weather flows during dry weather but, in response to GE's comments, provides an exception for minor weeping that results from the vaults not being hermetically sealed. Compliance with this BMP will ensure that the majority of dry weather flows are treated in the CDTS, which both GE and EPA agree is BAT, while allowing very minor leakage due to the vault design as defined by GE.

Comment 9.5: The CDTS is not Designed to Handle Wet Weather Flows.

The CDTS was designed to treat dry weather flows up to a capacity of 300 gpm, and is currently operated to treat a maximum average of 250 gpm. In order to capture and treat the first 30 minutes of wet weather flows (and, in turn, comply with the prohibition against discharging such flows from the Drainage System Outfalls), GE would need to fundamentally redesign and expand the system. The capital costs of such an undertaking would range from $5.7 and 37.9 million, and the schedule for doing so would extend from 3 to 4 years, all as more particularly described in Technical Exhibits 17 and 22.

Response to Comment 9.5:

EPA agrees with GE that the current configuration of drainage system outfalls and CDTS are not designed to handle wet weather flows. In response to GE's comment, the Final Permit does not include any requirement to treat wet weather flows in the CDTS. Instead, the BMPs contained in the Final Permit will likely ensure that the operation of drainage system outfall vaults and the CDTS transfer pumps effectively minimize the discharge of untreated dry weather flows to the Saugus River.

GE's comment also notes certain costs and a schedule for implementation of a redesign and expansion of the CDTS. It is not clear from the wording of GE's comment precisely what concern GE intends. However, as explained elsewhere in this RTC document, the Draft Permit's requirement to develop and implement site specific BMPs to eliminate groundwater infiltration has been eliminated from the Final Permit. The Final Permit requires the elimination of untreated discharges during dry weather and also requires that the volume of dry weather flow is minimized prior to the first flush of wet weather, as outlined in Attachment A. This change in regulatory approach will significantly reduce the costs associated with compliance with the Final Permit.

Comment 9.6: Neither the Prohibition nor the MEP Requirement is Necessary to Achieve Water Quality Objectives.

EPA's approach to the Drainage System Outfalls assumes that dry weather flows will adversely affect water quality if discharged during dry weather conditions or the first 30 minutes of wet weather conditions. This assumption is not accurate. Based on a conservative analysis of commingled volumes and pollutant concentrations in the vaults just prior to discharge, as set forth in Exhibit 15, only copper could be expected to exceed the acute saltwater criterion at the initial point of discharge from four of the outfalls; concentrations of all pollutants, including copper, would be expected to decrease substantially during the first 30 minutes of a wet weather event; and after the first hour, no pollutants in the discharge would be expected to exceed any of the applicable water quality standards at any of the outfalls. We note, as well, that this analysis does not account for any mixing in the receiving water, which as described in Exhibit 14, is expected to be substantial (i.e., ranging from approximately 4.2:1 to 33.2:1 for various outfalls and discharge scenarios).

Response to Comment 9.6:

EPA evaluated the dry weather samples submitted by GE from each Drainage System outfall vault and determined the requirements necessary to meet technology- and water quality- based limits. In Exhibit 15, GE provides estimations of commingled volumes and pollutant concentrations in the vaults just prior to discharge compared to water quality standards. While

EPA generally agrees with the GE's methods in Exhibit 15, GE's comment applies to the application of water quality-based numeric limitations, all of which have been eliminated from the Final Permit with the exception of those few that have been carried forward consistent with anti-backsliding. The Final Permit implements a technology-based BMP approach to the discharges from the drainage system outfalls and includes monitoring requirements to ensure that water quality is protected.

10. EPA's Proposed Thermal Limits for Outfalls 018 and 014 are more Stringent than Warranted by Applicable Law.

Comment 10.1: Overview of EPA's Approach to Deriving the Proposed Thermal Limits.

According to the Fact Sheet, pp. 74-80, EPA arrived at the proposed thermal limits in three steps. First, using its "best professional judgment" ("BPJ") the Agency made a "technology-based" determination that retrofitting wet closed-cycle cooling represents the "best available technology" ("BAT") for reducing the thermal discharge.[40] As discussed in Section XI, that determination must be reconsidered because EPA did not collect adequate information with which to support its evaluation of the technical feasibility, affordability, or cost-effectiveness of closed-cycle cooling for the Facility,[41] nor did it adequately evaluate site-specific information bearing on any of the other statutorily required factors, such as the age of the Facility or energy and non-water quality impacts. Instead, the Fact Sheet indicates that EPA reached its conclusion based primarily on the fact that some other facilities, including the Brayton Point Station (a 1,500-MW steam electric power plant located on Mount Hope Bay for which EPA performed exhaustive site-specific analyses) have retrofitted closed-cycle cooling. Relying on the results projected for the Brayton Point Station, EPA concluded that retrofitting a closed-cycle cooling system for both the Power Plant and Test Cell would reduce the heat load at the Facility by 95% or more. Fact Sheet, p. 75.

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[40] As EPA notes, there are no "applicable" technology-based requirements for the Facility, but the statute authorizes permit writers to establish technology-based limits on a case-by-case basis, using best professional judgment. Notably, however, neither the statute nor EPA's regulations require a permit writer to make a BPJ determination for each pollutant that is discharged but not subject to effluent guidelines. *See, e.g.*, CWA § 402(a)(1) (authorizing the Administrator to establish BPJ limits that she "determines are necessary"); 45 Fed. Reg. 68,329, citing *NRDC v. Train*, 8 ERC 2120 (DDC 1976), modified at 12 ERC 1833 (DDC 1979). Rather, the decision to make a BPJ determination is a matter of discretion. This is the first time that EPA has deemed it appropriate to make such a determination for the Facility, and EPA nowhere explains the reason for this change.

[41] EPA did consider some of the relevant site-specific factors in evaluating whether retrofitting closed-cycle cooling would qualify as the "best technology available" ("BTA") for purposes of § 316(b) of the Clean Water Act, which pertains to cooling water intake structures. For the reasons discussed in Section XI of these comments, however, EPA's analysis of site-specific factors in that context is inadequate and cannot be used to support the Agency's proposed conclusion that closed-cycle cooling would be BAT for the thermal discharge.

Second, EPA examined the Massachusetts Water Quality Standards applicable to the Saugus River in the vicinity of the Facility's discharge. Because the Agency concluded that its proposed technology-based limits would be more stringent than those required by applicable water quality standards for temperature, EPA chose not to derive water quality-based limits that account for an appropriate mixing zone. Fact Sheet, p. 76.

Third, recognizing (correctly) that GE intended to request renewal of the alternate thermal limits included in the Facility's current permit, which were established pursuant to the thermal variance provision in § 316(a) of the Clean Water Act, EPA developed alternate thermal limits. Instead of renewing the thermal limits included in the current permit, however, EPA developed more stringent limits based on "additional monitoring and modeling studies pertaining to GE's thermal discharges." Fact Sheet, pp. 77-79.

As the following discussion demonstrates, EPA's threshold determination that closed-cycle cooling represents BAT for the Facility's thermal discharge is unsupported and incorrect. Equally important, the Agency's determination that a 5°F reduction in the current thermal limit (reducing the maximum discharge limit from 95°F to 90°F) is necessary to satisfy § 316(a) is based on a flawed analysis and must be reconsidered.

Response to Comment 10.1

GE's comment does several things. It characterizes EPA's analytical path for developing the Draft Permit's thermal discharge limits, it alleges certain flaws in EPA's analysis, and it provides GE's interpretation of certain CWA requirements. While GE's description of EPA's analysis and various relevant legal requirements is accurate in some respects, it is also incomplete and incorrect in other respects. Moreover, EPA does not agree that its analysis for the Draft Permit was flawed in the ways that GE suggests. EPA's detailed response is set forth below.

EPA's Fact Sheet for the Draft Permit, *see* pp. 17-28, details the standards and criteria applied to determine an NPDES permit's effluent limits (and cooling water intake requirements). EPA explained that, in general, technology standards are the minimum requirements that must be met. *Id.* at 18. EPA further explained that technology-based permit requirements are derived either from the terms of an applicable National Effluent Limitation Guideline (NELG) or, if no NELG applies, then from a case-by-case, Best Professional Judgment (BPJ) application of the technology standard. *Id.* at 21-22. In addition, EPA explained that beyond technology-based requirements, an NPDES permits must also include any more stringent water quality-based requirements that apply to the discharge(s) in question. *Id.* at pp. 18 and 23. Finally, EPA also explained that a NPDES permit can specify less stringent limits for discharges of waste heat (also referred to as "thermal discharges") based on a variance from technology-based and/or water quality-based requirements, if the criteria of CWA § 316(a) are satisfied. *Id.* at 26-27.

GE is correct in stating that EPA evaluated technology-based requirements for the control of the facility's waste heat discharges based on a case-by-case, BPJ application of the BAT standard. In the Fact Sheet, EPA established that the BAT standard applies to discharges of heat, *id.* at 19, 74, 76, and that there are no NELGs applicable to the GE facility's waste heat discharges. *Id.* at

22, 74. EPA explained that, as a result, technology-based limits for these discharges would be developed on a case-by-case, BPJ basis. *Id.* at 21-22, 74-76.

GE's comment acknowledges both that there are no NELGs governing its thermal discharges and that the CWA authorizes EPA to set limits on a BPJ basis. GE goes on, however, to state that EPA is *not required* by law or regulation to set BPJ-based technology standards, that doing so is a matter of EPA's discretion, and that EPA did not explain why it chose for the first time to develop BPJ-based limits for controlling discharges of waste heat by GE's facility.

These comments do not undermine the validity of EPA BPJ decision regarding the BAT for controlling thermal discharges by the GE facility. To begin with, GE's comment recognizes that EPA has, at a minimum, the discretion to develop BPJ limits. In addition, EPA disagrees that it did not explain why it was determining technology-based thermal discharge limits on a BPJ basis as part of developing the Draft Permit. Furthermore, while EPA may under certain circumstances have discretion not to develop BPJ-based thermal discharge limits in a particular case, this discretion is more circumscribed than GE's comment seems to imply.

The CWA makes point source discharges of pollutants to the waters of the United States unlawful unless authorized by an NPDES permit. *See* 33 U.S.C. § 1311(a) and 1342(a). CWA § 402(a) provides EPA discretion as to whether or not to issue such NPDES permits, stating only that EPA "may" do so. The statute also constrains this discretion, however, by stating that permits may be issued "upon condition" that the discharge will satisfy either (A) NELGs, among other requirements, or (B) "prior to the taking of necessary implementing actions related to all such requirements, such conditions as the Administrator determines are necessary to carry out the provisions of this chapter." 33 U.S.C. §§ 1342(a)(1)(A) and (B). The latter condition refers to the determination of BPJ-based discharge limits. This does not mean that EPA may simply ignore technology standards in the absence of applicable NELGs; BPJ-standards should be applied where they are "necessary to carry out the [technology standard] provisions of this chapter." *Id.* Furthermore, EPA's regulations specify that "[t]echnology-based treatment requirements … represent the minimum level of control that must be imposed in a permit … [and p]ermits shall contain the following technology-based treatment requirements in accordance with the following statutory deadlines; … [f]or all pollutants which are neither toxic nor conventional pollutants, effluent limitations based on BAT ….." 40 C.F.R. § 125.3(a) and (a)(2)(v). The regulations go on to dictate that technology-based requirements may be imposed based on NELGs or, in the absence of applicable NELGs, on a case-by-case basis. 40 C.F.R. § 125.3(c)(1) and (2). *See also* 40 C.F.R. §§ 122.43(a) and 122.44(a)(1). EPA explained all of this in the Fact Sheet. Consistent with the legal requirements discussed above, the NPDES Permit Writers' Manual (Chapter 5, Section 5.2.3) indicates that developing case-by-case effluent limits based on best professional judgment (BPJ) is generally appropriate for pollutants when (a) there are no NELGs governing discharges of the pollutants for the point source category at issue, and (b) the pollutant is present, or expected to be present, in the discharge in amounts that can be treated or otherwise removed.

In this case, heat is a non-conventional pollutant that is present in GE's wastewater from the Test Cell and Power Plant. Furthermore, discharges of heat via Outfalls 018 and 014 have the potential to harm aquatic life in the Saugus River. Therefore, EPA's decision to develop BAT limits for GE's discharge of waste heat based on a case-by-case, BPJ analysis was also consistent with the NPDES Permit Writers' Manual.

Although the CWA generally calls upon EPA to apply applicable technology standards on a BPJ basis in the absence of an applicable NELG, EPA agrees that under certain circumstances it has the discretion to decide not to do so. For example, when considering discharges of waste heat, EPA might decide not to develop technology-based limits on a case-by-case, BPJ basis in a case in which the discharger has requested permit limits – either for an initial permit or a renewal permit – based on a variance from any such technology standards under CWA § 316(a) *and* EPA agrees that the requested variance should be granted.[42] In such a case, EPA could reasonably regard it to be unnecessary to develop the technology-based requirements when it had already decided, and the applicant had requested, that any such technology-based limits would be set aside in favor of the variance-based limits requested by the discharger.[43] *See In The Matter Of Public Service Company of New Hampshire, et al. (Seabrook Station, Units 1 and 2)*, 1 EAD 332, 338 (Adm'r 1977) (cited hereafter as *Public Service)*; *Status of the Initial Decision of Regional Administrator Where Appeal is Pending*, EPA GCO 77-1 (Jan. 11, 1977) (cited hereafter as *Status of the Initial Decision). Cf. In re Dominion Energy Brayton Point, LLC (Formerly USGEN New England, Inc.), Brayton Point Station,* 12 EAD 490, 537-539 (2006) (cited hereafter as *In re Dominion Brayton Point).*

While EPA might not need to develop BPJ limits under such circumstances, these were not the circumstances prevailing in this case, as EPA explained in the Fact Sheet. GE's permit application requested renewal of the thermal discharge limits in its existing permit, but the application neither expressly requested renewal of the CWA § 316(a) nor included the type of substantive demonstrations required by the regulations to obtain renewal of a § 316(a) variance. *See* Fact Sheet at 77. *See also* 40 C.F.R. §§ 125.72(c); 125.73(c). While EPA ultimately decided to *interpret* GE's permit application to be seeking renewal of the prior CWA § 316(a) variance, the Agency could not be sure at the time that GE would agree with this interpretation. *See id.* (In its comments, GE does now concur with EPA's interpretation.)

Furthermore, EPA could not be sure that it would ultimately decide to grant GE a CWA § 316(a) variance, or a variance with the limits requested by GE, once it had considered all the relevant information, including information outside of GE's permit application. Indeed, for this Draft Permit, EPA decided to base the thermal discharge limits on a CWA § 316(a) variance with limits more stringent in certain respects than GE had requested. *See* Fact Sheet at 77-79. When a CWA § 316(a) decision may be contested, as appeared possible in this case, developing the technology-based requirements may be necessary to provide thermal discharge limits in case the variance is set aside or as part of justifying the variance decision. *See In re Dominion Brayton*

[42] EPA also might not need to develop technology-based limits if, for example, it was able to conclude that water quality-based limits would necessarily be more stringent and would govern the permit. This would plainly be the case if, for example, water quality requirements barred a particular discharge.

[43] This scenario posits that EPA and the discharger agree on variance-based limits. Of course, if a third party commenter persuaded EPA that the variance-based limits were insufficiently stringent, then EPA might need to go back and develop technology-based limits.

Point, 12 E.A.D. at 500 n. 13, 537-539; *Status of the Initial Decision*, EPA GCO 77-1 (Jan. 11, 1977).

For the reasons described above, EPA was well within its discretion to develop BAT limits on a case-by-case, BPJ basis for the control of GE's discharges of waste heat to the Saugus River.

GE asserts that EPA must reconsider its BAT determination because the Agency neither collected adequate information in support of its evaluation of the technical feasibility, affordability, and cost-effectiveness of using closed-cycle cooling at the GE facility, nor adequately evaluated site-specific information bearing on the other statutorily required considerations, such as the age of the facility or energy and non-water quality impacts. GE states that "the Fact Sheet indicates that EPA reached its conclusion based primarily on the fact that some other facilities, including the Brayton Point Station … have retrofitted closed-cycle cooling." According to GE, EPA relied on the results projected for Brayton Point Station to conclude that retrofitting a closed-cycle cooling system for both the Power Plant and Test Cell would reduce the waste heat discharges to the Saugus River by GE by 95% or more. Moreover, although GE acknowledges that EPA "considered some of the relevant site-specific factors in evaluating whether retrofitting closed-cycle cooling would qualify as the 'best technology available' ("BTA") for purposes of § 316(b) of the Clean Water Act, which pertains to cooling water intake structures …," the company argues that "EPA's analysis of site-specific factors in that context is inadequate and cannot be used to support the Agency's proposed conclusion that closed-cycle cooling would be BAT for the thermal discharge."

EPA disagrees with these comments. The Agency identified and then considered the relevant factors for determining on a BPJ basis the BAT for controlling the GE facility's discharges of waste heat to the Saugus River. *See* Fact Sheet at 18-22, 74-76, Attachment J. EPA considered the facts of *GE's* waste heat discharges to help specifically evaluate technologies that might work to address issues *at the GE facility* and to help identify materials relevant for informing EPA's BPJ analysis (e.g., which NELGs and other permits and facilities might be pertinent). *Id.* at 3-4, 16, 59-60, 63-66, and 74-76. While GE seems to question EPA's consideration of other facilities that have converted their cooling systems from open-cycle to closed-cycle technology, EPA explained that *a starting point* for determining the BAT is to identify the pertinent facilities that best control discharges of the pollutants in question. *See* Fact Sheet at p. 20 and Att. J, pp. 4-5. EPA also explained that a BPJ analysis can be informed by sources such as permits issued to other facilities, as well as knowledge about technologies used at other facilities. *See id. See also* NPDES Permit Writers' Manual at p. 5-48, Exhibit 5-22. Furthermore, when EPA used this type of information, it explained how it was being used. *See* Fact Sheet at p. 20-22 and Att. J, pp. 4-5. At the same time, EPA was clear that the BAT for GE would have to be a technology that was actually available for use *at GE.* In other words, EPA stated that a technology used elsewhere but infeasible at GE could not be the BAT for this permit. *See* Fact Sheet at Att. J, p. 7.

An important part of EPA's BPJ determination of the BAT for thermal discharge control is provided in portions of Attachment J to the Fact Sheet. EPA expressly incorporated the relevant portions of the Attachment J analysis into its BPJ determination. Fact Sheet at 76. While Attachment J presents EPA's BPJ analysis of the Best Technology Available (BTA) for controlling adverse effects of cooling water intake structure operations under CWA § 316(b), this analysis also expressly includes consideration of technologies for controlling thermal discharges and the factors that must be considered for determining the BAT for achieving such control. Fact Sheet, Attachment J at 3-5, 7-8, 21-23.

Converting from open-cycle to closed-cycle cooling is the most effective technology for reducing *both* a cooling system's thermal discharges *and* its entrainment and impingement of aquatic organisms. *See* Fact Sheet Att. J, p. 23. From the outset, EPA understood the potential relationship between methods of reducing cooling water withdrawal effects and thermal discharge effects. Therefore, when EPA sent GE an information request letter under CWA § 308 on October 25, 2007, EPA specifically asked GE for information related to the potential application of closed-cycle cooling at GE, including the thermal discharge reductions that it could achieve (*see* item 6.b). EPA also asked for information from GE relevant for considering the BAT factors in connection with closed-cycle cooling. *Id*. (Items 5 and 6). GE provided the requested information in the Cooling Water Intake Structure Information Document and the Cooling Tower Analysis Technology and Biological Assessment Information Items 5(a) and 6, prepared for GE by CH2MHill and submitted in February 2008. EPA then considered this information in its analysis.

GE is correct that EPA referenced Brayton Point Station as a facility for which it was estimated that converting to closed-cycle cooling would result in an approximately 96% reduction in heat load. Assuming the other thermal parameters remain the same, the estimated reduction in heat load results in large part from the reduction in the overall volume of heated cooling water being discharged.[44] This estimate was also consistent with general estimates of the thermal discharge reductions possible from converting from open-cycle to closed-cycle cooling and results at other facilities as well. *See, e.g.,* EPA, Technical Development Document for the Proposed Section 316(b) Phase II Existing Facilities Rule § 6.2.3 (March 28, 2011) (available on EPA website at www.epa.gov/waterscience/316b). *Cf.* 76 Fed. Reg. 22,246 (April 20, 2011) (Proposed Rule – CWA § 316(b) Requirements for Existing Facilities) ("Most retrofit installations of cooling towers at electric generating facilities have been required by NPDES permits for the sole purpose of reducing thermal discharges."). EPA regards these estimates to provide a reasonable and appropriate basis for a general estimate of what could be achieved with regard to thermal discharge reduction at GE.

Moreover, GE estimated that if mechanical draft cooling towers were used at the Power Plant, the required make-up water volume would be 1.2 million gallons per day (MGD), which represents greater than a 96% reduction in cooling water volume compared to maximum daily discharge limits in the current permit (35.9 MGD) (p. 23 in Attachment J to the Fact Sheet).

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[44] A closed-cycle cooling system runs cooling water in a loop between the condensers, where waste heat is transferred from process steam to the cooling water, and one or more cooling technologies, where waste heat is then transferred from the heated cooling water to the atmosphere. As a result, the cooling water is chilled and may be reused for condensing steam. In a closed-cycle system, the cooling technologies must be applied at a scale sufficient to chill the cooling water to a temperature allowing the water to be reused for condensing process steam. A closed-cycle cooling system will typically reduce a generating plant's thermal discharge (and cooling water withdrawals) by more than 90% of what the facility would discharge using an open-cycle cooling system. The specific reductions achieved may vary over the course of a year and will depend on the specific cooling technologies chosen and a variety of other factors (e.g., chloride concentrations and water quality standards, meteorological conditions).

Thus, EPA based the estimated reduction in heat load of "95 % or more" on what it expects would result from retrofitting a closed-cycle cooling system at the GE Power Plant (as well as at the GE Test Cell) based on information specific to GE (e.g., reduced cooling water volumes estimated for GE specifically) and in light of the results achieved at other facilities that have converted from open-cycle to closed-cycle cooling systems for condensing process steam. EPA's estimate was not based solely on a blind application of the results from the Brayton Point Station facility to GE. Fact Sheet at 75. Furthermore, GE itself indicated that the thermal discharge from a closed-cycle system at the facility would be reduced to such a small volume that it could be discharged to the local POTW instead of to the Saugus River. EPA concurred with this conclusion. *Id.* at 76.

Turning from the technology-based analysis to the evaluation of water quality-based requirements, GE is correct that EPA evaluated the applicable state water quality standards-based requirements but did not prepare water quality-based limits based on a mixing zone. Of course, EPA would look to the Massachusetts Department of Environmental Protection (MassDEP) in the first instance to prepare any mixing zone that it deemed appropriate under its water quality standards. MassDEP's 1993 *Implementation Policy for Mixing Zones* specifies that "to protect swimming and drifting organisms the in-zone quality must be such that these organisms can pass through the mixing zone without acute exposure to toxicants." MassDEP concluded that temperatures, delta temperatures (delta Ts), and durations similar to those which resulted in acute toxicity for juvenile alewife in Otto et al. (1976) were observed at specific monitoring stations in August 2001 at low slack tide in the Saugus River. As a result, GE's thermal discharges would not be authorized under Massachusetts Water Quality Standards, even taking into account the state's mixing zone policy. Therefore, MassDEP did not designate a mixing zone for GE's waste heat discharges.[45] In any event, as GE states, undertaking that type of analysis would have been unnecessary given that other evaluations indicated that that the technology-based requirements would be more stringent than, and would therefore take precedence over, water quality-based requirements. In addition, conducting a separate mixing zone analysis would have been superfluous given that EPA ultimately designated thermal discharge limits based on a CWA § 316(a) variance and such variance-based limits are deemed to satisfy the state's water quality standards. *See* 314 CMR 4.05(4)(b)(2)(c).

Finally, as GE's comment recognizes, the numeric temperature limits in the current permit and the new Draft Permit are both based on a CWA § 316(a) variance from technology-based and water quality-based requirements. Although GE did not expressly request renewal of its existing CWA § 316(a) variance, EPA interpreted GE's permit application – which sought reissuance of a permit with the same permit limits – as intending to do so, despite the inadequacy of the company's application for that purpose. GE's comment confirms the accuracy of EPA's interpretation.

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[45] In response to GE's comments, MassDEP prepared an analysis of thermal impacts and concluded that the thermal discharge from Outfalls 014 and 018 would not meet the requirements for a mixing zone under Massachusetts Surface Water Quality Standards Implementation Policy for Mixing Zones and no mixing zone would be granted. See MassDEP's Summary of Thermal Concerns Relative to the General Electric Aviation, Lynn NPDES Draft Permit.

More specifically, EPA reviewed the thermal surveys and modeling submitted under the last permit issuance, as well as new data and models submitted since the last permit issuance in association with reissuance of the Wheelabrator Saugus NPDES permit. EPA also considered information on the effects of thermal discharges on the species of fish that use the Saugus River for habitat. Fact Sheet at pp. 77-79. From this information, EPA concluded that the current maximum daily temperature limit on 95°F from Outfalls 014 and 018, in combination with the thermal impacts of the heated effluent from the Wheelabrator Saugus discharge, "would not reasonably assure the protection and propagation of the BIP as required by CWA Section 316(a)." Fact Sheet, at p. 78.

Rather than simply rejecting the idea of § 316(a) variance, however, the Agency identified a more stringent set of variance-based limits that it concluded would assure the protection and propagation of the BIP and included these limits in the Draft Permit. More specifically, EPA determined that "a maximum daily temperature limit of 90°F at Outfalls 014 and 018 is more consistent with the near-field modeling that supported the 1993 Section 316(a) variance in the current permit" and concluded that "a 90°F effluent limit poses a threat of only limited thermal impact to the BIP and, as a result, will assure the BIP's protection and propagation" (p. 79 of the Fact Sheet). For the Final Permit, however, EPA has decided to make certain adjustments to these requirements after considering GE's comments and other relevant information. These adjustments are discussed below.

Comment 10.2: EPA's Proposed Determination that Retrofitting Closed-Cycle Cooling Reflects BAT for the Facility is Fundamentally Flawed.

EPA based its proposed determination that retrofitting closed-cycle cooling is BAT for the Facility on the flawed analogy it drew between the Facility, which manufactures and tests jet engines, and steam electric power plants, which are engaged primarily in the generation and distribution of electricity for sale to others (*see* 40 C.F.R. § 423.10 (2010)). That analogy cannot withstand scrutiny.

To understand why that analogy is inapposite, it is important to understand why the Facility produces steam and electricity. The Power Plant (Building 99) provides steam and electrical power for the entire GE site, which includes 3.4 million square feet of buildings on 220 acres. The Power Plant was designed specifically to produce steam at 650 pounds-force per square inch gauge (psig) and 850ºF for a variety of Test Cell users. All five existing boilers produce superheated steam at 650 psig, and steam is distributed to meet site needs at three different pressure levels – 650 psig, 200 psig, and 3 psig. Steam is reduced via pressure-reducing stations or extraction from steam turbines to provide steam for medium- and low-pressure applications. Site thermal loads met by the existing steam generation system include heating, process, and test steam. Site steam demand is greatest from late October to mid-April.

The Power Plant's ability to reliably provide superheated test steam at 650 psig pressure to drive steam turbines at the Test Cell (Building 29G) is critical to the readiness, simulation precision, and cost-competitive performance of GE's aircraft engine and engine component testing business. Steam turbines provide the rotational power source for testing engine components. The Test Cell is a specialized "boutique style" engine and component testing and diagnostic facility.

GE's customers for this unique facility include military, regulatory, commercial, and research and development entities, each having its own exacting specifications and requirements for the final outcome of testing. Target flight conditions must be precisely simulated on the ground to achieve certain flight ambient conditions (*e.g.*, extreme temperatures), strength or endurance parameters, or lift, power, and thrust targets. All of these conditions must be achieved within the Test Cell via flight simulation protocol. Achieving and accommodating these simulated conditions create the need for:

- Critical volumes of steam at exact temperature, pressure, and humidity conditions that are precisely metered and monitored to achieve the requisite conditions for successful flight simulation, and
- Critical volumes of non-contact cooling water at carefully controlled temperatures that are essential for lowering the temperatures of dynamometers, intake air, bearings, rotating shafts, exhaust, and other test equipment.

Based on the outcomes of testing, GE customers determine whether aircraft engines and components can safely be returned to service to fulfill the needs of military and commercial customers. All water, steam, and air sources must be available when needed in evaluating the potential success of a simulated flight.

Over the past several decades, the electrical and thermal loads of the Facility have declined. Due to the critical nature of process steam at the site as well as operational issues relating to starting boilers and time to reach required pressure/temperature, the Power Plant operates a minimum of two boilers at all times. The boilers produce significantly more steam than is required to support site steam consumption external to the Power Plant, and in order to avoid venting excess steam, the Power Plant uses the excess steam to produce electricity. Thus, electrical generation at the Power Plant frequently is driven by the need to condense steam generated by boilers operating at minimum turndown.

Imposing the high costs of retrofitting the Power Plant with closed-cycle cooling would drive up the costs of steam and electric power production for the entire Facility, impair the economic competitiveness of the specialized Test Cell operations, and reduce the incentive for using the excess steam for power generation instead of venting it. As evaluated in GE's cooling tower analysis, imposing a closed-cycle cooling system for the Power Plant would be economically unreasonable and would impose a significant burden on GE operations.

Even if this were not the case, EPA's analogy is inapposite given the vast differences in scale of these two facilities and the seasonal nature of thermal discharges from the Test Cell, both of which bear on the cost-effectiveness of using closed-cycle cooling to reduce the thermal discharge.[46] Cost estimates developed by EPA indicate that retrofitting closed-cycle cooling at

[46] EPA has declined to weigh the costs and benefits of imposing closed-cycle cooling as BAT for the Facility, arguing that cost-benefit considerations are not contemplated by the BAT provisions of the statute (Fact Sheet, p. 76). But the Agency also failed to perform any analysis of the cost-effectiveness of closed-cycle cooling. Such an analysis involves evaluating the cost-per-unit of pollutant removed. As a matter of longstanding policy and practice,

the GE Power Plant would be far less cost-effective in reducing cooling water flow and any associated heat load than retrofitting a closed-cycle cooling system at a large stream electric plant like Brayton Point Station. EPA estimated that costs of constructing closed-cycle cooling at the GE Power Plant as of 2010 would be $36,491,000 (Fact Sheet, Attachment J, pp. 22-23). Based on a design cooling tower duty of 257.4 million British thermal units (MBTU) per hour (MBTU/hr) ("Cooling Tower Analysis Technology and Biological Assessment Information, Items 5(a) and 6" (CH2M HILL, 2008)), the cost of closed-cycle cooling at the GE Power Plant would be on the order of $141,768 per MBTU/hr. In contrast, the unit cost of closed-cycle cooling at Brayton Point Station, the largest fossil-fuel burning power plant in New England, would be much smaller. Based on a maximum station heat load of 7,360 MBTU/hr at Brayton Point (Brayton Point Fact Sheet, p. 29) and EPA's 2002 cost estimate of $68.385 million for closed-cycle cooling for the entire station (*Clean Water Act NPDES Permitting Determinations for Thermal Discharge and Cooling Water Intake from Brayton Point Station in Somerset, MA*, EPA, 2002; Table 7.4-11, Column 3 [EPA/Abt 20 years 0% plume], p. 7-101), the cost of closed-cycle cooling at Brayton Point would be on the order of about $9,291 per MBTU/hr. Thus, the costs per MBTU/hr of retrofitting closed-cycle cooling at the GE Power Plant are an order of magnitude higher than the costs per MBTU/hr at Brayton Point.

In short, the fact that a few large steam electric plants[47] have converted or are converting from once-through to closed-cycle cooling does not demonstrate that retrofitting closed-cycle cooling would be feasible and affordable for a manufacturing facility like this one, with a small power plant designed specifically to produce steam for aircraft engine testing and other site purposes. In fact, our prior submission and these comments provide ample evidence to the contrary. *See* Section XI.

In addition, EPA's determination that retrofitting closed-cycle cooling is technically feasible for the Test Cell and the Power Plant is at odds with the facts. As GE's "Cooling Tower Analysis Technology and Biological Assessment Information, Items 5(a) and 6" (CH2M HILL, February 2008) demonstrates, retrofitting the Test Cell with closed-cycle cooling would be infeasible, in light of given space limitations due to existing infrastructure. EPA has not questioned this conclusion, nor has it performed any independent evaluation to show that these limitations can

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EPA has considered cost-effectiveness in selecting BAT. *See, e.g.*, *Riverkeeper, Inc.*, 358 F.3d 174, 195 (2004). EPA provided no explanation for its failure to consider cost-effectiveness in this instance.

[47] The Fact Sheet, p. 75, refers to several large steam electric power plants, including Brayton Point that have retrofitted closed-cycle cooling. None of these facilities serves a primary purpose other than generating electric power for transmission or sale to another entity for transmission. None supports specialized, on-site, seasonal testing operations like the GE Power Plant, and none operate at a generation capacity nearly as low as the GE Power Plant (35 MW that use once-through cooling water system). It is inappropriate to treat power plants with generating capacities 7 to 44 times larger than GE's as proof of the efficacy, practicability, and affordability of retrofitting closed-cycle at the GE Power Plant, when clearly their differences in critical respects do not support such a conclusion. And, as recent announcements by the owners of the Salem Harbor Station in Massachusetts and the Oyster Creek Station in New Jersey illustrate, even large power plants often cannot absorb the substantial costs of retrofitting closed-cycle cooling. *See* "Dominion sets Schedule to Close Salem Harbor Power Station, Dominion News, May 11, 2011, http://dom.mediaroom.com/index.php?s=43&item=988)"; http://dailycaller.com/2010/12/09/epa-regulations-force-power-plant-out-of-business-more-to-follow/.

be overcome. With respect to the Power Plant, as we discuss in Section XI of these comments, EPA did not resolve crucial uncertainties before reaching the conclusion that closed-cycle cooling is BAT. GE respectfully requests that EPA withhold its determination until these uncertainties have been resolved.

As EPA itself appears to recognize, the fact that the Agency has made a BPJ determination requiring a different facility in a different industry category with different economics and different site-specific circumstances to retrofit closed-cycle cooling does not relieve the Agency of responsibility for making a BPJ determination for the Facility based on adequate, site-specific information. Although EPA says it has made such a determination for the Facility (albeit in the context of evaluating cooling water intake structure technologies),[48] for the reasons discussed below, its evaluation and the resulting determination are not adequately supported. Indeed, as discussed Section XI.G of these comments, EPA bases its conclusions more on what is absent from the record than on specific facts adequate to support reasonable conclusions. Thus, before EPA can justify a determination that closed-cycle cooling is BAT, it must develop facts sufficient to resolve important uncertainties. GE believes that those uncertainties weigh conclusively against such a determination.

In any case, GE submits that it is unnecessary for EPA to undertake (or require GE to undertake) the substantial studies needed to make a well-supported determination regarding the technological feasibility, performance, cost, and affordability of closed-cycle cooling for the Facility. As noted above, in the absence of applicable effluent limitations guidelines, the permit writer has discretion to decide whether or not to establish BPJ limits for a given constituent. In this case, GE is requesting, and EPA already has proposed to establish, an alternative limit under § 316(a). Although GE disagrees with the alternative limit EPA has proposed, we submit that further analysis should focus on refinement of that limit.

Response to Comment 10.2

The GE facility uses an open-cycle (or "once-through") cooling system as part of its process for generating steam for engine testing and generating electricity. As part of this industrial process, GE, in essence, uses the Saugus River, a public natural resource, as a heat sink. The company takes water from the river at ambient temperatures and uses it to condense its process steam as a prelude to additional steam generation, and to meet other cooling needs. GE then disposes of its waste heat by discharging the heated river water back into the river. Under the CWA, EPA is concerned with both GE's withdrawal of river water for cooling and its disposal of waste heat in the river. In this part of the permit, EPA is addressing the facility's discharges of waste heat.

GE comments that "it is important to understand why the Facility produces steam and electricity" in order to understand why GE believes that EPA has incorrectly analogized the facility to a steam-electric power plant. Yet, having considered this comment, EPA continues to find the

[48] *See* Fact Sheet, p. 76 (incorporating results of site-specific BTA analysis in Appendix J for purposes of BAT rationale).

analogy to be apt. This is so for both the Power Plant and the Test Cell despite the differences between the two facilities.

As is well evident in the Fact Sheet, *see* pp. 3-4, 33-34, 74-76, EPA understands that GE is not *primarily* engaged in the business of generating electricity for sale and distribution. EPA explained that the GE facility "manufactures, tests, and assembles jet turbine engines and associated components" as its primary business." *Id.* at 3. EPA also explained that:

> GE Aviation also operates an oil-fired steam electric power plant onsite (12 – 45 MW) for the production of steam, electricity, and compressed air. This electricity is primarily for GE Aviation's onsite needs, but at times the facility sells excess electricity to the local power grid.

Id. at 4. Thus, EPA clearly understood that the facility's power plant was not identical to a major steam-electric power plant that is primarily engaged in producing electricity for sale and distribution. *See, e.g., id.* at p. 4. Nevertheless, EPA also explained that the process by which GE's Power Plant (Outfall 018) produces steam to drive steam turbines – whether for power generation in the Power Plant or for engine testing purposes in the Test Cell – and the intake and effluent streams associated with the facility's open-cycle cooling systems are the same or similar to those used by a steam-electric power plant regulated under the Steam-Electric NELGs. *See id.* at 4, 74-75. *See also* 40 C.F.R. Part 423.

EPA has also recognized the similarity between steam-electric power plants and manufacturing facilities with on-site power plants on a national level in its review and development of effluent limitations guidelines for steam-electric facilities. EPA considered "industrial non-utilities" (defined as "industrial plants that generate electric power using steam to drive a turbine, but that are not primarily engaged in distributing and/or selling that electric power") in the Steam Electric Power Generating Point Source Category: Final Detailed Study Report (October 2009). According to that report, the electrical generating process of industrial non-utilities is similar or the same as that of steam-electric power plants; both generate steam to drive a turbine and use non-contact cooling water to condense the steam. Thus, the manner in which both types of facilities generate process steam, and use cooling water to condense that steam as a precursor to further steam generation, is equivalent or analogous. Moreover, the manner in which both types of facilities generate and dispose of heated wastewater is essentially the same.

As GE comments, the facility's Power Plant continuously operates two boilers to be ready to provide superheated steam within the time constraints of testing. While electrical generation is not the primary activity at GE, it is financially beneficial to the company and the activity results from GE's understandable desire to make profitable use of the steam generated at the facility. By using steam to generate electricity, GE can meet its own facility's electrical needs and, at times, sell electricity to the grid. As GE states, permit requirements that would necessitate expenditures to control thermal discharges would, among other things, "reduce the incentive for using the excess steam for power generation instead of venting it." Thus, it is evident that generating electricity on-site is economically beneficial to GE, but EPA does not have the information to identify its full value.

In any event, the facility's cooling needs are the same whether the steam is used for testing, electrical generation or other on-site processes. In other words, even though generating electricity may not be the primary purpose of generating steam at GE, as it would be for a typical steam-electric power plant, the processes involved and the resulting waste heat effluent, which is the focus of the technology-based effluent limit, are the same or comparable in both cases. Moreover, while EPA recognizes that the Test Cell is not directly generating its own steam – it obtains it from the Power Plant – EPA also sees that after the steam is used to drive the turbines in the Test Cell, GE then condenses that steam with an open-cycle cooling system that uses water from the Saugus River. The facility then discharges the water back to the river along with the facility's waste heat. An open-cycle cooling system at a steam-electric power plant works in essentially the same way and raises the same water pollution control issues.

Moreover, the same technologies that can reduce waste heat discharges at a steam-electric power plant can also be applied at GE's facilities. Therefore, the same technologies should be considered in developing a technology-based effluent limit for restricting waste heat discharges for both types of facilities. For example, a closed-cycle cooling system, once operational, would enable both a steam-electric power plant and a manufacturing facility with a subsidiary steam-generating power plant, like GE, to reduce its waste heat discharges while permitting the processes of generating and condensing steam.

EPA also explained in the Fact Sheet that when developing technology-based standards, the Agency is not restricted to considering technologies used at *identical* types of facilities. EPA may also consider "transfer technologies;" that is, technologies used by different industries and different types of facilities that are nevertheless potentially suitable for the type of facility in question to help control pollutant discharges. *See id.* at p. 22 and Att. J at pp. 4-5. Thus, even if steam-electric power plants were not closely analogous to GE's Power Plant and Test Cell – and EPA thinks they are – EPA concludes that it still would have been appropriate to look at steam-electric power plants in developing technology-based limits for waste heat discharges from GE's Power Plant and Test Cell because of the applicability of the same types of cooling technologies.

EPA determined that closed-cycle cooling is an available technology for the Power Plant and the Test Cell based on the site-specific information that GE submitted upon EPA's request. This information addressed the engineering aspects of converting to that technology as well as other considerations. EPA also concluded that converting to closed-cycle cooling would constitute the best performing technology for reducing thermal discharges. GE's own analysis concluded that mechanical draft cooling towers at the Power Plant were "technically feasible from an engineering standpoint" (Cooling Tower Analysis Technology and Biological Assessment Information, Items 5(a) and 6, February 2008). At the same time, GE has not argued that there is a superior or even competitive method of limiting waste heat discharges. Rather, GE previously argued that converting to closed-cycle cooling "while "technically feasible, would be economically impractical," but it neither provided a detailed economic analysis supporting the latter conclusion nor clearly defined what it meant by economically "impractical." GE's comment above argues, in sum, that converting to closed-cycle cooling would be economically detrimental to the company, but stops short of stating that it would be infeasible.[49]

GE estimated the cost of construction and engineering at $31,864,000 for retrofitting closed-cycle cooling at the facility. Using GE's estimate, EPA then estimated a nominal, after tax cost of $36,491,000 (2010 dollars), including annual operation and maintenance costs, additional costs to purchase replacement power during a two-month construction outage (using GE's estimate of $2.2 million for additional electrical costs and revenue loss), and the cost of additional power generation due to auxiliary power requirements and efficiency losses. Neither estimate included additional costs for any abatement technologies that might be needed to address potentially problematic water vapor plumes, salt drift, and/or sound emissions. Whether such abatement equipment or outages would be needed has yet to be defined. GE also estimated a loss of $15 to $20 million for production shutdown costs due to a lack of steam for tests and auxiliary systems for manufacturing, but does not provide information showing how this estimate was derived. EPA is uncertain to what degree plant operation would be impacted based on GE's own conclusion that "conversion of the Power Plant to a closed-cycle recirculating water system could largely be accomplished during normal plant operations in an effort to minimize lost power generation and other interruptions to Facility operations" (CH2MHill Cooling Tower Analysis Assessment Information p. 2-4). Given that, according to GE, the Power Plant was designed to provide superheated test steam to drive steam turbines at the Test Cell, conversion of the Power Plant during periods when the Test Cell is also scheduled to be shutdown could likely be accommodated, given the Test Cell's annual capacity utilization of only 5%. *See also* EPA, Technical Development Document for the Proposed Section 316(b) Phase II Existing Facilities Rule (March 28, 2011) (available on EPA website at www.epa.gov/waterscience/316b), at pp. 8-27 to 8-28. Ultimately, EPA concluded that the costs for this option were affordable for GE and would achieve a very substantial reduction (around 95% or more) in waste heat discharges to the Saugus River.

GE comments that EPA "failed" to conduct a cost-effectiveness analysis of closed-cycle cooling in determining the BAT for the Draft Permit, and that EPA did so without explanation and contrary to the Agency's "longstanding practice and policy" of conducting such analyses when determining BAT. EPA disagrees with this comment and maintains that its approach was reasonable in this case and consistent with applicable law and Agency policy. The statute and regulations require EPA to consider cost when determining the BAT. EPA met this requirement, as discussed above. Neither the statute nor regulations require preparation of any particular type of cost assessment, such as a cost-effectiveness analysis, as part of the Agency's consideration of cost. *See* 33 U.S.C. § 1314(b)(2)(B) and 40 C.F.R. § 125.3(d)(3)(v). *See also* EPA Permit Writers' Manual at p. 5-46 (Exhibit 5-21). Nevertheless, contrary to the comment, and as discussed farther below, EPA did consider cost-effectiveness in this case. Ultimately, the Agency's overall consideration of costs satisfies all legal requirements.

EPA considers the cost of implementing a technology when determining the BAT. *See* 33 U.S.C. §§ 1311(b)(2) (requiring "application of the best available technology *economically achievable*" (emphasis added) to control the discharge of certain types of pollutants) and

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[49] Economic forces will determine whether or not GE would be able to pass on to its customers any increased production costs resulting from requirements to reduce its disposal of waste heat in the Saugus River.

1314(b)(2) (when assessing BAT for a particular point source category or individual discharger, EPA must take "cost of achieving such effluent reduction" into account); 40 C.F.R. § 125.3(d)(3) (same). As one court has summarized, CWA §§ 301(b)(2) and 304(b)(2) require "EPA to set discharge limits reflecting the amount of pollutant that would be discharged by a point source employing the best available technology that the EPA determines to be *economically feasible* . . . ." *Texas Oil & Gas Ass'n v. U.S. Environmental Protection Agency*, 161 F.3d 923, 928 (5th Cir. 1998) 161 F.3d at 928 (emphasis added). *See also BP Exploration & Oil, Inc. v. U.S. Environmental Protection. Agency*, 66 F.3d 784, 790 (6th Cir. 1995) ("BAT represents, at a minimum, the best economically achievable performance in the industrial category or subcategory."). Furthermore, CWA § 301(b)(2) also dictates that BAT limits "shall require the elimination of discharges of all pollutants if the Administrator finds, on the basis of information available to him . . ., that such elimination is . . . economically achievable." This also, in effect, mandates consideration of cost.

The courts have also explained that the cost of effluent reduction must be considered within the context of the CWA's express overarching goal of restoring and maintaining the chemical and biological integrity of the nation's waters. *See* 33 U.S.C. § 1251(a). Thus, the United States Supreme Court has explained that treatment technology that satisfies the CWA's BAT standard must "represent 'a commitment of the maximum resources economically possible to the ultimate goal of eliminating all polluting discharges." *U.S. Environmental Protection Agency v. Nat'l Crushed Stone Ass'n*, 449 U.S. 64, 74 (1980). EPA must also keep in mind the purpose of the BAT provision itself (i.e., CWA § 301(b)(2)(A)) when assessing costs associated with BAT options. "The BAT standard reflects the intention of Congress to use the latest scientific research and technology in setting effluent limits, pushing industries toward the goal of zero discharge as quickly as possible." *Kennecott* v. *U.S. EPA*, 780 F.2d 445, 448 (4th Cir. 1985), citing *A Legislative History of the Water Pollution Control Act Amendments of 1972*, 93d Cong., 1st Sess. (Comm. Print 1973), at 798. In light of this policy context, the courts have also confirmed that while costs must be "considered" in setting BAT limits, costs are not to be a consideration of "primary importance." *See, e.g.*, *FMC Corp.*, 539 F.2d at 978-79; *American Iron and Steel Inst.* v. *EPA*, 526 F.2d 1027, 1051-52 and n. 51 (3rd Cir. 1975) ("it is clear that for [BAT] standards, cost was to be less important than for the [BPT] standards, and that for even [BPT] standards cost was not to be given primary importance").

Furthermore, the CWA gives EPA "considerable discretion" in determining what is economically achievable. *Natural Resources Defense Council*, 863 F.2d at 1426, *citing American Iron & Steel*, 526 F.2d at 1052. The Fourth Circuit Court of Appeals has stated that:

> [t]he Act's overriding objective of eliminating ... the discharge of pollution into the waters of our Nation indicates that Congress, in its legislative wisdom, has determined that the many intangible benefits of clean water justify vesting [EPA] with broad discretion, just short of being arbitrary or capricious, in his consideration of the cost of pollution abatement.

FMC Corp. v. *Train*, 539 F.2d 973, 978-79 (4th Cir. 1976), as quoted in *Reynolds Metals Co.* v. *U.S. EPA*, 760 F.2d 549, 566 (4th Cir. 1985) (discussing BPT cost analysis). The CWA does not require a precise calculation of the costs of complying with BAT limits. *See BP Exploration*, 66

F.3d at 803. EPA "need make only a reasonable cost estimate in setting BAT," meaning that it must "develop no more than a rough idea of the costs the industry would incur." *Id. See also Rybachek v. U.S. Environmental Protection Agency*, 904 F.2d 1276, 1290–91 (9th Cir. 1990); *Chemical Manufacturers*, 870 F.2d at 237–38. Moreover, CWA § 301(b)(2) does not specify any particular method of evaluating the cost of compliance with BAT limits or state how those costs should be considered in relation to the other BAT factors; it only directs EPA to consider whether the costs associated with pollutant reduction are "economically achievable." *Chemical Manufacturers Ass'n v. U.S. Environmental Protection Agency*, 870 F.2d at 250, *citing* 33 U.S.C. § 1311(b)(2)(A). Similarly, CWA § 304(b)(2)(B) requires only that EPA "take into account" cost along with the other BAT factors. *See Reynolds*, 760 F.2d 549, 565 (4th Cir. 1985) (in setting BAT limits, "no balancing is required – only that costs be considered along with the other factors discussed previously"), *citing National Ass'n Metal Finishers v. U.S. Environmental Protection Agency*, 719 F.2d 624, 662–63 (3rd Cir. 1983); *Association of Pacific Fisheries v. U.S. Environmental Protection Agency*, 615 F.2d at 818 (in setting BAT limits, "the EPA must 'take into account . . . the cost of achieving such effluent reduction,' along with various other factors"), *citing* CWA § 304(b)(2)(B).

Not only did Congress give EPA considerable discretion in how to assess the BAT factors, such as cost, but it also gave EPA discretion to determine how to weigh the different factors together in determining the BAT. In the Fact Sheet, EPA explained as follows:

> The CWA sets up a loose framework for assessing these statutory factors in setting BAT limits. It does not require their comparison, merely their consideration. [I]n enacting the CWA, Congress did not mandate any particular structure or weight for the many consideration factors. Rather, it left EPA with discretion to decide how to account for the consideration factors, and how much weight to give each factor. In sum, when EPA considers the statutory factors in setting BAT limits, it is governed by a standard of reasonableness. It has considerable discretion in evaluating the relevant factors and determining the weight to be accorded to each in reaching its ultimate BAT determination. One court has succinctly summarized the standard for judging EPA's consideration of the statutory factors in setting BAT effluent limits: [s]o long as the required technology reduces the discharge of pollutants, our inquiry will be limited to whether the Agency considered the cost of technology, along with other statutory factors, and whether its conclusion is reasonable.

Fact Sheet, Att. J at pp. 7-8 (footnotes with citations omitted). Therefore, GE's comment is incorrect to the extent that it suggests that EPA *must* consider costs in a particular way, such as by using a "cost-effectiveness" analysis or a particular type of cost-effectiveness analysis.

At the outset, it should be understood that the term "cost-effectiveness" can be used in more than one way. From one perspective, the most "cost-effective" option is the least expensive method of reaching a particular performance goal. From another perspective, the most cost-effective option could be the one that achieves the greatest pollutant loading reductions per unit of cost (e.g., pounds of pollutant discharge eliminated per dollar).

GE correctly points out that EPA often considers cost-effectiveness analyses in setting BAT standards. Yet, for good reasons, EPA does not, and is not required to, do so in every case. *See e.g.*, EPA, Responses to Comments, Public Review of Brayton Point Station NPDES Permit No. MA0003654 (October 3, 2003), pp. VIII-14, VIII-28; EPA, Clean Water Act NPDES Permitting Determinations for the Thermal Discharge and Cooling Water Intake Structures at Merrimack Station in Bow, New Hampshire (NPDES Permit No. NH0001465), Sept. 29, 2011, pp. 129, 168 n. 58. As Second Circuit Court of Appeals stated in the context of determining the Best Technology Available under CWA § 316(b), "EPA is by no means required to engage in cost-effectiveness analysis." *Riverkeeper, Inc. v. United States Environmental Protection Agency*, 475 F.3d 83, 100 n. 12 (2d Cir. 2007) (J. Sotomayor) ("*Riverkeeper II*"), *rev'd on other grounds, Entergy Corp. v. Riverkeeper, Inc.,* 129 S. Ct. 1498, 68 ERC 1001 (2009).

In the context of considering cost in a particular BAT decision, EPA might or might not decide that a comparative "cost-effectiveness" analysis of the available technology options would be useful. For example, cost-effectiveness analysis can provide a means of comparing technology options when multiple options are able to meet an applicable performance threshold. The most cost-effective option would be the least expensive method of attaining the necessary level of performance. *See Riverkeeper II,* 475 F.3d at 99-100. *See also* EPA's Economic Analysis Guidelines, p. 178. Cost-effectiveness assessments may also, in some cases, provide a way to compare alternatives when the benefits of an action are difficult to monetize. Again, such an assessment would show some unit of performance per unit of cost (e.g., pounds of pollutant removed per dollar). In some instances, EPA has also used cost-effectiveness analysis as a means of comparing technology options from one policy context with technology options or decisions in other contexts by looking at the rates of pounds of pollutants removed per dollar in the different cases. GE's comment uses this approach to compare using closed-cycle cooling at GE with its use at Brayton Point Station. At the same time, comparative cost-effectiveness analysis would not be helpful in a case in which only one technology reaches (or comes close to) a particular performance goal or threshold. Thus, where there are wide disparities in the performance of alternative technologies, an option might be rejected due to its poor performance on an absolute level despite having a lower cost-per-unit-of-performance.

Even when cost-effectiveness analysis may provide helpful information to consider, cost-effectiveness metrics are not by themselves determinative of the BAT. Many other factors must be considered as well, such as the significance of the differences in levels of environmental performance, energy effects, secondary environmental effects, and more. *See id.* at p. 178. As a result, an option might be the most cost-effective but still be rejected because, for example, it caused unacceptable air quality impacts.

In the instant case, GE states that EPA did not undertake a cost-effectiveness analysis and that this was inconsistent with Agency policy and practice. In support of this claim, GE cites to *Riverkeeper, Inc. v. United States Environmental Protection Agency*, 358 F.3d 174, 195 (2d Cir. 2004) ("Riverkeeper I"), as an example of a case in which GE believes the Agency suitably considered cost-effectiveness. *Riverkeeper I* involved judicial review of EPA regulations governing cooling water intake structures at new facilities under CWA § 316(b). The court's opinion discusses EPA's evaluation of closed-cycle cooling using "wet" cooling towers and "dry" cooling towers. Dry cooling was identified as a potentially feasible technology that could achieve marginally greater reductions in intake flow – and corresponding marginally greater reductions in entrainment and impingement – than closed-cycle cooling with wet cooling towers, but which also would cost significantly more and impose higher "energy penalties." *Id.* EPA ultimately selected closed-cycle cooling with wet cooling towers as the BTA for new facilities instead of dry cooling. In making this choice, EPA considered many of the different consequences that would accompany the use of each technology, including their relative costs and ability to reduce intake flows. *Id.* Thus, the court stated:

> … comparing both closed-cycle cooling [with wet towers] and dry cooling to the baseline of once-through cooling adds a useful perspective on the marginal benefits of dry cooling. In other words, while it certainly sounds substantial that dry cooling is 95 percent more effective than closed-cycle cooling, it is undeniably relevant that that difference represents a relatively small improvement over closed-cycle cooling at a very significant cost.

Id. In this regard, EPA considered cost-effectiveness, but the Agency did not base its decision solely on cost-effectiveness, and the court neither mandated cost-effectiveness analysis nor made it "the fulcrum" of its own assessment. *See Riverkeeper II,* 475 F.3d at 100 nn. 11 and 12.

Contrary to GE's comment, EPA's analysis here for the Draft Permit is consistent with the analysis discussed in *Riverkeeper I* and cited with approval by GE. Just as it did for the regulations discussed in *Riverkeeper I*, EPA considered and rejected dry cooling as the BAT for the GE facility in part based on the same type of cost-effectiveness considerations discussed in *Riverkeeper I* and *Riverkeeper II*. In the Fact Sheet, at p. 75, EPA explained that it rejected dry cooling for a variety of reasons, including that it "…would likely achieve only a small marginal additional reduction over the high end of the reduction range for wet cooling towers and would be significantly more expensive." Moreover, in doing so, EPA specifically relied upon the very Agency decision that GE cites with approval (i.e., the decision on cooling water intake structure regulations for new facilities under CWA § 316(b)).

GE also argues that converting to closed-cycle cooling at a smaller power plant like GE's would be less cost-effective than at a very large power plant, like Brayton Point Station. GE provides some figures to suggest that the cost per unit of waste heat discharge reduction for GE would be an order of magnitude higher than that at Brayton Point Station. EPA has considered this comment and these figures (*see* footnote below).[50] EPA agrees that it may well be the case that

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[50] EPA notes that the figures GE uses to calculate cost-effectiveness for Brayton Point Station should not be relied upon. First, GE uses a cost estimate developed for EPA's draft permit for that facility, but this cost estimate was revised upward for the final permit. While GE cites to an estimate of $68.4 million, the corresponding estimates for the final permit ranged from $88.3 million to $120.2 million, depending on the scenario being assessed. A value of $104.25 million would represent the mid-point between these two values and would be a better figure to use than the $68.4 million figure. (This leaves aside the fact that Brayton Point Station later decided to use a different type of cooling tower.) Second, GE uses a figure that it states represents "the maximum station heat load" at Brayton Point Station rather than "the design cooling tower duty" which it uses to calculate a cost-effectiveness value for its own facility. Since EPA estimated that closed-cycle cooling could reduce Brayton Point Station's thermal discharges by approximately 95 percent, it would be appropriate to use a value at 95 percent of what GE cited (i.e., 7,360 MBTU/hr x 0.95 = 6992 MBTU/hr). Based on these values, a figure closer to $14,910 per MBTU/hour ($104.25

the cost per unit of heat reduction would be higher for GE than it would be for a much larger facility like Brayton Point Station, the largest fossil fuel burning plant in New England. Yet, this does not alter EPA's conclusion regarding closed-cycle cooling constituting the BAT for GE. It does not establish that the technology is either technologically infeasible or economically unaffordable for GE. Facilities of a range of sizes use closed-cycle cooling and have converted from open-cycle cooling to closed-cycle cooling. GE's comment also does not establish that thermal discharge reductions from closed-cycle cooling would not be appropriate for GE under the CWA BAT standard, or that there is an alternative technology that would be more cost-effective for reducing thermal discharges or that would preferable as the BAT for GE for some other reason. Indeed, GE proposes no alternatives for reducing its discharges of waste heat to the Saugus River. It only proposes to retain its open-cycle cooling system.

EPA agrees with GE that the mere fact that other facilities have converted from open-cycle to closed-cycle cooling does not establish that such a conversion is feasible at GE. This was not, however, the sum of EPA's analysis. EPA's analysis was based on an evaluation of the facts at GE, as is discussed in the Fact Sheet and herein. In addition, GE's comment in part seems to suggest that because its facility is smaller, it is necessarily irrelevant that other larger power plants have converted to closed-cycle cooling. EPA disagrees with any such suggestion. Cooling system conversions at larger power plants shows that cooling system conversions are generally feasible for this type of operation and can be done at *even* larger facilities. Having established that, it then becomes necessary to consider the facts at the GE site specifically. EPA did so and responds to comments about those specific site considerations in this Response to Comments.

GE comments that it has demonstrated that "retrofitting the Test Cell with closed-cycle cooling would be infeasible, in light of given space limitations due to existing infrastructure." EPA is not persuaded by GE's comment. In its earlier submissions to EPA, GE stated that "space constraints associated with existing infrastructure would limit the technical feasibility of constructing a 2- to 3-cell mechanical draft cooling tower for the design intake flow adjacent to the Test Cell." As a result, GE stated that cooling towers for the Test Cell would need to be located in the parking lot area being considered for the Power Plant cooling towers. GE noted that using this site, which is 700 feet linear feet from the Test Cell, would result in additional difficulties, costs and risks associated with the project. GE then concluded that "the high cost and feasibility limitations of implementing a closed-cycle cooling tower system for the entire design intake flow of the Test Cell CWIS would not be commensurate with the limited potential benefits for reducing fish entrainment and impingement." Yet, these statements and GE's current comment do not establish that closed-cycle cooling would infeasible for the Test Cell. Adding a 2 or 3 cell cooling tower to the parking lot area –where GE concluded a larger cooling tower installation could be placed for the Power Plant – would be a relatively small increase to the facility and ought to be feasible. Furthermore, 700 linear feet is a relatively modest distance, which would be sure to add some cost and difficulty to the cooling tower project, but GE has not established that it would render the project infeasible. In addition, GE's earlier analysis assessed

million/6992 MBTU/hr) would be more appropriate to use for the point GE is trying to make with regard to Brayton Point. This value is closer to, though still an order of magnitude less than, the value GE calculated for its own facility (i.e., $141,768 per MBTU/hr). In any event, as EPA states above, this does not change its conclusion regarding BAT.

a cooling tower for "the entire design intake flow" of approximately 75 MGD, whereas the Test Cell is only permitted for its actual maximum daily flow of 45 MGD. Thus, a smaller cooling tower might be sufficient for the Test Cell and would reduce and/or perhaps obviate some of the technical and economic issues. In the Draft Permit analysis, EPA concluded that cooling towers would be feasible for the Test Cell and would constitute the BAT for controlling that operation's thermal discharges. Fact Sheet at pp. 74-76; Att. J, p. 47 n. 29. EPA continues to hold that viewpoint after considering GE's comments.

Finally, GE notes that the Draft Permit's thermal discharge limits were ultimately based on a CWA § 316(a) variance and it comments, in essence, that it is therefore unnecessary to resolve all the issues regarding the BAT technology-based requirements. Specifically, GE comments that:

> [i]n this case, GE is requesting, and EPA already has proposed to establish, an alternative limit under § 316(a). Although GE disagrees with the alternative limit EPA has proposed, we submit that further analysis should focus on refinement of that limit.

Despite this statement, GE did submit certain comments about EPA's BAT determination and EPA has responded to those comments.

That said, EPA agrees, of course, that the Draft Permit's thermal discharge limits for both the Power Plant and the Test Cell are based on a CWA § 316(a) variance. EPA has also based the Final Permit's thermal discharge limits on a variance. EPA has made the limits less stringent for the Final Permit, as discussed elsewhere in these Responses to Comments. At the same time, EPA also has not determined closed-cycle cooling to be the BTA for either the Power Plant's or the Test Cell's CWISs under CWA § 316(b). Therefore, EPA would also expect that the most important parts of the analysis going forward will not focus on closed-cycle cooling. GE has, of course, commented on the appropriateness of the Draft Permit's limits on thermal discharges and cooling water withdrawals set under CWA §§ 316(a) and 316(b), respectively. EPA responds to those comments below.[51]

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[51] We also note that GE's comment includes references to web materials that GE suggests indicates that two larger power plants are closing because they cannot afford to convert to closed-cycle cooling. This comment does not offer strong support for GE's objections to EPA's determination that upgrading the GE facility to provide closed-cycle cooling represents the BAT for controlling waste heat discharges. First, the comment does not establish that the facts at the other two facilities are similar in important ways to the facts at GE. Second, it seems impossible that closed-cycle cooling costs would have had something to do with the decision to close the Salem Harbor power plant given that (1) the material cited to by GE does *not* say that the facility is closing for that reason; (2) EPA has not issued the Salem Harbor plant a permit requiring a conversion to closed-cycle cooling; and (3) there is no regulation in place that would necessarily mandate closed-cycle cooling for the facility. The owners of the Salem Harbor Station facility appear to have decided to close for other reasons. With regard to the Oyster Creek facility, EPA is uncertain of the reliability of the source cited by GE or of all the facts surrounding that facility. In any event, GE's comment does not demonstrate that the facts surrounding the cost or economic or technical feasibility of converting to closed-cooling at a more than 40-year old nuclear power plant such as Oyster Creek would be identical or even similar in important ways to those at GE's smaller, fossil fuel-burning facility. In general, EPA would expect there to be significant differences in the issues raised with regard to converting to closed-cycle cooling at a facility like

Comment 10.3: EPA's Determination that Alternative Thermal Limits of 90°F for Outfalls 018 and 014 are Necessary to Assure the Protection and Propagation of a Balanced, Indigenous Population in the Saugus River is Flawed.

Comment 10.3.1: Overview of EPA's Rationale for the Reducing the Maximum Daily Thermal Limit.

EPA justifies its proposal to reduce the current thermal limits for Outfalls 018 and 014 by 5°F by citing (1) additional monitoring and modeling studies pertaining to GE's thermal discharges, and (2) changes in the status of several resident and anadromous fish species in the Saugus River (specifically, striped bass, alewife, and winter flounder). Fact Sheet, pp. 77-79. Specifically, EPA claims:

(1) Thermal tolerance data for those three species indicate that juvenile winter flounder, alewife, and striped bass may experience thermally induced sublethal and lethal adverse impacts at temperatures between 86° and 90°F, and temperatures above 90°F would "create completely unsuitable habitat" (Fact Sheet, p. 78 and Attachment K).

(2) Thermal monitoring performed for purposes of setting thermal limits for the Wheelabrator Saugus facility on the opposite shore of the River suggests to EPA that river temperatures "in the vicinity of" GE Outfalls 018 and 014 can exceed 86°F around low slack tide during the hottest months of the year (Fact Sheet p. 78).

(3) The maximum daily discharge temperature from GE's Outfall 018 in August, 2001 was 95°F, and that discharge overlapped with measured instream temperatures of 86°F or higher during August 7 to 25, 2001, suggesting that the currently permitted maximum discharge may contribute to river temperatures above some target level below 86°F (*id.*).[52]

(4) Based on a review of DMR data, the Outfall 018 effluent has not exceeded 90°F since August 2002. Therefore, EPA does not anticipate that major operational changes would result from the more stringent thermal limits included in the Draft Permit (Fact Sheet p. 79).

With respect to its proposed alternative, EPA says that it concluded that a limit of between 90°F (the highest temperature at which EPA says the Facility has discharged since August 2002) and 91°F (the temperature used for purposes of GE's 1993 near-field thermal modeling of the Power

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Oyster Creek (i.e., a large nuclear power plant) versus doing so at a facility like GE (i.e., smaller, fossil-fuel burning facility).

[52] EPA also notes in the Fact Sheet that this segment of the Saugus is listed as thermally impaired. However, a review of the listing document (Massachusetts 2010 Integrated List of Waters) reveals that the Facility was not listed as causing or contributing to the impairment, nor was any other specific cause identified. Based on the ASA 2004 report entitled "Temperature Mapping and Hydrothermal Model Calibration of the Lower Saugus River Estuary," the largest components of the temperature changes seen in the Saugus River system appear to be the result of cool offshore water entering the estuary and being warmed in the extensive, shallow, marshy, upper reaches of the estuary.

Plant) would produce more protective instream temperatures, and only a small portion of the river would reach maximum temperatures of potential concern for very short periods of time (Fact Sheet, pp. 78-79).

As the following discussion shows, the analyses supporting EPA's proposal to ratchet down the alternative thermal limit for discharges from the Power Plant and Test Cell are fundamentally flawed for several reasons.

Response to Comment 10.3.1

In the Draft Permit, EPA proposed limits on GE's waste heat discharges to the Saugus River that are more stringent than those in GE's current permit. EPA based the Draft Permit's limits on a CWA § 316(a) variance determination.

EPA's Final Permit is again based on a variance determination under CWA § 316(a), but EPA has decided to relax the Draft Permit's proposed limits after considering GE's comments and other available information, including biological information and ambient temperature monitoring. For Outfalls 018 and 014, the Draft Permit proposed year-round maximum discharge temperatures of 90°F. The Final Permit retains the current permit's maximum discharge temperature limit of 95°F at Outfalls 018 and 014. *See* Response to Comments 10.3.2 and 10.3.3 for discussion of GE's specific comments on maximum daily temperature limits at Outfalls 014 and 018.

Comment 10.3.2: EPA Failed to Account for, or Provide GE an Opportunity to Account for, Facility Changes that may Affect the Facility's Thermal Plume.

EPA's analysis also fails to account for changes that have occurred, and that have reduced the size and temperature profile of GE's thermal plume. Moreover, the Agency's preemptive determination affords GE no reasonable opportunity to evaluate the effect of those changes. For example, EPA has not taken into account the reduction in flow and heat load associated with GE's proposal to permanently close the Gear Plant, which was covered by the 1993 thermography study, or the addition of an auxiliary closed-loop cooling system for the Test Cell in 2008.

Moreover, EPA apparently did not consider the potential change in discharge temperatures likely to result from the Agency's proposal to require GE to reduce intake flow by an annual average of 20% for § 316(b) purposes. In its § 308 letter dated October 25, 2007, requesting information on the cooling water intake structure, the Agency gave no hint that it was considering changes to the applicable thermal limit; thus, GE has had no opportunity to collect data or perform modeling to assess the likely impact of flow reductions on its ability to meet the significantly reduced thermal limit EPA now proposes. To the extent EPA now proposes to reduce the discharge temperature, that change may make it impossible for the Facility to achieve the flow reductions imposed by other permit provisions. In its permit determination for Wheelabrator Saugus, EPA recognized this important trade-off and ensured that the limits it imposed were not fundamentally incompatible. *See* Fact Sheet, Attachment K, pp. 16-17. EPA should conduct the same analysis here.

Response to Comment 10.3.2

GE's comments that the following two changes at the facility have reduced the size and temperature profile of GE's thermal plume: (1) the retirement of the Gear Plant and elimination of thermal discharge at Outfall 029; and (2) the addition of an auxiliary closed-loop cooling system at the Test Cell (Outfall 014). GE indicates that it appears to the company that EPA failed to consider these changes in determining new waste heat discharge limits under CWA § 316(a). Contrary to this comment, however, EPA was aware of, and considered, these changes when it developed the permit's thermal discharge limits. Moreover, the Agency has considered them further in response to GE's comments.

Subsequent to issuance of the currently effective permit in 1993, GE permanently closed the Gear Plant and eliminated the discharge of heated effluent from Outfall 029. This development will likely benefit the resident and transient biological community present in the natural channel to which Outfall 029 formerly discharged. The 1993 thermal surveys and modeling of this outfall, however, indicated that water temperatures resulting from the discharge were highest in the small channel where the discharge occurred and that the plume quickly dissipated upon combining with the mainstem of the river. At high tide, surface temperatures at the confluence of the channel and river were 80°F or less, and at depths of 6 feet or more temperatures were below 80°F even within the channel. At low tide, water temperatures in the channel tended to be high, but dropped to 85°F or less within 80 feet from the opening of the channel. In their analysis of the thermal plume to support the determination of limits for the Draft Permit, EPA and MassDEP were concerned about temperatures during low slack tide more than 2000 feet upstream of this channel nearer to Outfalls 014 and 018. It is unlikely that the plume from Outfall 029 would have significantly influenced temperatures that far upstream during this period. Therefore, while the elimination of the plume from Outfall 029 will likely reduce thermal impacts on the aquatic community present in the channel, and EPA recognizes this step by GE to reduce the facility's overall adverse environmental effects and improve its efficiency by eliminating unnecessary discharges, eliminating this particular discharge of waste heat is not likely to materially improve the conditions that lead to potential adverse thermal effects upstream in the river as a result of discharges of waste heat through Outfalls 018 and 014. Therefore, EPA's maintains that this is not a reason to relax the Final Permit's thermal discharge limits.

With regard to the Test Cell, GE is now operating a recently installed auxiliary closed-loop cooling system to take the place of using the 1,500 gpm spraywash pump for cooling water purposes. According to GE, this pump formerly supplemented cooling water needs at the Test Cell. Given the Test Cell's average monthly permitted flow of 27 MGD, and its maximum daily permitted flow of 45 MGD (current permit limits), the 1,500 gpm closed-loop system has the potential to reduce flows at the Test Cell by between 5% and 8%. GE has not demonstrated what effect this relatively small flow reduction and new use of a closed-loop system will have on the heat load discharged to the river. Although a step in the right direction, the relatively small flow reductions that are associated with this change are likely to result in only a small decrease in thermal load from the Test Cell. Therefore, EPA concludes that this change, whether viewed by itself or in combination with other factors, is not a reason to relax the thermal discharge limits in the Final Permit.

GE also comments, in effect, that cooling water flow (i.e., volume) restrictions can affect a facility's ability to meet temperature limits. According to GE's comment, EPA recognized this "trade-off" in setting permit limits for the Wheelabrator power plant, but did not do so for the GE Draft Permit. GE also states that the Draft Permit's thermal discharge temperature limits (maximum temperature of 90°F) for the Power Plant "may make it impossible" for the company also to comply with the Draft Permit's cooling water withdrawal volume limits (20% reduction in average monthly flow). GE calls on EPA, therefore, to consider the trade-off between restrictions on thermal discharge temperatures and cooling water withdrawal volumes at the Power Plant.

EPA has considered GE's comment and responds below. To begin with, it should be understood that technological and economic practicability are not criteria applicable to determining whether thermal discharge limits less stringent than the CWA's otherwise applicable technology-based and water quality-based requirements will satisfy the biological standard of CWA § 316(a) and should be authorized under a § 316(a) variance. (These factors are, of course, important considerations when applying the BTA technology standard under CWA § 316(b).)[53] Therefore, EPA has made its CWA § 316(a) variance decision based on the biological criteria that apply under the statute and regulations, and not based on technological or economic concerns. Conversely, EPA has made its decisions on cooling water withdrawal requirements under the BTA standard of CWA § 316(b) based on a consideration of relevant factors, including technological feasibility and economic practicability.

Within this analytical context, and in response to GE's comments, EPA has further considered the potential impacts of a more stringent discharge temperature limit at Outfall 018 on the Facility's ability to meet other permit provisions that mandate a 20% reduction in average monthly flow at the Power Plant. As part of this work, EPA evaluated the March 20, 2012, technical memorandum prepared by CH2MHill for GE Aviation and entitled, "Power Plant Once-Through Cooling System Modeling of Flow and Discharge Temperature at Outfall 018." EPA also considered the accompanying model that GE submitted upon EPA's request for additional analysis of this issue.

According to the technical memorandum, achieving a 20% reduction in average monthly flow (from 35.6 MGD to 28.5 MGD) at a discharge temperature limit of 95°F would be technically feasible, but would require restricting Power Plant output by about 30% (from 35 MW to 25 MW) during summer (June 1 through September 30). Under these conditions, the maximum through-screen velocity would be 0.5 fps. However, according to GE, maintaining the same 30% reduction in power output is technically impracticable if the average monthly cooling flow at the Power Plant is reduced by 20% *and* the Draft Permit's maximum discharge temperature of 90°F is applied. Under these conditions, GE projects that it would exceed the average monthly and maximum daily flow limits, as well as the maximum through-screen velocity of 0.5 fps, on some occasions during the summer. GE concludes that in order to meet both the flow limit and the 90°F maximum discharge temperature limit, the output from the Power Plant would have to be

[53] These factors are also, of course, considerations when determining technology-based effluent limits under the BAT standard of CWA §§ 301(b)(2)(A) and (F) and 304(b)(2)(B).

reduced by 66% (to 11.8 MW). This would significantly restrict summer operation of both the Power Plant and other equipment that relies on electricity provided by the Power Plant.

EPA notes that this comment does not indicate (or demonstrate) that meeting these conditions would be impossible – GE's comment only states that doing so "may" be impossible – but it clearly suggests that meeting the conditions would have a substantial adverse effect on facility operations during the summer. In its March 21, 2012, Response to EPA's additional information request (Response to Items 1 and 2), GE states that "[i]t would be technically impracticable for GE Aviation to limit its Power Plant output by 66% during the summer months." GE further explains:

> [t]he size and age of the boilers make it difficult to sustainably operate at the low level of turndown corresponding to a power reduction significantly less than what GE Aviation has proposed above. In particular, Boiler #3 may not be able to operate at all due to its size if power is reduced by 66 percent.

In response to EPA's request for additional analysis of the potential impacts of the Draft Permit limits requiring both a reduction in average monthly flow and a more stringent maximum temperature limit, GE, through CH2MHill, developed a once-through cooling system model for the Power Plant. The model's "Case 5" conditions include a discharge temperature limit of 90°F and an average monthly flow limit of 35.6 MGD (equivalent to a more stringent temperature limit and no flow reduction). EPA compared the output of the Power Plant under these conditions to the output under "Case 2" conditions involving a maximum discharge temperature of 95°F with an average monthly flow limit of 28.5 MGD (equivalent to a maximum temperature limit consistent with the current permit and a 20% flow reduction). In both cases, GE has proposed a 30% reduction in power output during the summer.

EPA compared power output between "Case 5" and "Case 2" for the July 1 through September 30 time period, when biological impacts on the aquatic community from thermal discharge would be most likely to occur (Figure 10.3.1). Under Case 5, weekday power output is expected to be restricted further than GE's proposed 30% reduction on approximately 25 days per year, and the average weekday power output is anticipated to be about 23 MW (34% reduction). This can be compared to an average weekday power output of 25 MW (a 29% reduction) under Case 2. In both cases, the weekend power output generally meets the required level (17.5 MW). For Case 5, the projected minimum output is about 13 MW (a 63% reduction), which occurs when the intake temperature is at its peak (greater than 81°F). This condition is expected to occur rarely; based on the recorded intake temperature between 2001 and 2004, the projected intake temperature would be anticipated to exceed 80°F on approximately two days per year. Based on analysis of GE's operational model, the anticipated average daily output from the Power Plant under Case 5 (maximum temperature limit of 90°F) during the summer would not be expected to be substantially less than the expected average daily output during the summer for GE's proposed operating conditions under Case 2, provided that GE is authorized to intake a higher volume of water equivalent to the maximum daily flow limit of 35.6 MGD with no reduction in average monthly flow during this period.

According to GE's model, the average daily output from the Power Plant on an extreme summer day (based on a Forecast from August 6, 2009) is 20.2 MW with a once-through cooling flow of 35.6 MGD. Under Case 5, the Power Plant output is expected to be less than 20.2 MW on only approximately 7 days per year. Operational profiles from GE indicate that the average hourly steam use during the summer (July to September) for heating, manufacturing, and test steam is less than 40,000 million pounds per hour (Mlb/hr) and generally less than 20,000 Mlb/hr (See Figure 10.3.1). This is consistent with GE's characterization of limited operations during the hottest months. During July through September, GE's plant operation profiles indicate that only the 200 psig steam is produced. From this assessment, EPA concludes that applying the more stringent temperature limit of 90°F during summer could be feasible if the facility were authorized to intake an average monthly flow limit of 35.6 MGD.

Nevertheless, EPA has concluded that, based on available information, a year-round discharge temperature of 95°F would reasonably assure protection and propagation of the BIP because the primary thermal impacts of concern appear to be limited in both size and duration and organisms would likely be able to avoid conditions that could result in acute toxicity. At a higher discharge temperature, the average monthly flow can be reduced by 20% year-round, including summer months when early life stages may be present, which will reduce mortality due to entrainment and impingement and further protect the BIP. Therefore, the Final Permit applies a year-round maximum discharge temperature limit of 95°F and an average monthly flow limit of 28.5 MGD at Outfall 018. In addition, according to GE, the steam requirements of the Test Cell are limited in summer, which should reduce the potential thermal impacts on those days when the ambient temperatures are likely to be highest.

Finally, in its comment, GE complains that it was not given a chance to evaluate the effects of its planned changes at the facility on its thermal discharges or to collect data on the effects of flow reductions on its ability to meet various thermal discharge requirements. EPA disagrees with this comment. If GE wanted to renew its CWA § 316(a) variance, it had the obligation to provide an adequate demonstration that it was entitled to such renewal. GE was in the best position to design its permit application to address whatever factors it believed would be relevant for EPA's evaluation. As discussed above, GE failed to submit an adequate demonstration under CWA § 316(a). As a result, for the Draft Permit, EPA and MassDEP assessed the relevant issues on their own, while considering whatever information GE did provide. Of course, GE has now had the opportunity to comment on the Draft Permit and EPA is considering these comments. Furthermore, as also discussed above, EPA sent GE an information request letter in 2007 that sought information from GE on technological modifications that could be undertaken to reduce entrainment and impingement effects, but that also requested GE to estimate the most stringent thermal discharge conditions that could be met in conjunction with the various intake technologies. Moreover, EPA asked GE to report as to whether it believed any particular technological approach would be infeasible and, if so, why. Thus, GE was invited by EPA to consider and submit information to EPA that evaluated the "trade-offs" between cooling water intake flow reduction and thermal discharge reductions. GE is incorrect when it comments that "EPA apparently did not consider the potential change in discharge temperatures likely to result from the Agency's proposal to require GE to reduce intake flow by an annual average of 20% for § 316(b) purposes …." EPA did consider this issue and has further done so in these responses to comments.

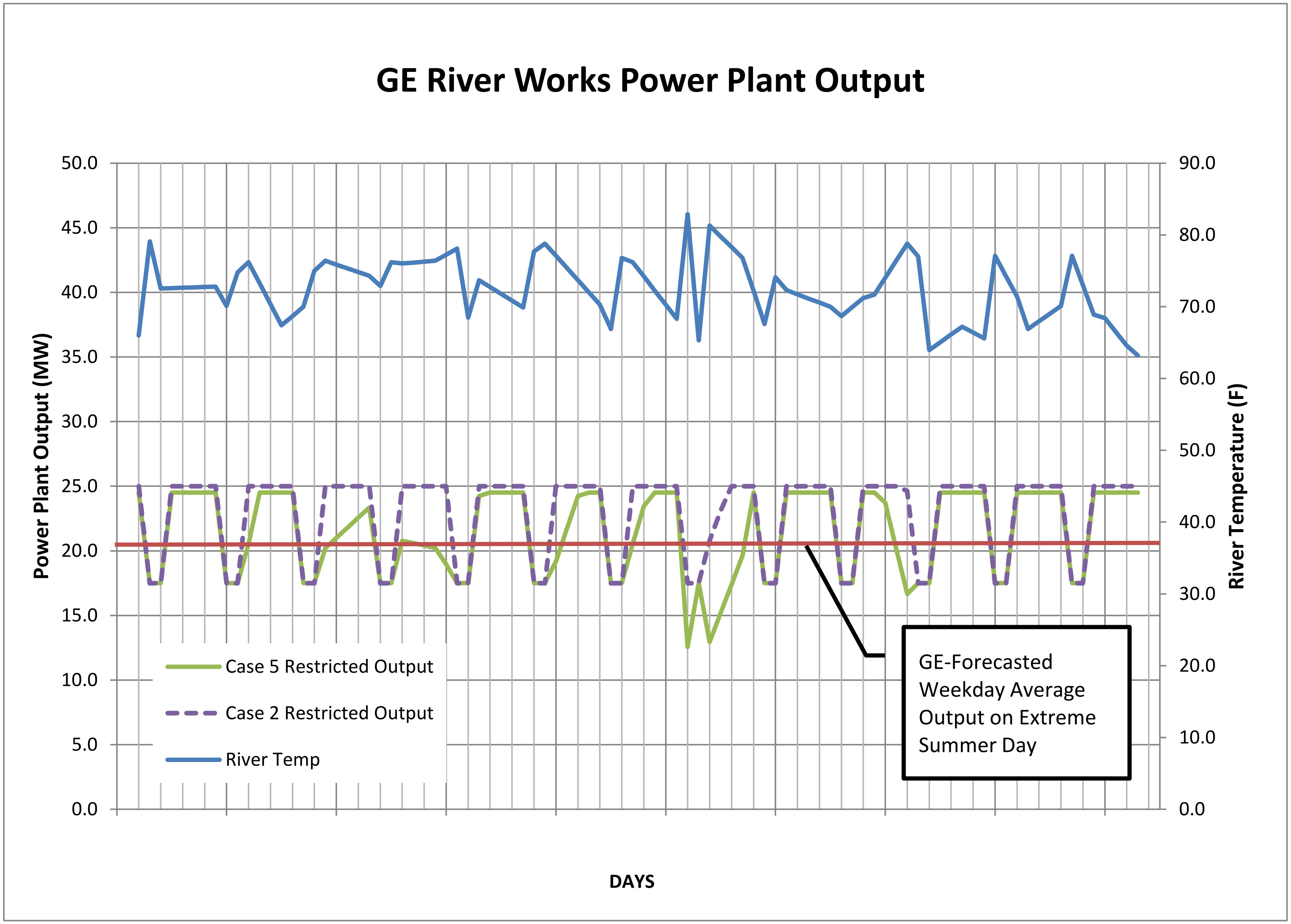


Figure 10.3.1 Comparison of GE's Case 5 and Case 2 modeling results including power generation, river flow, and intake flow for the period from July 1 through September 30.

Comment 10.3.3: The Biological Data on which EPA Relies do not Support the Agency's Decision to Reduce the Maximum Temperature Limit.

Equally important, the biological data on which EPA relies do not support the conclusion that resident species, including juvenile fish of the three species EPA says are of greatest concern (striped bass, winter flounder, and alewife), are likely to be harmed by the instream temperatures resulting from discharges by GE at the currently permitted levels.

Although the results of laboratory temperature testing provide some insight into thermal lethal and sublethal effects, laboratory testing usually involves immediate exposure of fish to temperatures much greater than the temperature to which they are acclimated. As the review and analysis provided in Technical Exhibit 18 to these comments show, the thermal studies relied upon by EPA reflect lethal and sublethal effects associated with tests in which juvenile organisms were acclimated to temperatures ranging from 9 to 30ºF cooler than the temperatures at which the observed effects occurred. In addition, laboratory testing also does not usually allow the fish to avoid or swim away from the higher temperatures. In contrast, the temperature differential between ambient levels and temperatures within the thermal plume predicted by the 1993 ENSR modeling is at most 9.5ºF at low water slack tide. Thus, fish in the Saugus River in the vicinity of the discharge would not be exposed to rapid temperature changes equivalent to those in the laboratory experiments. Instead, their exposure to the thermal plume would be more gradual, occurring over a greater surface area and depth. Although EPA says in its analysis of the Wheelabrator Saugus limits that "it is not possible to predict acclimation temperature or exposure time," it is possible to say with some assurance that resident organisms are unlikely to experience the wide temperature differential and rapid exposure evaluated by those studies.

In addition, all of the studies on which EPA relies involved continuous exposures of juvenile organisms under conditions in which they were unable to avoid the undesirable temperatures and seek cooler refuge. Here, by contrast, the available modeling demonstrates that the entire thermal plume resulting from the Facility discharge, as defined by the cross-sectional area in which temperatures differ by 2°F or more from ambient, is less than 37.5% of the cross section of the Saugus River. *See* "Thermography Study General Electric River Works Facility" (ENSR, 1993), pp. 4-12. (As updated by CH2M HILL using the latest bathymetry data for the Saugus River collected by USACE in 2006.) Equally important, in only 9.5 % of that already small plume are temperatures likely to equal or exceed 4°F over ambient, and in only 1.8% of the plume are temperatures likely to equal or exceed 8°F over ambient. Furthermore, the available modeling demonstrates that the entire thermal plume resulting from the GE Power Plant discharge, as defined by the surface area in which temperatures differ by 9.5°F or more from ambient (or 84.5ºF), is less than 3% of the surface area encompassed by the temperature isotherms of Outfall 018.

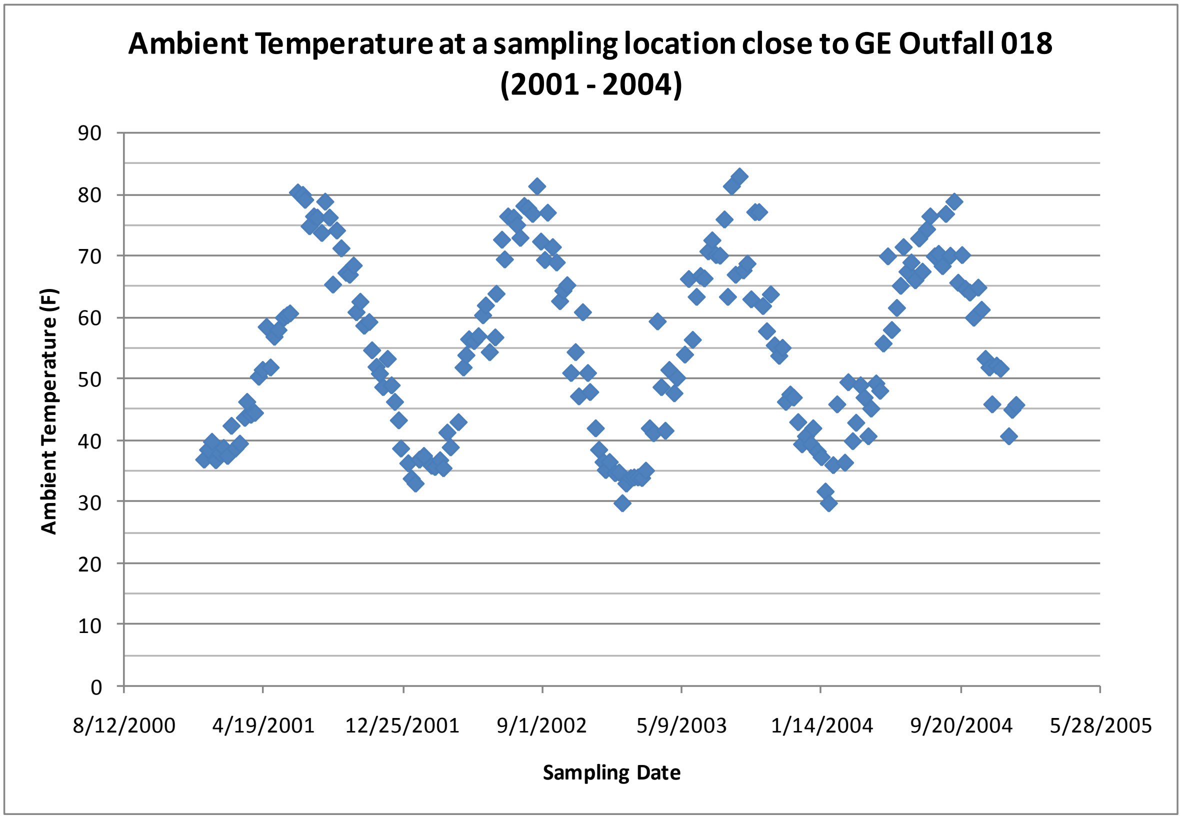
As demonstrated by the plan-view and cross-sectional figures of the modeled thermal plume in Technical Exhibit 18 to these comments, the Power Plant thermal plume projects away from the shoreline out into the deeper main channel of the river (Technical Exhibit 18, Figure 2.7). The lateral distance of the plume from Outfall 018 (following its trajectory as shown in Technical

Exhibit 18, Figure 2.7) and its depth below the surface during low-water slack tide (Technical Exhibit 18, Figure 2-3) show that (1) the plume does not extend across the river to the shallow-water and saltmarsh habitats near the southern shore of the river, and (2) a substantial zone of the river (in terms of both width and depth) is unaffected by the 2ºF isotherm. Thus, even at low-water slack tide, a substantial zone of passage remains in the Saugus River in the vicinity of Outfall 018 for juvenile fish to avoid rapid exposure to and swim away from the relatively gradual change in temperature associated with the thermal plume. Moreover, these conditions represent the maximum extent of the plume under low-water slack tide. That condition persists for less than 30 minutes, further limiting the exposure of young fish to elevated temperatures.

Although EPA suggests that GE's 1993 modeling may not accurately reflect the temperature profile of the Facility's plume, there are good reasons to believe that the model provides a reasonably accurate representation of its dimensions. See "Thermal/Biological Impact Analysis – Outfall 014 General Electric River Works Facility" (ENSR, 1993b). The effluent temperature of 95°F was used as a model input for discharges for the Test Cell at Outfall 014. Based on the modeling results, the predicted thermal plume from Outfall 014 exceeding 84.4ºF is about 20.5% of the total cross sectional area and 10% of the total surface area encompassed by temperature isotherms (when effluent temperature is 95°F). *See* "Thermal/Biological Impact Analysis – Outfall 014 General Electric River Works Facility" (ENSR, 1993), pp. 4-15 and 4-16. By way of analogy and extrapolation, it could reasonably be expected that Outfall 018 would observe a similar percentage increase when the effluent temperature is 95°F. It is important to note that 20.5% of total cross sectional area and 10% of the total surface area encompassed by temperature isotherms are still relatively small areas. Therefore, the incremental impact of the thermal plume on the BIP of fish in the Saugus River also would be relatively small.

Available ambient data support this conclusion. In its § 316(a) determination for the Wheelabrator Saugus facility, on which EPA relies heavily, the Agency concluded that available data indicate that no appreciable harm to balanced indigenous populations ("BIP") of fish has occurred from existing thermal discharges at Wheelabrator Saugus under conditions which included the existing thermal discharge from GE. Fact Sheet Attachment K, p. 16. Indeed, according to EPA, those conditions include at least some discharges by GE during August, 2001, at currently permitted discharge levels (Fact Sheet, p. 78).

Below is a summary of weekly ambient temperature for 2001-2004 at a sampling location close to GE Outfall 018 but outside the projected thermal plume impact zone, which includes data for the August 2001 time period cited by EPA. These ambient temperature records showed that EPA's *ad hoc* 85°F threshold was not exceeded in 2001 - 2004.



Based on DMR data in Attachment G to the Fact Sheet, the daily maximum effluent temperature reached 95 °F in August, 2001 However, the weekly ambient temperature records at this sampling location close to Outfall 018 were 73.7 °F (on 8/1/01), 78.8 °F (on 8/7/01), 76.2 °F (on 8/15/01), 65.3 °F (on 8/21/01) and 74.1 °F (on 8/28/01), respectively. Thus the ambient temperature records were below 85 °F, and in this particular time period below 80 °F, even when the effluent discharge temperature reached to 95 °F during the same month of the year. Although these ambient temperature data were collected outside the potential impact zone predicted by the 1993 model-generated thermal plume isotherms, they show that the size of the thermal plume was confined to a small surface area of the Saugus River projecting beyond the shoreline to the deeper portion of the channel, and did not extend along the shoreline downstream of Outfall 018.

Nor is it the case that the small area likely to be affected by GE's thermal discharge provides habitat of a type or amount likely to be necessary to or preferred by juvenile organisms of the species about which EPA has expressed concern. In contrast to the waters adjacent to the Wheelabrator Saugus discharge, which are located in shallow, tidal flats with abundant vegetation providing important nursery habitats for many estuarine species, the habitats located along the deeper northern shore next to the GE discharge are distinctly deeper and more open-water in character. The habitat in the vicinity of the GE Outfalls 018 and 014 discharges does not encompass intertidal or saltmarsh habitats preferred by many estuarine species, and they include a substantial zone of bottom habitat extending into the deeper main channel of the Saugus River that is unaffected by the thermal plume, even at low-water slack tide (*see* Technical Exhibit 18, Figures 2-3 and 2.7). The species about which EPA has expressed concern – alewife, rainbow smelt, striped bass, and winter flounder – do not appear to inhabit these waters during the period of highest plume temperatures (July-August during low tide) or are unlikely to be exposed to the relatively small area with the highest temperatures for a duration that could result in lethal or sublethal effects (*see* Technical Exhibit 18).

Thus, there is no basis for suggesting that the thermal plume associated with maximum daily discharges of 95°F would have any material impact on available habitat or otherwise prevent juvenile organisms from avoiding temperatures outside their preferred range.

Response to Comment 10.3.3

GE presents a series of comments maintaining that with a maximum temperature limit of 95°F for thermal discharges from Outfalls 014 and 018, the thermal plume from its discharge will occupy only a small area of the Saugus River and neither aquatic life nor habitat quality will suffer to a significant degree. GE also comments that the data relied upon by EPA in its analysis does not support the conclusion that species of concern would be harmed by GE's discharge with a temperature limit of 95°F.

In responding to these comments, EPA begins by noting that GE appears to misunderstand the respective "burdens" that must be carried by the permit applicant and the permitting authority under CWA § 316(a). Under CWA § 316(a), and 40 C.F.R. §§ 125.71, 125.72 and 125.73, the permit applicant must demonstrate to the permitting authority's satisfaction that the variance-based waste heat discharge limits that it seeks will assure the protection and propagation of the BIP. This is so whether the applicant is seeking an initial § 316(a) variance or renewal of a variance. *See id.*

In this case, GE failed to carry its burden. Indeed, it submitted no CWA § 316(a) variance demonstration whatsoever. While EPA *interpreted* GE's permit application to be seeking renewal of its existing variance, as discussed above, the fact remains that GE did not provide EPA with a submission demonstrating that the facility qualified for variance-based thermal discharge limits. While EPA could have responded to GE's failure by imposing the otherwise applicable technology-based and water quality-based requirements, the Agency decided to consider whether in this case the data indicated that there was a set of thermal discharge limits that would satisfy CWA § 316(a). Although it was not required, it was not unreasonable for EPA to undertake this exercise. Further, GE cannot (and does not) complain that EPA has done so, since it has led to less stringent thermal discharge limits than otherwise would have applied under the technology-based and/or water quality-based requirements.

In setting "its own" § 316(a) variance-based limits, EPA's burden also is to establish that the limits in question will meet § 316(a)'s criterion of assuring the protection and propagation of the BIP. It is not EPA's burden to establish that the limits in the existing permit, or some other set of limits likely to be preferred by the discharger, will not be sufficiently protective, or that the limits proposed by the Agency are the least stringent set of limits that would satisfy CWA § 316(a).

That said, EPA has carefully considered GE's comments and responds to them below. EPA has considered whether, as GE urges, a less stringent set of thermal discharge limits than those proposed in the Draft Permit would also satisfy CWA § 316(a). From this assessment, EPA has decided that, based on available information, the Final Permit's thermal discharge limits *can* be made less stringent than the limits included in the Draft Permit. GE's comments support and contribute to EPA's conclusion that the thermal discharge limits that it has included in the Final Permit (year-round discharge limits of 95°F) are likely sufficient to reasonably assure the protection and propagation of the BIP.

Comparison of Laboratory Versus Saugus River Conditions

GE comments that EPA and MassDEP rely on laboratory-based studies to support their concern that waste heat discharges of up to 95°F from the Power Plant (Outfall 018) and the Test Cell (Outfall 014) may harm fish in the Saugus River. According to GE, these laboratory studies "provide some insight" but are not persuasive evidence of potential harm from GE's waste heat discharges because the fish in the laboratory experiments experience conditions different from those experienced by fish in the portions of the Saugus River affected by GE's discharges. EPA disagrees with GE's attack on the Agency's use of laboratory studies in this case. EPA's view continues to be that these studies are one source of relevant information for assessing the threats that would be posed to fish in the Saugus River by giving GE a year-round thermal discharge limit of 95°F for the Power Plant and Test Cell. While EPA agrees that it is important to understand the differences between the conditions that prevail in the laboratory studies and the permitting context in question, GE overstates the difference between the thermal conditions in the laboratory studies and those prevailing in the Saugus River. Certainly, any suggestion that these studies should be disregarded would go too far, as GE's comment acknowledges that laboratory studies provide at least "some insight into thermal lethal and sublethal effects."

GE argues that "the temperature differential between ambient levels and temperatures within the thermal plume predicted by the 1993 ENSR modeling is at most 9.5ºF at low water slack tide. Thus, fish in the Saugus River in the vicinity of the discharge would not be exposed to rapid temperature changes equivalent to those in the laboratory experiments." EPA disagrees that resident organisms in the Saugus River are unlikely to experience temperature differentials comparable to those used in the laboratory studies. In the thermal study conducted by Otto et al. (1976), the difference between the acclimation temperature and the exposure temperature ranged from about 14° to 22°F. Using ambient temperature monitoring data from August 2001 (ASA 2004), the agencies approximated potential acclimation temperatures based on water temperatures collected at stations upstream of the discharge (near the Route 107 Bridge and at the edge of the Wheelabrator Saugus intake channel) and exposure temperatures from stations in the vicinity of GE Outfalls 014 and 018. At low water slack tide, these temperature differentials (delta T) were as high as 14° to 23°F. Thus, temperature differentials consistent with the delta Ts studied in Otto et al. have been observed in the Saugus River. *See also* MassDEP's Summary of Thermal Concerns Relative to the General Electric Aviation, Lynn NPDES Draft Permit, p.15.

GE also states that the conditions representing the maximum extent of the plume under low-water slack tide persist for less than 30 minutes, further limiting the exposure of young fish to elevated temperatures. EPA and MassDEP maintain that ambient monitoring data from 2001 provides evidence that fish in the Saugus River could experience temperature differentials at exposure durations similar to those under which thermal toxicity for alewife was observed in the referenced laboratory study. Otto et al. (1976) observed acute toxicity for young-of-year alewives at a delta T of 16.2°F with a median survival time of 14 minutes at a test temperature of 91.4°F, and at a delta T of 14.4°F with a median survival time of 76 minutes at a test temperature of 93.2°F. On August 16, 2001 at the monitoring station east of GE outfall 018 (inshore) (Station 22 in Figure 2-7, CH2M Hill's *Technical Support for Comments on Proposed Thermal Discharge Limits and Cooling Water Intake Structure Requirements,* Technical Exhibit 18), a delta T ranging from 15.3°F (maximum temperature of 88.7°F) to 22.5°F (maximum temperature of 96°F[54]) persisted for over 90 minutes. While GE comments that elevated temperatures persist for less than 30 minutes, ambient temperatures at stations west of the GE outfall (inshore) on August 10 and 18 of 2001, and east of the GE outfall (inshore) on August 16, 2001, were elevated for longer than 30 minutes. Furthermore, median survival time for young-of-year alewife acclimated at 77°F was *less* than 30 minutes at exposure temperatures greater than 91.4°F and at a delta T greater than 16°F. Ambient temperature monitoring in and near the predicted plume from Outfalls 014 and 018 (ASA 2004) suggests that, at certain times, temperatures in the plume may be as high as or higher than 93°F and delta temperatures may be greater than 16°F. This, and other ambient monitoring data from 2001 (when the maximum reported discharge temperature at Outfall 018 was 95°F), supports the agencies' determination that conditions in the vicinity of the GE outfalls at a discharge temperature of 95°F may have the potential to cause some thermal toxicity from elevated temperatures that persist during limited periods surrounding low slack tide. At the same time, the size and duration of areas with elevated temperatures that could potentially result in toxicity is relatively limited.

Potential for Avoidance of the Thermal Plume

GE comments that fish in the laboratory experiments in question were immediately exposed to high temperatures without opportunity to avoid them, whereas fish exposure to elevated temperatures in the Saugus River would likely be more gradual and conditions could allow fish the opportunity to avoid the conditions that could result in toxicity. In response to GE's comment, EPA evaluated the potential for a swimming or drifting organism to avoid exposure to a rise in temperature for a duration that would result in thermal toxicity. A comparison of the delta T at the monitoring stations in the vicinity of GE's outfalls (using the Wheelabrator Saugus intake channel station as acclimation temperature) indicated that during periods when the temperature differential at one station (most often the inshore station closest to Outfall 018) was large enough to result in potential toxicity (more than 16°F for 14 minutes based on Otto et al.), the temperature differentials at nearby stations were substantially lower and unlikely to cause toxicity. As an example, a delta T of 22.5°F was observed at the station closest to Outfall 018 on August 16, 2001. At approximately the same time, the delta T at the three nearest stations (one about 15 feet away from the inshore station and two near the steambridge opening) was between 9° and 11°F, and the delta T at the stations near Outfall 014 were less than 5.5°F. In all cases in which the delta T at one station had the potential for acute toxicity, the temperature differential at most or all of the remaining stations near GE would be unlikely to cause toxicity. In other

[54] At some stations near GE's thermal discharges during low slack tide, instantaneous river temperatures measured during the 2001 ASA temperature study exceeded GE's existing permit limit of 95°F. Data is unavailable to ascertain if GE's effluent temperature exceeded 95°F or if the thermistor record was compromised (e.g., reading temperatures at or above the water surface), but this data suggests that monitoring effluent temperatures at Outfalls 018 and 014 more frequently than the Draft Permit's weekly or monthly grab samples is warranted.

words, although conditions consistent with those observed to result in acute toxicity for juvenile alewife in Otto et al. (1976) persisted at one monitoring station in August 2001, most of the river remained at temperatures that would likely be cool enough to assure the protection and propagation of the BIP. Therefore, based on the currently (albeit limited) available data, EPA agrees with GE that fish in the Saugus River would likely be able to avoid the undesirable temperatures and seek cooler refuge.

The agencies are concerned that available data (two weeks of ambient monitoring data from August 2001) may be insufficient to make an accurate characterization of the size of the thermal plume during different, critical times of the year. Nonetheless, the available data suggest that the extreme delta Ts that could potentially result in acute toxicity for juvenile alewife are limited in both duration and space such that a drifting or swimming organism traveling through the thermal discharge plume at low slack tide during summer– when thermal impacts from GE are expected to represent the worst case– would likely be able to avoid rapid increases in temperature and seek cooler refuge. Therefore, EPA presently concludes that maximum temperature limits of 95°F for GE's thermal discharges from Outfalls 014 and 018 will be likely to assure the protection and propagation of the BIP in the Saugus River.

However, while EPA agrees that most fish in the Saugus River will likely be able to avoid the facility's thermal discharge plume so as to ensure protection and propagation of the BIP at the higher discharge temperature, EPA does not agree with the updated analysis in GE's comment. According to GE, EPA relied on laboratory studies that involved continuous exposures of juvenile organisms under conditions in which they were unable to avoid the undesirable temperatures and seek cooler refuge. GE further comments that, in comparison to these laboratory conditions, exposure to the thermal plume in the Saugus River would be more gradual, occurring over a greater surface area and depth, which would allow organisms (including juvenile fish) to avoid undesirable temperatures. In support of this comment, GE provides an updated analysis of the modeled plume from Outfall 018 based on updated bathymetry data collected by U.S. Army Corps of Engineers (USACE) in 2008. This analysis indicates that the thermal plume (defined in the model by temperatures of 2°F or more above ambient) covers less than 37.5% of the cross-sectional area of the river at low water slack tide (Exhibit 18 to GE Comments), compared to GE's 1993 analysis, which predicted that the 2°F isotherm would cover 85% of the cross-sectional area of the river.

EPA has several problems, however, with the use of the updated bathymetry (presented in Figure 2-3 of Technical Exhibit 18). In the figure, the 4° and 2°F isopleths are shown to penetrate the bank, which is not possible. GE appears to have simply overlaid the existing 1993 isopleths on a plan depicting depth along the trajectory of the surface thermal plume using the updated bathymetry data from the USACE. It is not clear if the calculation of 37.5% of the cross-sectional area encompassed by the 2°F isopleths accounts for the discrepancy where the isopleths overlays the bank, but if so, it is likely that the heat transfer attributed to the bank area would actually be taken up by the water, which would increase the cross-sectional area of the plume.

Second, EPA is even more concerned that the updated bathymetry data depicted in Figure 2-3, and used to calculate the cross-section of the isopleths does not appear to match either the 2008 bathymetry map available from USACE or any other depiction of the Saugus River. GE's figure shows a maximum depth of 13.2 feet below mean lower low water (MLLW) at a lateral distance 350 feet from the outfall. Soundings from the 2008 USACE survey of the Saugus River indicate that south of the navigation channel (about 225 feet from the outfall), depths quickly decrease to a maximum of 4 to 5 feet below MLLW. The agencies see no location 350 feet from the outfall where the depth would be more than 1 foot at MLLW based on the 2008 USACE survey data. A river depth of 13 feet is possible in the navigation channel in the area in front of and downstream of the Power Plant CWIS, which is downstream of Outfall 018 and the thermal discharge. Depths in the vicinity of the navigation channel near Outfall 018 appear to be in the range of only 9 to 11 feet below MLLW.

Finally, according to Technical Exhibit 18 (p. 2-2), bathymetric data from USACE "were converted to mean lower low water," but the 2008 soundings, according to USACE, refer to the plane of mean lower low water 1983-2001 Tidal Epoch. It is not clear what conversion GE performed, but as the soundings are already depicted at MLLW, no conversion should have been necessary. Based on available information, EPA is disinclined to accept GE's updated analysis based on the bathymetry depicted in Figure 2-3 of Technical Exhibit 18.

1993 ENSR Model Predictions

Based on predictions made using the 1993 ENSR model, GE maintains that the difference between ambient water temperatures and temperatures within the thermal plume is at most 9.5ºF at low water slack tide. GE further maintains that there are "good reasons" to believe that the 1993 ENSR model provides a reasonably accurate representation of the dimensions of the facility's thermal discharge plume.

EPA does not share GE's assessment of the 1993 ENSR modeling results. Instead, the Agency questions the reliability of predictions based on the 1993 ENSR model and, as a result, EPA relied primarily on ambient monitoring data collected during August 2001 in making its determination under CWA §316(a). EPA is unable to have confidence in the accuracy of the model's predictions of the temperature, location and depth of the thermal plume at a maximum discharge temperature of 95°F because the model's predictions are at odds with the ambient temperature monitoring data. For example, ambient monitoring data from the Saugus River reveals delta Ts greater than the model's predicted maximum of 9.5°F. In addition, as EPA stated in the Fact Sheet (p. 77-78), the 1993 model results do not appear to be representative of the profile and dimensions of the thermal plume at the currently permitted maximum of 95°F – *i.e.*, the model results likely understate the scope of the thermal plume at 95°F – possibly because the inputs to the model assumed maximum discharge temperatures of 91°F and 90°F at Outfalls 018 and 014, respectively. While GE comments that the predicted thermal plume from Outfall 014 in the 1993 model was based on a model input of 95°F and can be used to extrapolate a similar percentage increase for Outfall 018 at an effluent temperature is 95°F, EPA points out that the 1993 ENSR model input for Outfall 014 assumed a maximum delta T of 15°F and a maximum summer ambient temperature of 75°F, which equals a maximum effluent temperature of 90°F (not 95°F, as stated by GE).

Furthermore, EPA notes that the observed temperature differentials during 2001 do not correspond to the predicted isopleths from the 1993 model. For example, during August 2001, ASA recorded limited periods of greatly elevated surface temperatures (in excess of 93°F) in the vicinity of the GE's Outfall 018 (Station 22 in Figure 2-7 of Technical Exhibit 18), which is located outside of the isotherms predicted by the 1993 model. At ASA Station 20 (north of the channel opening at the steam bridge), EPA calculated temperature differences at low slack tide throughout the water column ranging from 7°F to 14°F above ambient (measured at the mouth of the channel to the Wheelabrator Saugus intake). In comparison, the model predicts Station 20 to lie within the 4°F isopleths and that the 4°F isopleth in the vicinity of Station 20 would extend only to a depth of between 2 and 3 feet. This suggests, at a minimum, that the 1993 ENSR model should not be used to evaluate the cross-sectional area encompassed by the isopleths from the discharge at Outfall 018. EPA maintains that GE has not, either in the 1993 model or in its comments on the Draft Permit, demonstrated that the model accurately predicts the extent of the thermal plume at a maximum discharge temperature of 95°F at either outfall 018 or 014.

GE uses ambient weekly temperature records from "a sampling location close to GE Outfall 018" to support statements that "the size of the thermal plume was confined to a small surface area of the Saugus River projecting beyond the shoreline to the deeper portion of the channel, and did not extend along the shoreline downstream of Outfall 018," and that "EPA's *ad hoc* 85°F threshold was not exceeded in 2001-2004." In response, EPA first notes that it did not apply the threshold of 85°F on an "*ad hoc*" basis. Rather, that temperature was used based on the Massachusetts Class SB surface water quality standards for temperature at 314 CMR § 4.05(b)(2). EPA further notes that while GE did not disclose the sampling location it is referring to, except to say that it was "outside of the potential impact zone predicted by the 1993 model-generated thermal plume isotherms," EPA assumes that the location was inshore of ASA Station 22 as depicted in Figure 2-7 from Technical Exhibit 18. Moreover, in the text above, EPA has described instances in which temperatures at Station 22 exceeded 93°F for certain periods (30 to 90 minutes) during low slack tide in August 2001. Similar temperature spikes at GE's monitoring station would likely not be captured in GE's review of "weekly ambient temperature," which EPA assumes refers to *average* weekly ambient temperatures. The data GE provides in its comments suggest that weekly average temperatures in August 2001 were 80°F or less. However, the temperature differential over a single tidal cycle at Station 22 was typically 10°F or more. It is not surprising that a temperature spike occurring on one or two days for approximately 30 minutes twice per day does not substantially impact a weekly average temperature value given the twice-daily flood tide which brings an influx of cool water from Lynn Harbor into the lower Saugus River. Therefore, EPA is not persuaded that the average ambient data provided by GE is evidence that the thermal plume is not, at times, wider and deeper than predicted by the 1993 model. Nevertheless, GE's average weekly data, together with the 2001 ambient monitoring data, support EPA's conclusion, based on available data, that impacts from the thermal plume are likely to persist for a relatively short duration and that, taking into account the potential for fish to avoid high water temperatures caused by the facility's discharges, thermal discharge limits of 95°F would reasonably assure the protection and propagation of the BIP in the Saugus River.

Presence of Juvenile Fish

EPA disagrees with GE's comments arguing that the area of the lower Saugus River impacted by the facility's waste heat discharges from Outfalls 018 and 014 is "not likely to be necessary to or preferred by juvenile organisms of the species about which EPA has expressed concern." GE attempts to distinguish the location of its thermal plume, and the type of bottom habitat that it affects from the type of habitat affected by the Wheelabrator Saugus discharge. GE contrasts the deeper, more open water habitats next to the GE discharge with the habitat adjacent to the Wheelabrator Saugus discharge, which GE characterizes as "shallow, tidal flats with abundant vegetation providing important nursery habitats for many estuarine species." This contrast contributes to GE's conclusion that its discharges would not be likely to cause adverse thermal effects to fish.

Yet, GE's argument based on this comparison is not persuasive. Wheelabrator Saugus discharges through a diffuser that is located on the river bottom at the north edge of the main channel of the Saugus River (at a depth of 20 feet) approximately 60% of the distance from the steam bridge to the railroad bridge. Contrary to GE's suggestion, Wheelabrator's discharge from the diffuser at the bottom of the main channel is unlikely to impact nursery habitats, such as vegetated intertidal or tidal flats. In addition, EPA set the maximum temperature limit for the Wheelabrator permit at 90°F with a delta T of 22°F. Indeed, the location of the Wheelabrator Saugus discharge in the deeper main channel was a major factor in EPA's 316(a) evaluation for that permit reissuance, which states that the thermal discharge "at a maximum limit of 90°F and delta T of 22°F would only nominally affect the size, shape, and magnitude of the current plume." (Fact Sheet for the Wheelabrator Saugus Draft NPDES Permit, p. 16). EPA also concludes that from July to September several of the species about which the agencies are concerned would be likely to be found in the open-water and shoal habitat near GE's discharge, as opposed to shallow, vegetated flats. Juvenile river herring, for example, which emigrate during late summer and fall, occur in the upper levels of the water column (Able and Fahey 1998). As another example, rainbow smelt tend to prefer sandy shoals, such as those found on the northern shoreline of the Saugus River (Bigelow and Schroeder 1953).

Finally, according to MassDEP, extensive monitoring for alewife and blueback herring in the lower Charles River, as well as other rivers in Massachusetts, suggests that juvenile alewives would likely be found in the lower Saugus River from very late June through the fall. Alewives begin spawning in late March to mid-May, while blueback herring tend to spawn later into April and through June. Juveniles of both species use freshwater habitat as a nursery during the early to late summer and begin their migration to the ocean in July and continue through November. According to the Massachusetts Division of Marine Fisheries (MarineFisheries), and based on recent (within the past 10 years) documentation, the Saugus River provides a spawning run and habitat for alewife, blueback herring, rainbow smelt, and winter flounder. Alewife, in particular, would be expected to be migrating to the ocean from July through November in the Saugus River (MA DMF 2011). In addition, Wheelabrator Saugus impinged juvenile alewife in late July 2011 (Normandeau 2012). Life history factors, scientific literature, anecdotal observations of fisheries scientists, and recent monitoring data indicate that alewife are very likely to be present in the Saugus River during the late summer months when the potential for acute toxicity appears to be greatest. Thus, all of this information tends to contradict any suggestion that GE's thermal discharge does not affect habitat likely to be preferred by juveniles of the species about which the agencies have expressed concern, or that these species would not inhabit the Saugus River during the period of highest plume temperatures.

Conclusion

In this case, thermal toxicity is the primary thermal impact of concern with regard to assuring the protection and propagation of the BIP in the segment of the Saugus River receiving GE's thermal discharge. As discussed above, the critical period for this concern as it relates to GE's thermal discharges is the 1.5-hour period surrounding low slack tide. In its comment, GE has not provided persuasive evidence that conditions that resulted in acute toxicity for juvenile alewife in laboratory studies would not occur in limited areas of the Saugus River at low slack tide, or that the 1993 model or GE's updated analysis can be used to predict with accuracy the magnitude and dimensions of the thermal plume at 95°F, or that the species that the agencies are concerned about (particularly alewife, which tends to be the most thermally sensitive species) would not be present in the Saugus River in areas affected by GE's discharges during periods when temperatures resulting in acute toxicity may occur.

Nevertheless, upon review of the limited, available information and in response to GE's comment, the agencies have determined that the potential for thermal impacts is likely limited to a relatively short period surrounding low slack tide during the hottest months of the year and at locations near the inshore habitat closest to the discharge. Outside of this period, lower ambient river temperatures during non-summer months and the tidally driven exchange of water during non-low slack tides are likely to minimize any potential for substantial thermal impacts. Moreover, even during low slack tide in the summer, conditions appear to be such that fish would likely be able to avoid elevated temperatures and seek cooler refuge. Because the potentially most serious impacts of the thermal plume can likely be avoided, EPA has determined that, based on available information, maximum temperature discharge limits of 95°F would reasonably assure the protection and propagation of the BIP. Therefore, whereas the Draft Permit included a year-round maximum daily temperature limit of 90°F, the Final Permit includes a maximum daily temperature limit of 95°F and an average monthly temperature limit of 90°F at Outfalls 014 and 018 consistent with the current permit. At the same time, the Final Permit adds protection for the BIP by requiring a reduction in flow to minimize entrainment mortality of early life stages in the Saugus River. Finally, given that the temperature data available to characterize the extent of the thermal plume and its potential impacts is relatively limited, and because the ASA thermistor data analyzed by EPA and MassDEP in development of this permits limits suggest that, at times, river temperatures may rise as high as or higher than 95°F, the Final Permit requires continuous temperature monitoring at Outfalls 018 and 014. Continuous temperature monitoring will provide data more representative of the actual range of effluent temperatures than the weekly (at 018) or monthly (at 014) grab samples that were required in the Draft Permit.

11. EPA's Proposed BTA Determination for the Facility's CWIS Require Reconsideration.

Comment 11.1: Background.

Although NPDES permits typically cover only discharges of pollutants to waters of the United States, the Clean Water Act also includes a unique provision, § 316(b), that applies to "cooling water intake structures." Section 316(b), 33 U.S.C. § 1326(b), provides:

> Any standards established pursuant to section 1311 of this title or section 1316 of this title and applicable to a point source shall require that the location, design, construction and capacity of cooling water intake structures [CWIS] reflect the best technology available [BTA] for minimizing adverse environmental impact.

EPA first issued regulations implementing § 316(b) in 1976. Those regulations required selection of BTA case-by-case, following guidance provided separately by the Agency. The regulations were suspended by the United States Court of Appeals for the Fourth Circuit in 1977 on procedural grounds, after which they were withdrawn. From 1977 on, EPA and the states implemented § 316(b) on a best professional judgment (BPJ) basis, guided by case-specific decisions of the Administrator and reviewing courts, opinions issued by EPA's Office of General Counsel, and an EPA draft guidance document entitled "Guidance for Evaluating the Adverse Impact of Cooling Water Intake Structures on the Aquatic Environment: Section 316(b) P.L. 92-500" (May 1, 1977) ("1977 Draft Guidance"). As EPA has recognized, those sources of guidance emphasize the importance of considering impingement and entrainment losses in context, rather than in the abstract. For example, the 1977 Draft Guidance counsels that "[r]egulatory agencies should clearly recognize that some level of intake damage can be acceptable if that damage represents a minimization of environmental impact" (p. 3). Further, in evaluating whether "damage" from entrainment and impingement occurs, "the critical question is the magnitude of any adverse impact" (p. 11). Thus, the 1977 Draft Guidance (p. 34) instructs permit writers to relate individual losses to effects on local populations, taking into account life history information and species fecundity.

In 1995, EPA entered into a settlement agreement committing the Agency to conduct a phased § 316(b) rulemaking. The first phase, covering CWIS at new facilities, was completed in 2001. 66 Fed. Reg. 65,256 (Dec. 18, 2001), codified at 40 C.F.R. Pt. 125, subpart I. For purposes of those regulations, known as the "Phase I" rules, EPA chose a new, more uniform, more administratively streamlined approach to § 316(b) regulation that emphasize reducing individual organism losses. In doing so, however, EPA stressed that its decision to adopt this approach for new facilities was not binding with regard to existing facilities, which the Agency recognized faced more limited alternatives and higher costs. *See, e.g.,* 66 Fed. Reg. 65,285.

As EPA notes, in 2004 the Agency adopted so-called "Phase II" § 316(b) regulations for existing steam electric power generators designed to withdraw more than 50 MGD, and in 2006 EPA adopted § 316(b) regulations for "Phase III" facilities, including existing manufacturing facilities like the Facility. Fact Sheet, Attachment J, p. 2. For Phase II facilities, EPA determined that closed-cycle cooling was not BTA for a variety of reasons, including its high costs, potential incompatibility with existing site limitations, and adverse environmental implications for other environmental media. 69 Fed. Reg. 41,605-41,606 (July 9, 2001). Instead, the Phase II rule established performance standard ranges based on the Agency's estimate of what other technology alternatives could achieve. The Phase II rule anticipated that permittees would select the most cost-effective technology capable of achieving reductions within the range, but authorized permittees to obtain less stringent alternative standards if they could show that the costs of complying with the otherwise applicable standards would be significantly greater than the benefits. 69 Fed. Reg. 41,595-601. For Phase III facilities, EPA determined that no uniform standards were warranted, finding that the cost of any such standards would be "wholly disproportionate" to the likely benefits. 71 Fed. Reg. 35,006-015 (June 16, 2006).

As EPA correctly notes (Fact Sheet, Attachment J, p. 2), the Phase II rule was suspended in July, 2007, after various portions of the rule (including the provision for alternative standards based on cost-benefit analysis) were remanded by the United States Court of Appeals for the Second Circuit. In 2009, the United States Supreme Court reversed the lower court's decision on this score, upholding EPA's authority to weigh costs and benefits in implementing § 316(b). Indeed, in the words of Justice Breyer, "every real choice requires a decision maker to weigh advantages against disadvantages, and disadvantages can be seen in terms of (often quantifiable) costs." *Entergy Corp. v. Riverkeeper, Inc.*, 129 S. Ct. 1498, 1513 (2009) (Breyer, J., concurring in part). Because the Supreme Court's decision resolved only one of several issues on which the Phase II rule was remanded, EPA has chosen to continue developing an alternative rule covering existing steam electric generating plants. Until that rulemaking is concluded, Phase II facilities are subject to § 316(b) implementation on a case-by-case basis.

Although the Phase III rule also was challenged by environmental interest groups, no court has ever opined on its validity. Rather, as it acknowledges (Fact Sheet, Attachment J, p. 2), EPA chose to seek a remand so that it could reconsider the Phase III rule in conjunction with its Phase II rulemaking. Because the Phase III rule contemplated case-by-case decision-making using BPJ, the remand of the Phase III did not affect the Agency's approach to implementing § 316(b) for existing manufacturing facilities like the Facility.

EPA recently published proposed § 316(b) regulations for CWIS for all existing facilities, including manufacturing and steam electric plants, designed to withdraw more than 2 MGD of water, of which 25% or more is cooling water, from surface waters of the United States. *See* 76 Fed. Reg. 22,174, 22,280-81 (April 20, 2011). Those proposed regulations, if adopted, would require all covered facilities either to meet monthly average and annual average limits on mortality to impingeable-sized organisms, or to achieve a design or actual intake velocity of 0.5 fps or less. Although the impingement mortality standards apply to "all life stages of fish," the rule also allows the permittee to propose, and the permit writer to approve, the selection of "species of concern" for purposes of compliance. 76 Fed. Reg. 22,287. For entrainment, the proposal requires permit writers to identify BTA on a case-by-case basis, taking into account a variety of factors, including whether the social benefits of alternative technologies justify the social costs. 76 Fed. Reg. 22,277-278. Only facilities with actual intake flows[55] greater than 125 MGD are required to submit extensive information in connection with entrainment standards selection, however. *Id.* Facilities below that threshold, like the Facility, are presumed to present far less risk and thus to warrant less onerous evaluation and regulation. EPA considered, but decided against proposing closed-cycle cooling as BTA for a number of reasons, including physical constraints, air emissions, energy impacts, and adverse implications for reliability. 76

[55] EPA proposes to define "actual intake flow" as the "average volume of water withdrawn on an annual basis by the cooling water intake structures over the past three calendar years." 76 Fed. Reg. 22,281 (April 20, 2011).

Fed. Reg. 22,208-210. The proposal also expressly recognizes that permit writers may conclude that the existing CWIS is BTA. 76 Fed. Reg. 22,288.

EPA's proposal is just that – a proposal, having no regulatory effect. But the fact that EPA has once again declined to require closed-cycle cooling as BTA for entrainment is telling, as are its proposals to require consideration of whether the social benefits of entrainment reduction technologies justify their social costs, and to exempt facilities with relatively low flows from all or some portions of the regulation. Although some changes in the proposal can be expected, these aspects of EPA's proposal deserve weight because they are consistent with the Agency's longstanding guidance and with its previous determinations in the Phase II and III rulemaking. Thus, while GE does not believe that the Agency is either authorized or obliged to apply the rule before it becomes final, we believe that EPA's proposal in this regards is telling.

Nevertheless, we recognize that there is substantial uncertainty regarding the precise requirements of any final rule. In light of that uncertainty, and the fact that EPA has committed to finalize the rule by July 27, 2012,[56] GE submits that it should not be subject to a BPJ determination that may prove to be inconsistent with the final rule. Given the very short window of uncertainty remaining, GE requests that the Region either stay this permit renewal proceeding until § 316(b) rule for existing facilities becomes final, or reissue the permit without any new § 316(b) requirements, subject to permit modification when § 316(b) rulemaking is complete.

Addendum to Comment 11.1

In a letter to EPA submitted July 31, 2014, GE submitted additional comments regarding the impact of the Final 316(b) Rule on GE's ongoing NPDES permit proceeding. GE presented its views on how EPA should interpret and apply the Final Rule to the facility. GE believes that the Final Rule must be accounted for in the development of the final NPDES permit, and comments specifically on both the implementation of the rule and what requirements should be included in the Final Permit. The following are excerpts from GE's letter to EPA pertaining to the Final 316(b) Rule and its impact of GE's Final Permit.

For permits like the one at issue here, where the reissuance proceeding is already underway, the final 316(b) Rule contemplates that the permitting authority will wait at least one permit cycle before imposing substantive impingement mortality and entrainment requirements and will use the intervening time to gather all of the information necessary to make an informed determination about whether and how those requirements should be imposed (including any necessary schedule of compliance). As a result, GE believes that it would be premature for EPA to attempt to implement the final rule in the pending reissuance proceeding, especially since the public comment period on the draft permit closed years ago. If EPA declines to wait and instead proceeds with a determination of the "best technology available" standards for impingement mortality and entrainment, then, at a minimum, EPA must publish this determination in a revised draft permit for public review and comment.

[56] *See* Settlement Agreement Among the United States Environmental Protection Agency, Plaintiffs in *Cronin et al. v. Reilly*, 93 CIV. 314 (LTS) (SDNY) and Plaintiffs in *Riverkeeper, et al. v. EPA*, 06 CIV. 12987 (PKC) (SDNY).

Impingement Mortality Requirements. GE believes that the Facility qualifies for the *de minimis* provision in 40 C.F.R. §125.94(c)(11). The Facility (1) withdraws a total of less than 31 million gallons per day (MGD) actual intake flow (AIF) from its two active cooling water intake structures, (2) withdraws less than 3 percent of the tidal excursion volume during one complete tidal cycle of ebb and flood of the Saugus River, and (3) is not co-located with other facilities with CWISs such that it contributes to a larger share of withdrawals of the tidal excursion volume. As a result, the Facility appears to closely match the illustrative *de minimis* example presented on page 37 of the pre-publication version preamble. For purposes of this *de minimis* evaluation, GE submits that due to the tidal nature of the Saugus River in the vicinity of the Facility's CWIS, comparison of the Facility's withdrawals to tidal excursion volumes provides a more representative comparison of the Facility's withdrawals than the mean annual flow referenced in the EPA's illustrative example. In addition, the Facility's CWIS impacts are likely substantially less than in EPA's example due to the combination of technologies, management practices, and operational measures already in place or proposed by GE in prior submittals. GE believes that the necessary and proper next step is for EPA to issue a revised draft permit that includes the Regional Director's determination that no additional impingement controls are warranted, consistent with the process requirements set forth in 40 C.F.R. §125.94(c)(11).

Alternatively, if the Regional Director declines to make a *de minimis* determination, then, at a minimum, EPA would need to provide GE with the opportunity to conduct an impingement technology performance optimization study in support of alternative #6 in EPA's Best Technology Available (BTA) standards for impingement mortality, as provided in 40 C.F.R. §125.94(c)(6). As noted in our comments on the draft permit, GE has proposed various operational measures and technologies designed to ensure that any impacts to aquatic populations are minimal (e.g., using variable frequency drives to reduce both intake flows and through-screen velocities). Once optimized and documented, these measures and technologies should be more than adequate to meet the requirements of alternative #6.

Entrainment Mortality Requirements. GE believes that the Facility also qualifies for *de minimis* consideration regarding entrainment mortality. We recognize that EPA has not provided specific regulatory language for *de minimis* entrainment. However, EPA's explanation on page 302 of the pre-publication rule preamble appears to allow for both *de minimis* impingement mortality and entrainment in appropriate cases. Based on the substantial data and information already in the record, GE believes that the Facility presents just such a case.

If EPA disagrees and instead chooses to establish site-specific requirements for entrainment, then, at a minimum, EPA must conduct a thorough evaluation of the factors set forth in 40 C.F.R. §125.98(f)(2) and (3), and then document its determination in the fact sheet of a revised draft permit as provided in 40 C.F.R. §125.98(f)(1). Among other factors directly relevant to the Facility is credit for reductions in flow associated with retirement of units occurring within the past 10 years. As GE has already reported to EPA, the former Gear Plant CWIS was permanently retired in 2011 resulting in a 28.8 MGD reduction (33.5%) in the Facility's current total permitted average monthly CWIS flow (85.8 MGD) and a 54.7 MGD reduction (40.4%) in the Facility's total permitted daily maximum CWIS flow (135.3 MGD). In addition to the retirement of the former Gear Plant CWIS, GE has implemented or committed to undertake reductions in flow at both the Power House and the Test Cell CWIS as explained in Section 11.B of GE's June 2011 draft renewal permit comments. Regarding the Power House, due to reductions in cooling water flow previously realized and GE's proposal for an additional reduction of withdrawals by an average of 20% of the current permitted level annually, GE will reduce the Power House CWIS flow by 51% compared to the design capacity of the Power House condenser cooling pumps. With regard to the Test Cell, in approximately 1991 GE installed a closed-loop recirculating cooling tower system that reduces the Test Cell CWIS intake flow by 1,500 gallons per minute.

<u>Schedule of Compliance.</u> If and when EPA reaches a determination that additional impingement mortality and entrainment requirements are needed (a determination that GE would strongly oppose), EPA would need to provide GE with an opportunity to determine the schedule necessary to achieve compliance "as soon as practicable" and thereafter provide such a schedule in the renewal permit. Needless to say, some of the alternatives presented in the final rule would necessitate major investments in time and capital, and surely could not be implemented overnight. GE believes that EPA must give consideration to whether a schedule of compliance will be needed.

Response to Comment 11.1

In this comment, which GE labels as "Background," the company addresses two things. First, it provides GE's characterization of the evolution or history of EPA's regulatory approach to the application of CWA § 316(b) to NPDES permits. Second, after noting that on April 20, 2011, EPA had published a Proposed Rule applying CWA § 316(b) to existing facilities with cooling water intake structures (CWISs), and further noting that EPA was planning to issue a Final Rule on July 27, 2012, GE asks that EPA, "[g]iven the very short window of uncertainty remaining [with regard to § 316(b) regulations], … either stay this permit renewal proceeding until § 316(b) rule for existing facilities becomes final, or reissue the permit without any new § 316(b) requirements, subject to permit modification when § 316(b) rulemaking is complete." EPA did not agree to stay the permit proceeding and as events have transpired, EPA was not able to issue either the Final Rule or GE's Final Permit by July 27, 2012.

Instead, EPA issued a pre-publication notice of the new Final CWA § 316(b) Rule on May 19, 2014. EPA published the new Final Rule in the Federal Register on August 15, 2014. 79 Fed. Reg. 48300 - 48439 (Aug. 15, 2014) ("Final Regulations to Establish Requirements for Cooling Water Intake Structures at Existing Facilities and Amend Requirements at Phase I Facilities; Final Rule") (the "New CWA § 316(b) Regulations"). The new regulations are not yet in effect, but are scheduled to become effective on October 14, 2014. *See* 79 Fed. Reg. 48300, 48358. While the comment period for GE's Draft Permit had closed on June 1, 2011, GE took the opportunity to review EPA's pre-publication copy of the New CWA § 316(b) Regulations and to submit to EPA additional comments presenting its views about the implications of the new Final Rule for GE's NPDES permit. GE's additional comments were presented in a letter dated July 31, 2014. Although submitted after the close of the comment period, EPA decided to consider and respond to GE's comments in light of the publication of the new regulations. These responses are presented below along with EPA's responses to GE's earlier comments on the Draft Permit.

At the outset, EPA must point out that the New CWA § 316(b) Regulations are not yet in effect and do not apply to GE's new Final Permit as a matter of law. *See* 40 C.F.R. § 122.43(b). Thus, the Final Permit's CWA § 316(b)-based requirements have been developed by EPA based on a BPJ determination of the facility-specific BTA. This is consistent with both the existing 40 C.F.R. § 125.90(b),[57] which currently remains in effect, and the new 40 C.F.R. § 125.94(a)(2), 79 Fed. Reg. 48433, which calls for the continued BPJ determinations of the BTA for permits issued prior to the new Rule's effective date of October 14, 2014, and provides as follows:

> (2) Prior to *October 14, 2014,* the owner or operator of an existing facility with a cumulative design intake flow (DIF) greater than 2 mgd is subject to site-specific impingement mortality and entrainment requirements as determined by the Director on a case-by-case Best Professional Judgment basis. The Director's BTA determination may be based on consideration of some or all of the factors at § 125.98(f)(2) and (3) and the requirements of § 125.94(c). If the Director requires additional information to make the decision on what BTA requirements to include in the applicant's permit for impingement mortality and entrainment, the Director should consider whether to require any of the information at 40 C.F.R. 122.21(r).

Thus, it is clear that EPA intends that permits should continue to be issued prior to the new regulations becoming effective, and that such permits should include CWIS requirements based on a BPJ determination of the BTA. *See also* 79 Fed. Reg. 48358 ("… in the case of permit proceedings begun prior to the effective date of today's rule, and issued prior to July 14, 2018, the Director should proceed. See §§ 125.95(a)(2) and 125.98(g).").

In this case, EPA issued GE's Draft Permit prior to the April 2011 issuance of the new Proposed CWA § 316(b) Rule and, as explained in the Fact Sheet for the Draft Permit, the Agency determined the applicable BTA on a site-specific BPJ basis under 40 C.F.R. § 125.90(b). For the Final Permit, EPA has finalized its BTA determination on a BPJ basis after consideration of public comments. Even prior to publication of the New CWA § 316(b) Regulations, EPA's existing analysis had, in effect, considered the substance of many or all of the factors set forth in the new 40 C.F.R. § 125.98(f)(2) and (3) and many of the compliance options set forth in the new 40 C.F.R. § 125.94(c). In finalizing its BPJ determination and responding to comments for this Final Permit, EPA has given due consideration to all of these factors and requirements, although whether and how to do so is left to the Agency's discretion under the new 40 C.F.R. 125.94(a)(2), as spelled out above.[58] Finally, EPA's BPJ determination is based on substantial

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[57] EPA notes that the New CWA § 316(b) Regulations, once they take effect, will amend 40 C.F.R. § 125.90(b) to require BPJ determinations of the BTA for facilities not covered by either new or existing regulatory standards. 79 Fed. Reg. 48430.

[58] With regard to the factors in the new § 125.94(f)(2), as the record plainly indicates, EPA considered the "numbers and types of organisms entrained," "impact of changes in particulate emissions or other pollutants associated with entrainment technologies," "land availability," and "quantified and qualitative social benefits and costs of available entrainment technologies when such information on both benefits and costs is of sufficient rigor to make a decision." 79 Fed. Reg. 48438 (40 C.F.R. § 125.98(f)(2)(i), (ii), (iii), and (v)). In addition, with regard to emissions of particulate matter and other pollutants, it should be noted that EPA's consideration was focused primarily on the issue of salt drift with regard to the possibility of using cooling towers. Using cooling towers at GE would not, in

information gathered from GE and other sources over a period of years and EPA does not require additional information, including any additional information specified under 40 C.F.R. § 122.21(r), to make its final BTA determination regarding the control of impingement mortality or entrainment for GE's Final Permit.

EPA further points out that in the case of a final permit issued after October 14, 2014, as part of an ongoing permit proceeding, the Agency can proceed to final permitting in much the same manner as discussed above for permits finalized before October 14, 2014. Thus, the new 40 C.F.R. § 125.98(g), 79 Fed. Reg. 48438-48439, further provides as follows:

> (g) *Ongoing permitting proceedings.* In the case of permit proceedings begun prior to October 14, 2014 whenever the Director has determined that the information already submitted by the owner or operator of the facility is sufficient, the Director may proceed with a determination of BTA standards for impingement mortality and entrainment without requiring the owner or operator of the facility to submit the information required in 40 C.F.R. 122.21(r). The Director's BTA determination may be based on some or all of the factors in paragraphs (f)(2) and (3) of this section and the BTA standards for impingement mortality at § 125.95(c). In making the decision on whether to require additional information from the applicant, and what BTA requirements to include in the

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EPA's view based on existing information, pose other significant issues the emission of particulates or other pollutants in light of the relatively small size of the power plant to be affected. Furthermore, the BTA selected by EPA, which entails a combination of steps including the use of VFDs and wedgewire screens rather than cooling towers, does not raise issues concerning the emission of particulates or other pollutants. EPA's has also considered the issue of the remaining useful plant life, *id.* (40 C.F.R. § 125.98(f)(iv)), in the sense that there is no indication that GE has any present intention or plan to close the generating units that utilize the cooling water intake structures on the grounds that they have a limited remaining useful life. Moreover, GE has not made any significant recent improvements to the cooling water intake structures for which a major investment has been made by the company that EPA ought to consider.

Turning to the factors set forth in the new 40 C.F.R. § 125.98(f)(3), EPA's analysis again, in effect, has considered the substance of these factors, including "(i) entrainment impacts on the water body; (ii) thermal discharge impacts; (iii) credit for reductions in flow associated with the retirement of units occurring within the ten years preceding October 14, 2014; (iv) impacts on the reliability of energy delivery within the immediate area; (v) impacts on water consumption; and (vi) availability of process water, gray water, waste water, reclaimed water, or other waters of appropriate quantity and quality for reuse as cooling water." 79 Fed. Reg. 48438. Additionally, EPA notes here that it does not expect any significant impact on energy delivery in the immediate area (or at GE, in particular) from making improvements at GE's cooling water intake structures because the cooling system changes under consideration will not preclude future energy production, installation of any new equipment (e.g., wedgewire screens, VFDs, or cooling towers) could potentially be accomplished without outages of any significance, *see Clean Water Act Permitting Determinations for Thermal Discharge and Cooling Water Intake from Brayton Point Station in Somerset, MA* (July 22, 2002), p. 7-56 (accessible at http://www.epa.gov/region1/braytonpoint/pdfs/BRAYTONchapters7-8.PDF), any outages that were needed to install new equipment could be timed to avoid disruptions at GE, and GE is not a major power supplier to the grid at large. Finally, EPA does not regard consumptive water use concerns to be a significant issue for the GE BTA determination. The preferred options will not increase any consumptive water use, and the cooling tower option could result in a small amount of evaporative water loss, but any such losses would be inconsequential in the tidal environment around GE.

> applicant's permit for impingement mortality and site-specific entrainment, the Director should consider whether any of the information at 40 C.F.R. 122.21(r) is necessary.

Thus, the new regulations again make clear that EPA does not intend that ongoing permit proceedings be required to backtrack and go through the full process set out by the new regulations. *See* 79 Fed. Reg. 48358 ("… in the case of permit proceedings begun prior to the effective date of today's rule, and issued prior to July 14, 2018, the Director should proceed. See §§ 125.95(a)(2) and 125.98(g)."). As appropriate, the procedures of the new regulations will be applied in such cases in future permit renewal proceedings.

In any event, as demonstrated below, EPA's Final Permit is consistent with the New CWA § 316(b) Regulations, even though they do not constitute "applicable requirements" for GE's Final Permit. *See* 40 C.F.R. § 122.43(b).

The first part of GE's initial comments presents the company's characterization of the evolution or history of EPA's regulatory approach to the application of CWA § 316(b) to NPDES permits, as well as GE's interpretation of certain of the policies and regulations that make up that history. In this comment, GE discusses these subjects largely in a "generic" sense, without addressing how they apply specifically to the GE permit. With regard to this generic discussion, EPA agrees with some of it and disagrees with some of it. (EPA discussed this regulatory background in the Fact Sheet at p. 27 and Att. J, pp. 3 – 4.) It is unnecessary, however, for the Agency to respond directly to GE's generic discussion of § 316(b) law, regulation and policy, especially with regard to its characterization of regulations that are no longer in effect (*e.g.*, the Phase II and Phase III CWA § 316(b) regulations). Regulations that are no longer in effect are not determinative of the decisions that presently need to be made regarding GE's permit. Therefore, EPA will respond to GE's characterization of the law and policy only to the extent that it applies to the GE permit.

One place that GE connects these general comments to the GE permit is where it states that for EPA's 2011 Proposed Rule applying CWA §316(b) to existing facilities, the Agency presumed that facilities withdrawing less than 125 million gallons per day (MGD) from a water body, "like the Facility, are presumed to present far less risk and thus to warrant less onerous evaluation and regulation." EPA disagrees with GE's suggestion that the Proposed Rule creates a presumption that facilities that withdraw less that 125 MGD, such as GE, present "far less risk and thus … warrant less onerous evaluation and regulation."

In EPA's view, the New CWA § 316(b) Regulations create an *appropriate* (not "onerous") scheme for developing the information needed to support decision-making about the requirements to be applied at individual facilities to reduce the adverse environmental effects of cooling water intake structures on public natural resources, as required by the Clean Water Act. In addition, neither the Proposed Rule nor the Final Rule indicate that less stringent technological requirements should necessarily be applied to facilities that withdraw less than 125 MGD of water for cooling. With regard to reducing impingement mortality, the Rule specifies various measures that apply for all facilities that withdraw more than 2 MGD. *See* 79 Fed. Reg. 48433 (40 C.F.R. §§ 125.94(a), With regard to reducing entrainment, the Rule calls for a case-by-case determination of the Best Technology Available (BTA) at each facility.[59] While the Final Rule does specify more involved information submission requirements for facilities withdrawing more than 125 MGD, it does not mandate relaxed BTA requirements for facilities with smaller water withdrawal rates.[60] In fact, the preamble to the Final Rule specifically rejects the notion raised in some public comments that facilities withdrawing less than this threshold are not causing adverse environmental impacts.[61]

While EPA agrees that all other things being equal, a facility that withdraws less water is likely to kill and injure fewer aquatic organisms from impingement and entrainment, under certain circumstances, even smaller plants can impose serious adverse effects. For example, a facility with a cooling water intake structure located in a particularly sensitive ecosystem (e.g., a spawning and/or nursery area) could cause serious harm even if it withdraws a relatively smaller volume of water. Similarly, a facility with a relatively smaller withdrawal volume could contribute to serious adverse effects if located on a water body already being impacted by other

[59] With regard to closed-cycle cooling, GE's comment emphasizes that EPA did not find that technology to be the BTA on an industrial category-wide basis in the 2014 Final Rule, the 2011 Proposed Rule, or the 2004, but later-withdrawn, Phase II Rule. Yet, EPA has consistently recognized that closed-cycle cooling is likely to be the best performing technology for reducing entrainment and impingement mortality, and nothing in the Rule prevents closed-cycle cooling from being selected as the BTA at GE, or any other facility, on a case-by-case, BPJ basis depending on the results of the required case-by-case analyses. The Agency has recognized that closed-cycle cooling might be the appropriate BTA for some facilities. With regard to the GE permit, EPA found that closed-cycle cooling would be the best performing technology for reducing entrainment and impingement mortality at GE, *see* Fact Sheet, Att. J, p. 23, but did not mandate it as the BTA at the facility for other reasons. *Id.* at pp. 38-40. EPA did, however, include a condition in the Draft Permit making it clear that if GE were to *choose* to install closed-cycle cooling, it would be in compliance with the permit. *See id.* at p. 40; Fact Sheet at p. 85; Draft Permit § I.C.2.b.b. This condition makes sense because even better environmental performance would be achieved with closed-cycle cooling than with the combination of technologies EPA determined to be the minimum BTA for this facility, and no countervailing adverse environmental or energy impact has been identified that would lead EPA to reject closed-cycle cooling as a possible BTA at GE. EPA has modified this condition for the Final Permit (Part I.C.3) to be clear to authorize, but not require, closed-cycle cooling to minimize impingement and entrainment at the Power Plant CWIS. *See* Response to Comment 11.7.

[60] In the preamble to the Final Rule, EPA explained its decision about the information submission requirements as follows:

> EPA has selected an administrative threshold of 125 MGD AIF for the submission of the entrainment study because this threshold will capture 90 percent of the actual flows but will apply to only 30 percent of existing facilities. Further, based on EPA's data there are no closed-cycle recirculating systems in use above this threshold. The 125 MGD threshold will significantly limit facility burden at more than two-thirds of the potentially affected facilities while focusing the Director on major cooling water withdrawals.

79 Fed. Reg. 48309-48310 (August 15, 2014) (Final Rule).

[61] The preamble to the Final Rule states:

> Contrary to a number of public comments, however, EPA is not implying or concluding that the 125 MGD threshold is an indicator that facilities withdrawing less than 125 MGD are 1) not causing any adverse impacts or 2) automatically qualify as meeting BTA. In other words, the threshold, while justified on a technical basis, does not result in exemptions from the rule.

79 Fed. Reg. 48310 (August 15, 2014).

cooling water intake structures.[62] The Final Rule's requirement for a case-by-case determination of the BTA for entrainment mortality allows these types of site-specific factors to be considered.

EPA now turns to the second part of GE's comment and to the comments from the July 31, 2014 letter regarding how to proceed with the permit reissuance in light of the Final Rule. In its letter submitted July 31, 2014, GE comments that it would be premature for EPA to attempt to implement the Final Rule in the pending permit re-issuance proceeding, but argues that if EPA proceeds with a BTA determination, then the Agency must publish the determination in a revised draft permit for public review and comment. Since GE's comments on the pre-publication notice, the Final Rule was published in the Federal Register and will become effective on October 14, 2014. *See* 79 Fed. Reg. 48300 (August 15, 2014). The Final Rule establishes requirements for cooling water intake structures at existing facilities with design intake flows greater than 2 MGD and which use 25% or more of the intake water for cooling purposes, which includes GE.

EPA disagrees with GE's comments that the Agency should further delay, or should have further delayed, permit issuance until new CWA § 316(b) regulations are finalized. First, the new regulations *are* now finalized and an effective date has been set. Second, as discussed above, the Final Rule speaks directly to the issue of permits issued prior to the Rule's effective date and indicates that permitting should proceed and that BTA determinations should be made on a BPJ basis. Third, EPA is not, and has not been, prepared to purposefully delay the permit because in addition to the permit's cooling water intake structure (CWIS) requirements, there are also other important aspects of the NPDES permit that EPA does not believe should be delayed. For example, EPA believes that it is important to develop and put into effect new permit requirements for, among other things, GE's thermal discharges and drainage system outfall discharges. These issues are discussed in great detail in the Fact Sheet for the Draft Permit and in these Responses to Comments. Finally, EPA will not delay the permit until the regulations become effective because, as discussed above, the regulations indicate that permitting should proceed and indicate how to do so. Further, EPA must point out that delaying a permit to follow detailed procedures set forth in new regulations can be a mistake because the new regulations can themselves ultimately be delayed and derailed as a result of litigation. Indeed, this is what happened with the Phase II and Phase III § 316(b) regulations that EPA issued in 2004 and 2006 to address existing facilities. *See* 40 C.F.R. Part 125, Subparts J and N (no longer in effect, except for 40 C.F.R. § 125.90(b)). EPA notes that, as of this writing, multiple petitions challenging the New CWA § 316(b) Regulations have already been filed.

EPA also must reject GE's suggestion that the Agency could issue the permit by simply leaving the CWA § 316(b) requirements unchanged and then modify the requirements, as needed, to make them consistent with the Final Rule after it becomes effective. EPA understands GE to be proposing that the Agency leave the 316(b) requirements "as is," and issue the permit without conducting a BPJ analysis applying CWA § 316(b)'s requirements in light of any new facts. This would be contrary to both the New CWA § 316(b) Regulations, as discussed above, and pre-existing law, regulations and policy statements cited above. *See* 79 Fed. Reg. 48358, 48369,

[62] Indeed, both GE's and Wheelabrator's cooling water intake structures take water from the same segment of the Saugus River, within the bounds of the Rumney Marshes ACEC, for their industrial cooling uses. These facts may be considered by EPA when determining the BTA for these facilities on a BPJ basis.

48433, and 48437. *See also* 33 U.S.C. § 1342(a)(1)(B); 40 C.F.R. §§ 122.43(a) and (b)(1) and 125.90(b); 72 Fed. Reg. 37107, 37108 (July 9, 2007) (notice suspending the Phase II Rule and indicating that CWA § 316(b) should be applied on BPJ basis until new regulations are in effect). The CWA limits NPDES permit terms to five years, 33 U.S.C. § 1342(b)(1)(B), and intends that permit terms be re-considered, and not simply "rolled over," as part of developing a new permit. Certainly, permit requirements need not necessarily be changed in a new permit, but the decision about those requirements should be based on an updated analysis in light of current facts and law.

GE comments that "where the reissuance proceeding is already underway, the final 316(b) Rule contemplates that the permitting authority will wait at least one permit cycle before imposing substantive impingement mortality and entrainment requirements and will use the intervening time to gather all of the information necessary to make an informed determination about whether and how those requirements should be imposed." Based on the discussion presented above, EPA disagrees with GE's interpretation of how ongoing permit proceedings should (or must) be handled under the New CWA § 316(b) Regulations. The Final Rule at 40 C.F.R. 125.98(g) specifically authorizes EPA to proceed with a determination of BTA standards based on available information where permit proceedings have begun prior to the effective date of the Final Rule. GE's permit reissuance clearly falls under this category. In this case, and as discussed above, the CWIS information submitted by GE in response to EPA's October 25, 2007 Section 308 request for more information and the biological studies conducted by MRI are sufficient for a BTA determination, and additional information under 40 C.F.R. § 122.21(r) is not required. In addition, EPA's proposed BTA determination provided with the Draft Permit (see Attachment J to the Fact Sheet) considered many of the factors specified in §125.98(f)(2) and (3), including but not limited to the number and types of organism entrained and the quantified and qualitative benefits and costs of available entrainment technologies, and provided GE a reasonable opportunity to comment to the Agency on the relevant issues.

In addition to its comments on implementation of the Final Rule, to which EPA has responded above, GE submitted a number of comments on what requirements should be included as BTA in the Final Permit. EPA considers and responds to these comments below.

Impingement Mortality Requirements: GE comments that the facility qualifies for the "de minimis rate of impingement" provision in the Final Rule at 40 C.F.R. § 125.94(c)(11). EPA does not agree. The preamble to the Final Rule at 79 Fed. Reg. 48309 states that:

> … some low flow facilities that withdraw a small proportion of mean annual flow of a river may warrant special consideration by the Director. As an illustration, if a facility withdraws less than 50 MGD AIF, withdraws less than 5% of mean annual flow of the river on which it is located (if on a river or stream), and is not co-located with other facilities CWISs such that it contributes to a larger share of mean annual flow, the Director may determine that the facility is a candidate for consideration under the de minimis provision contained at 125.94(c)(11).

EPA acknowledges that GE's actual intake flow is not more than 31 MGD (though the cumulative permitted flow from both CWISs is 80.9 MGD) and that GE's CWISs withdraw less than 3% of the tidal excursion volume. In fact, EPA considered that the Test Cell CWIS (permitted at 45 MGD) runs infrequently when determining the permit requirements for the Final Permit (see Response to Comment 11.2). Still, contrary to GE's statement, the facility is "co-located" with another CWIS. Wheelabrator Saugus (NDPES Permit No. MA0028193) is located on the opposite bank of the Saugus River approximately 400 feet upstream from the Test Cell CWIS and 900 feet upstream from the Power Plant CWIS. This facility's CWIS also runs year-round and is permitted at a maximum intake up to 60 MGD. Moreover, both facilities withdraw from the Saugus River, which is designated as an Outstanding Resource Water (ORW) and is part of the Rumney Marsh Area of Critical Environmental Concern (ACEC). Furthermore, GE's CWISs cause significant impingement effects, as discussed below in the Response to Comment 11.5. For these reasons, EPA has determined that the facility should not be considered under the de minimis provision of the Final Rule.

EPA disagrees with GE's comment that the facility needs the opportunity to conduct an impingement technology performance optimization study prior to the establishment of BTA requirements in the Final Permit. As explained above, EPA is proceeding with a case-by-case, BPJ-based BTA determination for minimizing impingement mortality. Having said that, EPA also believes that the impingement mortality requirements in the Final Permit at Part I.C are consistent with the Final Rule.

The Final Permit requirements for entrainment at the Power Plant CWIS require installation and operation of fine-mesh wedgewire screens with a design intake velocity of 0.5 fps or less. This design intake velocity qualifies as one of the possible "pre-approved" BTA options for impingement mortality under 125.94(c)(2). In compliance with the impingement mortality alternative under the Final Rule, the permittee must demonstrate that the maximum design intake velocity as water passes through the structural components of a screen measured perpendicular to the screen mesh does not exceed 0.5 fps under all conditions, including during minimum ambient source water surface elevations and during periods of maximum head loss across the screen during normal operation of the intake structure. See 40 C.F.R 125.94(c)(2). In addition, the Final Rule requires that facilities conduct visual inspections or employ remote monitoring devices weekly to ensure that any technologies operated to comply with 125.94 are maintained and operated to function as designed. See 40 C.F.R. § 125.96(e). The impingement monitoring requirements in Part I.D.1 of GE's Final Permit are consistent with the Final Rule and require no additional biological monitoring.

The Final Permit requirements to reduce impingement mortality at the Test Cell CWIS include installation and operation of a new fish return trough. EPA believes that the BTA at the Test Cell is a combination of the existing traveling screens, upgraded fish return trough, and the low annual withdrawal and intermittent use of this CWIS. The Fact Sheet states that the capacity utilization of the Test Cell is about 300 hours per year and has ranged from 5% to 8%. Given the intermittent usage of this CWIS, EPA determined that upgrading the fish return trough would be sufficient to minimize impingement mortality. This BTA determination is consistent with 40 C.F.R 25.94(c)(6) ("Systems of technologies as the BTA for impingement mortality"). In addition, the monitoring requirements for the Test Cell at Part I.D.1.b of the Final Permit are consistent with the impingement technology performance optimization study under 40 C.F.R. §

122.21(r)(6)(ii) and will confirm that, combined with the intermittent use and low annual withdrawals, the new fish return trough is optimized to minimize impingement mortality.

Entrainment: GE also comments that the facility qualifies for de minimis consideration regarding entrainment mortality. EPA agrees with GE that the Final Rule allows, in effect, for a "de minimis" determination for entrainment in that, through a case-by-case, BPJ-based determination, the Director may determine that no additional control requirements are necessary beyond what the facility is already doing.[63] See 40 C.F.R. § 125.98(f)(4). However, in this case, given the number of organisms entrained, the cumulative impacts of Wheelabrator Saugus' CWIS, and because the source waterbody is both an ORW and ACEC, EPA has determined that entrainment impacts at GE are not de minimis. *See* Response to Comment 11.5, below.

GE comments that, should EPA establish site-specific requirements for entrainment, then EPA must conduct a thorough evaluation of the factors set forth in 40 C.F.R §125.98(f)(2) and (3), and then document its determination in the fact sheet of a revised draft permit as provided in 40 C.F.R. § 125.98(f)(1). EPA has already responded to this comment above.

Finally, GE comments that, under the Final Rule, EPA must consider credit for reductions in flow associated with the Test Cell and Power Plant CWISs, as well as the retirement of the Gear Plant. According to GE, credit for reductions in flow associated with retirement of units occurring within the past 10 years is directly relevant to the Facility because the Gear Plant was permanently retired in 2011. First, EPA considered flow reductions at both the Test Cell (by limiting average monthly flow during peak entrainment periods) and the Power Plant (through the operation of variable frequency drives) as part of its BTA determination for entrainment. *See* Attachment J of the Fact Sheet and Response to Comment 11.9. Second, while EPA agrees that, in 40 C.F.R. § 122.21(r)(8) under the Final Rule, EPA would consider the operational status of each unit, including schedules for decommissioning and retirements when making a case-by-case BTA determination for entrainment, EPA's final BTA determination for GE has been completed before the effective date of the new regulations. That being said, EPA has understood that the Gear Plant has been retired and taken that into account in its overall BTA determination. Yet, in EPA's view, the retirement of the Gear Plant does not obviate or reduce the need for the BTA measures to address GE's remaining cooling water withdrawals. EPA notes that the Gear Plant CWIS has actually not been in use for more than 10 years (since 2002) and, therefore, EPA's analysis of adverse environmental impact did not consider impingement or entrainment impacts from this unit (See Attachment J). In other words, EPA never considered the Gear Plant CWIS in its evaluation, either in terms of its adverse impacts or the environmental benefit from its retirement because the CWIS has essentially been decommissioned for more than a decade. EPA's BTA determination for GE was based on the adverse impacts, requirements, and available technologies for each individual CWIS and the Gear Plant, because it was idle and scheduled to be retired, was not considered.

Schedule of Compliance: EPA discusses schedules for compliance in additional detail in its Response to Comment 14, below. Here GE comments that EPA would need to provide GE with

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[63] In the preamble to the Final Rule EPA specifies "Since the entrainment requirements are already determined by the Director for each site, EPA concluded that specific regulatory language for de minimis entrainment was unnecessary." See 79 Fed. Reg. 48372.

an opportunity to determine the schedule necessary to achieve compliance with any impingement mortality and entrainment reduction requirements in the Final Permit. Yet, GE has already been provided that opportunity and, in fact, has supplied a compliance schedule to achieve compliance "as soon as practicable." In its review of the Draft Permit, GE commented on achieving compliance with the proposed BTA requirements for the Power Plant and Test Cell CWISs and submitted a proposed compliance schedule as Technical Exhibit 22. EPA has incorporated GE's proposed compliance schedule into the Final Permit for the Power Plant CWIS requirements.[64] The compliance schedule in Technical Exhibit 22 also includes upgrading the Test Cell CWIS with new fish buckets, a low pressure spraywash, and new fish return trough. EPA has also incorporated this compliance schedule into the Final Permit for the Test Cell CWIS requirements, which EPA notes have been reduced for the Final Permit to require only the installation of a new fish return trough.

Moving forward with GE's Final Permit based on the Agency's site-specific, BPJ-based BTA determination is consistent with existing legal requirements, as well as consistent with the terms of the New CWA § 316(b) Regulations, which are not yet in effect. EPA also notes that it presented a detailed BTA determination for the Draft Permit and that not only did GE comment on it extensively, but EPA carefully considered GE's comments and, in some cases, made the Final Permit's requirements less stringent in response to GE's comments (see responses to comments below). In no case, are there new, more stringent requirements included in the Final Permit under CWA § 316(b). Therefore, EPA is proceeding with its final BTA determination and sees no reason to publish a revised draft permit for additional public review and comment.

Comment 11.2: GE's Proposed Operational Measures.

Operational measures for the Power Plant CWIS.

Although GE does not believe that impingement and entrainment losses caused by the existing CWIS are sufficient to result in "adverse environmental impact" to the aquatic populations in the Saugus River, GE nevertheless has volunteered to pursue operational measures to reduce losses. In the Cooling Water Intake Structure Information Document (CH2M HILL, 2008), GE proposed operational measures for reducing cooling water flow. These measures would consist of operating the seawater pumps and condenser cooling water pumps with variable-frequency drives (VFDs) to reduce intake flow by an estimated average of 20 percent over the course of a year. The VFDs also would reduce through-screen velocities to 0.5 fps or less, on average, when they are operating. These operational measures would substantially reduce both the impingement and entrainment of fish at the Power Plant CWIS.

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[64] EPA notes that it added additional time for data collection to GE's schedule to take site preparation dates into account, and added some additional specifics to milestones in the schedule. EPA also notes that GE failed in its comments to take the opportunity to provide a specific schedule for installation of the Variable Frequency Drives (VFDs) that will be used to help reduce water withdrawal volumes. As a result, EPA has written the Final Permit's compliance schedule to call for the VFDs to be installed as soon as practicable, consistent with the applicable legal deadline. *See* Response to Comment 14, below. It is EPA's view that installation of the VFDs should be able to be completed no later than 12 months from the effective date of the permit based on experience at other facilities. *See In the Matter of the University of Massachusetts Boston, "Findings and Consented To Order for Compliance"* (Docket No. CWA-01-2013-0034).

As demonstrated by the site-specific impingement monitoring study (MRI, 1997), the existing fish collection and return system for the Power Plant CWIS already is highly effective in minimizing impingement mortality. The addition of operational measures that would allow the facility to reduce flows when conditions permit, thereby reducing through-screen velocities at the same time, would reduce the potential for both entrainment and impingement by a substantial amount.

As for entrainment, the Power Plant already has reduced its cooling water flow by 39%, compared to the total design capacity of the six condenser cooling pumps of 58.3 MGD. By instituting operational measures to reduce the total volume of water withdrawn annually by the Power Plant by an average of 20 % of the current permitted level annually, the Power Plant will in effect have reduced its flow by 51%, compared to the design capacity of its condenser cooling pumps. Moreover, by permanently retiring the Gear Plant CWIS, which has a current maximum daily discharge flow limit of 54.7 MGD, GE has committed to reducing total facility flow by as much as 46 % from currently permitted levels.[65] In short, the overall facility reduction in entrainment would be substantial, further minimizing any potential for adverse environmental impacts to the Saugus River estuary and its commercial and recreational fisheries resources. These operational and facility flow reduction measures offer the most practical and cost-effective combination of options constituting BTA for minimizing adverse environmental effects of entrainment.

These proposed operational measures are subject to one important caveat: their feasibility is based on continuation of the facility's current permitted thermal discharge limit of 95ºF. GE has not had an opportunity to evaluate the technical feasibility, process changes, and costs associated with requirements both to reduce cooling water flow by 20% on average and meet a reduced thermal discharge limit of 90ºF, as EPA has proposed. The record shows that EPA has not performed such an evaluation. Thus, before imposing requirements for annual average flow reductions achieved by using VFDs and lower thermal limits, EPA would need to determine, or provide GE an opportunity to determine, whether such reductions are technically and economically feasible.

Operational Measures for the Test Cell CWIS.

For the Test Cell CWIS, GE proposes a combination of operational measures and technology improvements as BTA for minimizing adverse environmental impact. The current infrequent, seasonal operation of the Test Cell reduces the potential for adverse environmental effects of fish entrainment and impingement at the Test Cell CWIS. GE believes that the most reasonable and cost-effective options for minimizing adverse impacts at the Test Cell CWIS would include operating the newly constructed closed-loop recirculating cooling tower to eliminate the use of

[65] Notably, EPA determined in the Final NPDES Permit for the Wheelabrator Saugus facility across the Saugus River that 28 percent flow reduction from its previously permitted levels from October 1 to May 31 (60 MGD to 43.2 MGD) minimized potential adverse impacts from entrainment and constituted BTA at that facility. It reached this conclusion even though the Wheelabrator Saugus CWIS is much closer to the shallow marsh nursery habitats of the Rumney Marshes Area of Critical Environmental Concern (ACEC) than the GE Power Plant CWIS.

spray pump water for minor cooling purposes and replacing and improving the existing debris/fish return system.

The newly installed closed-loop recirculating cooling tower system reduces intake flow by 1,500 gpm, incrementally reducing further fish entrainment as a result of seasonal Test Cell operation. GE also proposes to replace the existing debris/fish return system to improve the survival of impinged fish and prevent their entrapment as they are collected and transported back to the river. This proposal would include spray wash modifications, provisions for conveyance of water, a new return pipe, and pipe supports in the river to enable the safe return of fish at low tide, as evaluated in the Cooling Water Intake Structure Information Document (CH2M HILL, 2008). The new return trough would avoid high elevation drops and 90-degree turns to the extent practical in consideration of site-specific space constraints.

Response to Comment 11.2

GE's comment presents the company's views regarding the operational and equipment modifications which, when joined with certain existing equipment and practices, it believes would satisfy CWA § 316(b)'s BTA requirements for reducing entrainment and impingement mortality at both the Power Plant and the Test Cell.[66]

<u>Power Plant</u>

Impingement Mortality Reduction. To begin with, EPA agrees that high initial survival of impinged individuals of the numerically dominant species was observed during the limited MRI study (1997) with continuous operation of the Power Plant's traveling screen and fish return system. In its comment, GE proposes to reduce impingement mortality by installing variable frequency drives (VFDs) for its Power Plant intake water pumps in order to reduce the volume of water withdrawals from the Saugus River by an average of 20% and reduce the through-screen velocity at the Power Plant to no greater than 0.5 fps. EPA agrees that these steps should help to minimize impingement mortality. When less water is withdrawn, fewer fish (or other aquatic organisms) should be drawn against the intake screens. Moreover, with a through-screen velocity of 0.5 fps or less, most species of fish should be able to swim away from the intake and avoid becoming impinged. See Fact Sheet p. 19.

[66] GE also mentions the permanent retirement of the Gear Plant and the termination of its cooling water intake withdrawals as part of the overall reduction in intake flows at the facility as compared to permitted levels which it argues collectively constitute the BTA. Consistent with GE's retirement of the Gear Plant, EPA's Draft Permit did not, and EPA's Final Permit does not, authorize cooling water withdrawals or pollutant discharges by the Gear Plant portion of GE's facility. *See* Fact Sheet at pp. 5, 16, 74. Moreover, EPA has not regarded the termination in Gear Plant withdrawals as somehow offsetting the amount of adverse impact reduction needed at the Power Plant or Test Cell. As EPA explained in the Fact Sheet, the Gear Plant has not operated in more than 10 years and GE had already planned its retirement quite apart from this permit proceeding. *Id. See also* Fact Sheet, Att. J at p. 17. Therefore, the BTA requirements for the Power Plant and Test Cell were determined based on the facts related to those facilities without consideration of the closure of the Gear Plant.

Thus, EPA agrees that a low through-screen velocity, coupled with the current operation of the traveling screen and fish return system, would satisfy the requirements of Section 316(b) for minimizing impingement at the Power Plant.

Entrainment Reduction. EPA chose to compare the reduction in entrainment by potential changes at GE to a baseline at the currently permitted flow rate, rather than at design flow rates, since the facility has not operated at the design flow at least since the current permit was issued in 1993. As a result, using the permitted flow levels provides a more meaningful comparison, while the design flow rates would provide at most a hypothetical point of comparison. EPA agrees that installing and operating VFDs to reduce intake flow at the Power Plant by 20% on an average monthly basis, as compared to the current permitted flow, will reduce entrainment mortality from current levels. All things being equal, a reduction in intake flow is reasonably assumed to yield a proportional reduction in entrainment. This may not be the case, however, for systems that experience strong seasonality in entrainment (such as the Saugus River) if periods when flow is reduced do not coincide with periods of peak ichthyoplankton density. In other words, GE's proposal to reduce the total volume of water withdrawn by the Power Plant by an average of 20% of the current permitted level *annually* may not result in a 20% annual reduction in entrainment if lesser flow reductions occur during periods of peak entrainment.

Although GE's comment complains that EPA did not adequately consider the interaction of intake flow limits and thermal discharge restrictions, EPA did consider this interaction in its work on the Draft Permit (just as it did for the Wheelabrator permit, as GE notes). Moreover, EPA has further considered this interaction in light of GE's comments and after reviewing additional analysis requested by EPA and provided by GE after the close of the public comment period. The interaction between limits on intake flow and thermal discharges is discussed above in responses to comments regarding the Final Permit's thermal discharges limits (see Response to Comment 10.3.2).

After considering the issues raised in GE's comments, EPA has adjusted the requirements for the Final Permit by allowing thermal discharges of up to 95ºF year-round. (Again, this is discussed in detail in above responses to comments regarding the permit's thermal discharge limits.)

EPA's evaluation of the BTA for the Power Plant looks beyond the flow reductions to be provided by the VFDs. Section 316(b) of the Clean Water Act directs EPA to set permit requirements based on the best technology available to minimize adverse environmental impacts, not, as GE comments, the "most practical and cost-effective," though these factors may be considered. For GE's Power Plant, VFD flow reductions will reduce entrainment, but they are not the only available, nor necessarily the best, technology for doing so. EPA determined that the combination of a flow reduction with variable frequency drives *and* the operation of fine-mesh wedgewire screens is the best available option to minimize entrainment at the Power Plant. Both technologies are available and will minimize adverse impacts by reducing entrainment more in combination than either technology would independently. *See* Response to Comment 11.8 for discussion of the availability of wedgewire screens. The estimated percentages of entrainment reduction achievable for these technologies are discussed in Attachment J (p. 39) to the Fact Sheet for the Draft Permit.[67]

Test Cell

Impingement Mortality Reduction. EPA agrees that, as GE proposes, operating the closed-loop cooling tower and improving the fish return system are two components of BTA for the Test Cell. *See* Response to Comment 11.9. Operating the cooling tower will replace the 1,500 gpm cooling water volume previously supplied by the spraywash pump, which equates to about 5% of the maximum daily flow limit of 45 MGD. GE maintains that the entrainment potential from this cooling water intake structure is also minimized in light of the infrequent, seasonal operation of the Test Cell. According to GE, the Test Cell, with operation of the cooling tower, has a 5% capacity utilization rate, which EPA agrees reduces the potential for adverse environmental effects and should be a consideration in the BTA determination. However, without an enforceable flow limit during the peak entrainment season, the Test Cell is not prohibited from operating at higher flows inconsistent with minimizing the potential for entrainment. If the Test Cell were to operate at maximum permitted flows when ichthyoplankton density is greatest, adverse impacts could be on par with the Power Plant. In other words, EPA considered the generally low operational capacity of the Test Cell as a factor in minimizing adverse impacts from entrainment, but believes that it is not a valid component of BTA if it is not enforceable. The Draft Permit proposed a more stringent average monthly flow limitation at the Test Cell during peak entrainment season to assure that adverse impacts from entrainment are reduced. See Response to Comment 11.9 for GE's comments and EPA's response to the seasonal flow limit at the Test Cell.

Comment 11.3: EPA's Proposed BTA Determination.

Overview of EPA's Approach.

EPA says that it has concluded that "the current location, design, construction, and capacity of the Power Plant's CWIS do not reflect the BTA for minimizing adverse environmental impact." Fact Sheet, Attachment J, p. 38. The Agency apparently based this conclusion on its evaluation of (1) current levels of entrainment and impingement; (2) the Power Plant's existing CWIS technology; and (3) the availability of other technologies capable of reducing impingement and entrainment. *Id.* Having concluded that the existing Power Plant CWIS is not BTA, the Agency selected a combination of variable frequency drives (which GE had proposed to install on the two condenser cooling water pumps not already so equipped) and installation of fine mesh wedgewire screens.

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[67] Specifically, EPA stated:

> EPA concludes that the VFD option would achieve some benefit of significance at very little cost, but rejects it as the possible BTA because other options could perform substantially better at only a relatively small cost increase. Specifically, the option of combining wedgewire screens with the VFD plan could achieve a substantially greater reduction in entrainment (approximately 67%) at a reasonable cost that is only slightly greater than the costs of VFDs alone. In other words, EPA concludes that the costs of this option are warranted by the benefits to be achieved.

Fact Sheet, Att. J, pp.39-40.

The Agency's analysis of current entrainment and impingement levels involved counting the total number of organisms impinged or entrained and identifying the range of species covered, without evaluating whether those individual losses have had or are likely to have any material impact on the quality or sustainability of any particular species or on the aquatic community as a whole in the Saugus. Instead of following longstanding Agency guidance advocating assessment of the environmental significance of impingement and entrainment losses in terms of their likely effect on aquatic populations, it chose a different approach. Noting that "EPA has read CWA § 316(b) to intend that entrainment and impingement be regarded as 'adverse impacts' that must be minimized by application of BTA" (*id.*, p. 3), the Agency appears to have presumed that any impingement and entrainment occurring is adverse. In essence, EPA has elected to follow the approach the Agency employed in developing national standards for new sources. Having concluded that impingement and entrainment occurs, and that some individuals represent species that are experiencing population declines or are recreationally or commercially important, EPA made no further effort to assess whether the level of impingement and entrainment loss is material for any species.

GE requests that EPA reconsider this approach, which is neither required nor well-adapted to this proceeding. Here, the Agency is making a BPJ decision for a 100 plus-year old facility with relatively low withdrawals. Equally important, as discussed below, there is no evidence that the Facility's cooling water withdrawals have had any adverse impact on the species about which EPA expresses concern, or that further limiting impingement and entrainment would materially improve the health or sustainability of those species.

EPA's Proposed BTA Determination for the Power Plant CWIS.

EPA's evaluation of the Power Plant's existing CWIS technology cites three deficiencies in the existing structure.

First, the Agency says that the current through-screen velocity ("TSV") range of 1.0 to 1.61 feet per second ("fps") is too high to prevent impingement of juvenile and adult fish. Fact Sheet, Attachment J, p. 19. Although EPA acknowledges that "many species and life stages were able to swim against a TSV as high as 1.0 fps," it notes that EPA Headquarters selected a more conservative standard of 0.5 fps in setting a national standard for new facilities. *Id.* The Agency did not make any assessment of the species-specific swim speeds of the species in the Saugus. Such an assessment would be necessary to determine whether the species potentially vulnerable to the Power Plant CWIS are capable of avoiding it, assuming they are otherwise healthy.

Second, EPA concluded that "the traveling screens do not effectively protect fish that are impinged during transport." *Id.*, pp. 16, 19. EPA cited as deficiencies the use of a high pressure spray and the use of a single trough to return both impinged fish and debris to the waterbody, which the Agency said "could cause physical harm." *Id.,* p. 19. Although EPA recognized that facility-specific impingement studies for the Power Plant showed extremely high initial survival rates for impinged fish (ranging from 100% - 82.6%), it chose to discount those data, because the studies did not examine latent (*i.e.* ≥ 24 hour) survival. Instead of requiring further assessment to determine latent survival, the Agency assumed that latent impingement mortality would be high and on that basis concluded the screens were inadequate.

Third, EPA asserts that the once-through cooling system with 9.5-mm mesh on the existing CWIS is not adequate to minimize entrainment of fish eggs and larvae. *Id.* Here too, EPA did not consider whether the number of eggs and small larvae entrained is likely to be biologically significant, given the high natural fecundity of the species to which they belong, and the equally high natural mortality rates those very early life stages typically experience.[68] Instead, it appears to have assumed entrainment of a large number of individuals is equal to a high impact. As the discussion below shows, however, this is not the case.

EPA also offers its evaluation of alternative technologies as support for its conclusion that the existing CWIS is not BTA. EPA considered whether the alternative was available for use at the site (in the sense that site conditions are suitable for use of the technology); estimated the extent to which an alternative would further reduce impingement mortality and/or entrainment; in some cases, identified potential operating and maintenance issues; and estimated the technology's cost.

In addition, EPA provided a very general, qualitative assessment of the benefits of reducing impingement and entrainment. Lacking any basis for evaluating whether any particular level of reduction is likely to materially enhance the health or sustainability of the affected populations, EPA relied on two assumptions: (1) reducing impingement and entrainment will directly increase the number of organisms in the river, and (2) the more entrainment is reduced, the more likely it is that those reductions will contribute to increased populations of juvenile and adult fish. *Id.,* p. 35.

Based on these assumptions, and after evaluation of a number of alternative technologies, EPA concluded that BTA for the Power Plant includes both (1) reducing the monthly average intake flow by 20% and (2) retrofitting fine-mesh wedgewire screens with a slot or mesh size no greater than 0.5 mm and a pressurized system to clear debris from the screens.[69]

EPA's Proposed BTA Determination for the Test Cell CWIS.

The approach EPA used in selecting BTA for the Test Cell CWIS (which withdraws flow only a few days a month, resulting in a monthly average flow rate of 1.5 MGD) largely followed the model used for the Power Plant CWIS. Because it lacked any impingement data for this CWIS, EPA chose to extrapolate using Test Cell flows and the impingement rates for the Power Plant CWIS. *Id.*, p. 47. Lacking entrainment data, EPA simply assumed that it would be appreciable during those months when eggs and larvae are most prevalent.

Because EPA recognized that it had no way of estimating how many more eggs might be saved by implementing further technology, the Agency instead decided to limit operation of the Test Cell CWIS, imposing an average monthly limit of 5 MGD from March 1 to July 21, and an

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[68] *See Seacoast Anti-Pollution League v. Costle,* 597 F.2d 306, 309-11 (1st Cir. 1979) (citing the fecundity of fish in upholding EPA's use of population-level considerations in the Agency's administrative decisions).

[69] GE agrees with EPA's conclusion that moving the location of the CWIS, installing fine mesh traveling screens, and/or installing an aquatic filter barrier are not BTA. None of those technologies or measures are necessary or feasible for this Facility.

average monthly limit of 27 MGD from August 1 to February 28. For impingement, EPA determined that improving the existing coarse mesh traveling screens with new fiberglass fish buckets, a low pressure spray wash, and a new fish return system is BTA. The Draft Permit gives the facility the option of installing fine mesh wedgewire screens, which it said would also satisfy § 316(b).

Response to Comment 11.3

EPA's Assessment of Adverse Environmental Impacts from GE's CWISs. GE comments that "instead of following longstanding Agency guidance advocating assessment of the environmental significance of impingement and entrainment losses in terms of their likely effect on aquatic populations, {EPA] … chose a different approach …" and did not determine whether losses of eggs and larvae at GE's intakes would harm the affected species or the affected assemblage or community of species in a "material" way. GE also suggests that given the naturally high fecundity and mortality of early life stages of fish, losses from its cooling water intake structure may not be biologically significant. EPA disagrees with this comment. In the Agency's view, the comment suggests that GE has misread or misunderstood EPA's approach to these issues.

EPA considers the loss of, or injury to, aquatic organisms (including fish eggs and larvae, juvenile and adult fish, and other types of organisms) from being entrained or impinged by a CWIS to constitute adverse environmental impact under CWA § 316(b). Not only is this the case for this permit, but it is also EPA's view generally. At the same time, EPA also endeavors to consider these adverse impacts in broader ecological context to the extent possible based on the best, reasonably available information. For example, EPA considers whether the losses of the various life stages of a particular species can be shown to have, or not to have, an effect on the affected population of that species. EPA also considers whether the losses to one or more species might impact the health of the overall community of organisms in the affected ecosystem.

Of course, in many cases, the Agency will be unable to draw conclusions about these broader effects in light of the limits on available information and the difficulties of the science of fish population dynamics. Ultimately, EPA completes a reasonable assessment of the adverse impacts in light of the reasonably available information and then factors that into its determination of the BTA in each case, including the weighing of the costs and benefits of different BTA options. EPA's analysis for the GE Draft Permit, and now for the Final Permit, is consistent with these principles. *See* Fact Sheet, Att. J at pp. 11-50.

It should be understood that the term "adverse environmental impact" ("AEI") as used in CWA § 316(b) is not defined in either the statute or existing regulations. As such, neither statute nor regulation expressly limits the extent of adverse environmental impact that may be considered.

Stated differently, neither statute nor regulation specifies an impact threshold above which a CWIS's effects must rise before the BTA requirement is triggered.[70]

EPA has interpreted the entrainment and impingement of aquatic organisms to constitute AEI, without requiring a demonstration of broader-scale harm to populations of particular species or particular communities of organisms. As the Second Circuit explained in *Riverkeeper II*:

> [i]n the Phase II Rule, as in the Phase I Rule, the EPA has interpreted the statutory directive of section 316(b) to minimize "adverse environmental impact" ("AEI") to require the reduction of "the number of aquatic organisms lost as a result of water withdrawals associated" with cooling water intake structures. 69 Fed. Reg. at 41,586.

475 F.3d 83, 123–24, *rev'd on other grounds*, *Entergy*, 129 S.Ct. 1498. The Second Circuit upheld EPA's interpretation in both *Riverkeeper I* and *Riverkeeper II*. In *Riverkeeper I*, the Second Circuit explained:

> . . . the EPA's focus on the number of organisms killed or injured by cooling water intake structures is eminently reasonable. See Final Rule, 66 Fed. Reg. at 65,262-63, 65,292. As discussed above with respect to restoration measures, Congress rejected a regulatory approach that relies on water quality standards, which is essentially what UWAG urges here in focusing on fish populations and consequential environmental harm.

358 F.3d at 196. In *Riverkeeper II*, the court reaffirmed its earlier holding, stating, among other things, that "we are both persuaded and bound by our statements on this issue in *Riverkeeper I*." 475 F.3d at 124–25 (footnote omitted). *See also id.* at 125 n. 36 (presenting the "additional observation" that the "statutory structure thus indicates that Congress did not intend to limit 'adverse environmental impact' in section 316(b) to population-level effects").[71]

Consistent with this interpretation of the law, but long before promulgation of the Phase I and II Rules, EPA explained in a 1977 draft guidance document, which is still used today as a reference in § 316(b) determinations, that:

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[70] As mentioned above, the legislative history behind CWA § 316(b) is sparse, but in the House Consideration of the Report of the Conference Committee for the final 1972 CWA Amendments, Representative Clausen stated that "Section 316(b) requires the location, design, construction and capacity of cooling water intake structures of steam-electric generating plants to reflect the best technology available for minimizing *any* adverse environmental impact" (emphasis added). 1972 Legislative History at 264. This language suggests, if anything, that *all* AEI should be considered and minimized, perhaps with the exception of *de minimis* effects.

[71] *See also ConocoPhillips*, 612 F.3d at 840–42 (upholding BTA requirements based on likely AEI given presence of eggs and larvae in area of CWIS, without any necessity to evaluate AEI at the species population or biological community level); *Seabrook*, 1977 EPA App. LEXIS 16, at *20–*21 (CWA § 316(b) standard requiring that CWISs reflect BTA for minimizing adverse environmental impact differs from § 316(a) standard requiring that thermal discharge limitations protect balanced indigenous populations of fish, shellfish and wildlife, and § 316(b) may require further minimization of adverse impacts even if balanced indigenous populations would not be undermined). *Accord Cent. Hudson*, at 371, 382; *Brunswick*, at 197, 201–02.

> [a]dverse aquatic environmental impacts occur whenever there would be entrainment or impingement damage as a result of the operation of a specific cooling water intake structure.

Guidance for Evaluating the Adverse Impact of Cooling Water Intake Structures on the Aquatic Environment: Section 316(b) P.L. 92-500 (DRAFT) (EPA) (May 1, 1977) ("May 1977 Draft § 316(b) Guidance"), p. 11. Similarly, EPA had also concluded, based on the language and structure of CWA § 316(b), that CWISs must reflect the BTA for minimizing AEI whether or not those adverse impacts were considered to be "significant." *Decision of the General Counsel No. 41 (In Re Brunswick Steam Electric Plant)* (June 1, 1976), at 203 ("The [cooling water intake] structures must reflect the best technology available for minimizing . . . adverse environmental impact – significant or otherwise.") (emphasis in original); *Decision of the General Counsel No. 63 (In re Central Hudson Gas and Electric Corporation, et al.), (July 29, 1977)*, at 381–82 ("Under Section 316(b), EPA may impose the best technology available . . . in order to minimize . . . adverse environmental impacts – significant or otherwise.").

That said, EPA does, however, work to assess the scope and import of the adverse impacts as part of its ultimate determination of the BTA. Thus, EPA stated in the May 1977 Draft § 316(b) Guidance that "[t]he magnitude of an adverse impact should be estimated" with reference to the following factors: (1) "absolute damage," (2) "percentage damage," (3) absolute and percentage damage to any endangered species, (4) absolute and percentage damage to any "critical aquatic organism," (5) absolute and percentage damage to commercially valuable and/or sport fisheries yield, and (6) "whether the impact would endanger (jeopardize) the protection and propagation of a balanced population of shellfish and fish in and on the body of water from which the cooling water is withdrawn (long-term impact)." Thus the guidance indicates that adverse impacts ought to be evaluated at all these levels, but does not suggest that adverse impacts are insignificant or immaterial if impacts are not able to be demonstrated at the overall population or community level. Of course, the significance or magnitude of the impacts may come into play when considering whether the cost of undertaking particular actions to further reduce impacts is unreasonable.[72]

EPA's consideration of the adverse environmental impacts caused by GE's cooling water intake structures in the context of its BTA determinations for this permit have been both reasonable and consistent with applicable law and relevant Agency policy. Consistent with the law and policy discussed above, EPA evaluated impingement and entrainment at GE in terms of absolute number of individuals affected. EPA's evaluation relied primarily on these figures because that was the best approach based on available data. To EPA's knowledge, there is insufficient data to estimate local fish populations in the Saugus River to compare to losses from the cooling water intake structures. Yet, EPA also considered and discussed the entrainment and impingement losses from a variety of perspectives to the extent possible in light of the data limitations. For example, EPA discussed the overall condition of the species affected by entrainment and

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[72] GE comments that EPA took the approach that "any" entrainment or impingement is adverse and should not have done so. Yet, this is not a case of a fish or two being impinged, or a 10 or 20 eggs or larvae. The data indicates that GE's CWISs entrain tens of millions of eggs and larvae and impinge thousands of juvenile and adult fish. *See* Fact Sheet, Att. J, pp. 14 – 16. EPA concludes that there is no serious question that entrainment and impingement in this case is sufficient to register as AEI to be appropriately minimized under § 316(b).

impingement, the types of species affected, whether affected species had particular commercial and/or recreational value, the significance of the losses in light of the importance of the affected ecosystem, and whether any species afforded special legal protection were being affected. *See, e.g.,* Fact Sheet, Att. J, pp. 12-16, 35-38, 41, 48. Finally, EPA also explained that the cumulative adverse impacts from entrainment and impingement at GE's and Wheelabrator's CWISs along the lower Saugus River are biologically significant because they present an additional, potentially avoidable source of mortality in an ecologically valuable estuary that provides a migratory pathway as well as spawning, feeding, and nursery habitat for a number of aquatic and terrestrial species.

GE also comments that EPA's approach is not appropriate for this permit because GE is a "100 plus-year old facility with relatively low withdrawals" from the Saugus River. EPA does not believe that the age of GE's facility is relevant to the assessment of adverse environmental impacts from GE's CWISs. EPA considers the age of the facility in the context of its assessment of the engineering aspects and cost of retrofitting new technology to an existing facility. Beyond that, the age of the facility might suggest, if anything, that an upgrade to the CWIS would be appropriate in keeping with the technology-forcing goals of the CWA. Conversely, if the age of the facility indicated that it would soon reach the end of its useful life and be closing, that might be a reason for not requiring new investment in pollution control equipment. GE has given no indication, however, of an intent to close the facility. As for the volume of GE's water withdrawals, they are relevant to the extent that they are reflected in the level of entrainment and impingement at the facility, which is also affected by the character of the ecosystem impacted by the CWISs (e.g., an ecosystem containing a spawning area is more likely to have eggs and larvae to be entrained).

EPA has carefully assessed the entrainment and impingement losses at GE, and has considered these losses in light of impacts from the nearby Wheelabrator facility and the nature of the Saugus River ecosystem. GE states that "there is no evidence that the Facility's cooling water withdrawals have had any adverse impact on the species about which EPA expresses concern," but EPA has already explained that adverse impacts have clearly been demonstrated, as discussed above and in the Fact Sheet, Att. J. GE also states that there is "no evidence … that further limiting impingement and entrainment would materially improve the health or sustainability of those species," but EPA has explained how reduced entrainment and impingement will reduce adverse environmental impacts and could benefit these species and the Saugus River ecosystem. *See* Fact Sheet, Att. J, pp. 35-39.

__Power Plant__

BTA for Minimizing Impingement Mortality. GE's comment largely describes, but also seems intended to critique, EPA's conclusion that the Power Plant's existing technology does not meet the CWA § 316(b) BTA requirement for minimizing impingement mortality. EPA had several bases for this conclusion, at least some of which GE recounts in its comment. Having considered GE's comment, EPA maintains its initial conclusion that the Power Plant's existing CWIS does not satisfy the BTA standard of CWA § 316(b).

To begin with, EPA explained that GE's current intake had a through-screen velocity of 1.0 to 1.6 fps and that this would not adequately protect the adults and juveniles of the species impinged at GE. *See* Fact Sheet, Att. J, pp. 15 – 16, 19. As EPA explained, the Agency has identified a CWIS through-screen velocity (TSV) of 0.5 fps or less as being protective for most species. *Id.* at pp. 24-25 and n. 24. Furthermore, EPA explained that installation and use of VFDs would cost relatively little (and would even reduce energy costs). *Id.* Therefore, EPA based part of its BTA determination and permit limits on a TSV of 0.5 fps, given that it would be adequately protective, feasible, affordable and acceptable to GE, since the company has proposed installing specific technology capable of achieving it (i.e., VFDs). *See id.* at pp. 38-40, 49. EPA's permit condition pertaining to minimizing impingement mortality did not expressly mandate installation of VFDs, however, because certain other technologies would also be capable of achieving such an intake velocity (e.g., wedgewire screens or modified traveling screens). *See id.* at 26, 27, 49.

GE complains that EPA did not present a swim-speed analysis of the species of fish that are impinged at the facility, but EPA did not deem it necessary to present such an analysis because GE itself had proposed to install VFDs capable of reducing TSV to 0.5 fps or less, which EPA explained would be likely to protect the relevant fish species adequately. EPA notes that GE's comment does not identify that all (or any) specific species impinged at GE would be strong enough swimmers to resist a TSV ranging from 1.0 to 1.61 fps. While GE points to EPA's statement that some species of fish swim against a TSV of 1.0 fps, this changes nothing given that (a) the existing CWIS's TSV ranges up to 1.6 fps, (b) the fact that some individuals of some species may be capable of escaping a TSV of up to 1.0 fps, does not mean that all individuals of all affected species would be able to do so, and (c) it is undisputed that the Power Plant's CWIS impinges thousands of fish per year. (EPA estimated 64,000 fish impinged per year, while GE suggests a better estimate would be 20,530 impinged per year. *See* Comment 11.4, below.)

EPA acknowledges that TSVs higher than 0.5 fps may be adequately protective if coupled with traveling screens and fish return systems equipped with modern improvements designed to promote survival of impinged fish (e.g., low pressure spraywash, fish buckets, upgraded fish return system, according to EPRI 2007), but GE's CWISs do not currently incorporate such technologies. Thus, EPA pointed out in the Fact Sheet that the Power Plant's:

> … travelling screens do not effectively protect fish that are impinged during transport. Fish are rinsed with a high pressure spray and deposited in the same return trough as debris and both practices could cause physical injury.

Id. at p. 19. In addition, EPA also explained in the Fact Sheet that:

> Put simply, the facility's existing conventional screens are outdated and improved technologies are available to reduce impingement mortality. One such technology is known as "Ristroph screens" (named after the designer of the equipment). Ristroph screens improve fish survival following impingement and are now commonly used at power plants nationwide (EPRI 2007). While the Power Plant's current intake screens are not equipped with non-metallic fish buckets, improved seals, or smooth texture screen material, all of these features are

> available on Ristroph-style screens. Moreover, a low pressure spray system would be more protective of impinged organisms and is generally considered a standard feature of Ristroph-style screens (EPRI 2007). Finally, providing separate troughs for organisms and debris removed from the intake screens would better protect the organisms in the fish return system and could be provided in conjunction with a new Ristroph screen system. In sum, installing a low-pressure spray wash, improved fish return trough, and upgrading the conventional screens consistent with Ristroph screens would likely improve the survival of impinged fish.

Id. at p. 30. GE's comment above acknowledges some of these points, but complains that despite data suggesting high levels of initial impingement survival at the facility, EPA did not regard this to establish that the adequacy of existing CWIS and its fish return system because of the absence of latent survival data. Furthermore, GE complains that EPA did not require or undertake latent survival studies at the facility prior to permitting.

Yet, none of this changes the reasonableness of EPA's conclusions regarding whether GE's existing intake technology could be upgraded in line with improvements within the industry to improve the survival of impinged fish. Moreover, EPA explained the importance of latent survival in the Fact Sheet, stating:

> [w]hile it is important to understand an intake structure's potential to impinge organisms, it is also important to assess the capability of the intake system's design and operation to effectively return impinged organisms back to the receiving waters alive and uninjured. At the time of the MRI (1997) study, the impingement rates and initial survival of impinged organisms at the Power Plant CWIS were assessed by catching all materials washed off the collecting screens in a 1/4-inch mesh collecting pen attached to the end of the screenwash sluiceway. The initial reported survival of impinged fish following handling by the collecting screens was 99.7% for grubby and winter flounder, 100% for cunner, windowpane, and shorthorn sculpin, and 82.6% for all remaining species. The study did not address latent (e.g., >24 hours) survival. It is important to observe latent survival in impingement studies because injuries caused from impingement (*e.g.*, loss of protective slime or de-scaling) may cause mortality even in individuals that initially survive.

Id. at Att. J, p. 16. GE's comment does not establish that the issue of latent survival should be ignored.

Furthermore, EPA bases its permit decisions on the best, reasonably available information and has substantial discretion regarding when to undertake, or require permittees to undertake, scientific studies or data collection in support of permit development. EPA chose not to require a latent survival study because variable frequency drives – as proposed by GE - will meet the requirement to minimize impingement mortality by reducing intake TSV without an additional study. Of course, nothing prevented GE from undertaking and submitting data from such a site-specific study to support its argument that the facility's *existing* technology adequately minimizes impingement mortality, but it did not do so. The new permit does not require GE to upgrade the CWIS screens and fish return system because it requires that the CWIS's TSV be reduced to 0.5 fps or less, and this improvement will prevent most fish from being impinged in the first place.

BTA for Minimizing Entrainment. GE's comment notes that EPA found that the mesh size on GE's current screens is too large to minimize entrainment of eggs and larvae. EPA continues to conclude that this is true and GE's comment does not disagree.

GE goes on to state that EPA did not evaluate the biological impact of the entrainment losses in light of "the high natural fecundity of the species to which they belong, and the equally high natural mortality rates those very early life stages typically experience." Moreover, GE comments that EPA "appears to have assumed entrainment of a large number of individuals is equal to a high impact … [but] this is not the case." GE also asserts that "EPA provided a very general, qualitative assessment of the benefits of reducing impingement and entrainment …[, and that l]acking any basis for evaluating whether any particular level of reduction is likely to materially enhance the health or sustainability of the affected populations, EPA relied on two assumptions: (1) reducing impingement and entrainment will directly increase the number of organisms in the river, and (2) the more entrainment is reduced, the more likely it is that those reductions will contribute to increased populations of juvenile and adult fish."

EPA has considered these comments, but does not believe that they identify any flaw in the Agency's analysis or reason to change the Agency's conclusions regarding the BTA. As EPA explains above, the Agency continues to regard the millions of eggs and larvae needlessly taken from the Saugus River ecosystem and killed by the GE Power Plant's CWIS to constitute an adverse environmental impact that needs to be addressed under CWA § 316(b). To the extent that GE is arguing that there is no adverse environmental impact that needs to be minimized unless analysis demonstrates a significant population-level or community-level effect from the entrainment losses, EPA rejects that comment. See Response to Comment 11.2. (EPA also notes that GE has not provided a study demonstrating that entrainment losses at GE, combined with other adverse effects in the watershed, such as Wheelabrator's operations, have not had any population-level effect on the species in the Saugus River.) Certainly, EPA understands that the species affected have generally evolved to rely upon a reproductive strategy involving the production of very large numbers of eggs and larvae in likely reaction to high natural mortality from predators and other natural conditions. This does not necessarily mean that insertion of a large-scale anthropogenic source of mortality into the Saugus River ecosystem would have no effect on the species or community of aquatic organisms that reside in or transit the area.

No party has undertaken studies or analyses to try to specify the population-level and community-level effects of the Power Plant's annual entrainment of as many as 69 million eggs and larvae, in combination with other adverse impacts to the organisms from GE's operations and other stressors. It is not presently clear that such a study or analysis could be designed to provide results that could be relied upon with confidence, but any such analysis or study would undoubtedly be greatly time-consuming and expensive. EPA reasonably decided to move ahead with permitting based on the information that was presently available. What this information shows is that the Power Plant's CWIS takes a large number of eggs and larvae from biotic community of the Saugus River. EPA discussed the import of reducing these losses in the Fact Sheet, stating, for example, that:

> [r]educing impingement and entrainment by GE Aviation's CWIS's will directly increase the number of commercial, recreational, and forage fish (eggs, larvae, juveniles and adults), as well as other types of aquatic organisms found in the river (e.g., invertebrates). The more that entrainment is reduced, the more likely it is that those reductions will contribute to increased populations of juvenile and adult fish. But reducing the loss of eggs and larvae is valuable in and of itself because of the role they play at the base of the food web and other benefits that they provide, such as contributing to species' compensatory reserve. Reducing impingement directly contributes to increased abundance of adult fish.
>
> Beyond these direct benefits to aquatic life, reducing entrainment and impingement will also likely result in additional indirect benefits to the ecosystem and the public's use and enjoyment of it. Examples of such indirect benefits include increasing recreational and educational opportunities, increasing or maintaining biological diversity, and increasing populations of resident and migratory birds and other terrestrial wildlife dependent on the estuary for food.

Id. at Att. J, p. 35. EPA disagrees with GE's comment that its analysis of the benefits of reduced entrainment and impingement mortality was "very general." While it is true that EPA neither attempted the difficult, time-consuming, expensive and controversial task of attempting to develop a monetized estimate of the benefits of reducing GE's entrainment and impingement, nor, as explained above, attempted to estimate the particular levels of population growth that might occur as a result of such reductions, that does not mean the analysis of benefits was "very general." The analysis considered and was tailored to the facts of the specific case and quantified the benefits of reduced entrainment and impingement in terms of organisms saved, while assessing qualitatively the societal benefits of achieving these savings. This approach is reasonable, technically sound and consistent with the typical practice of permitting agencies applying CWA § 316(b) on a case-by-case basis in which the benefits of reducing entrainment and impingement are considered on a qualitative basis.

GE comments that EPA *assumed* that "reducing impingement and entrainment will directly increase the number of organisms in the river." Yet, this is not an "assumption," it is a fact. If GE's Power Plant is modernized so that many of the millions of eggs and larvae that are currently entrained each year, and many of the thousands of adult and juvenile fish that are currently impinged each year escape entrainment and impingement, then the organisms will be left in the river to serve their various biological purposes. GE also comments that EPA assumed that "the more entrainment is reduced, the more likely it is that those reductions will contribute to increased populations of juvenile and adult fish." EPA did state this conclusion, but is based on common sense rather than a pure assumption. EPA stated that it is "more likely" that saving tens of millions of eggs and larvae from entrainment by the GE Power Plant's CWIS will result in increased populations of juvenile and adult fish, not that it is a certainty. We continue to think that our statement is reasonable based on the facts of this case. Certainly, GE's submissions have not established that the loss of 69 million eggs and larvae to entrainment has had no effect on the numbers of juvenile and adult fish in the affected segment of the Saugus River. In fact, GE's analysis in support of its comments (Technical Exhibit 18) quantifies the potential benefits of impingement and entrainment analysis in terms of the number of equivalent age-1 individuals, which implies an increase in the number of fish in the Saugus River. In any event, EPA also explained that the eggs and larvae saved from entrainment also have value apart from whether the individual eggs and larvae grow up to become juvenile or adult fish.

Test Cell

BTA Determination. GE comments that EPA followed essentially the same methods to determine the BTA for the Test Cell as it did for the Power Plant. EPA agrees with this comment. The Agency determined the BTA on a BPJ basis using essentially the same approach. EPA tries to use consistent approaches and methods for all its permits, with reasonable adjustments based on the facts and circumstances of each case and the applicable law.

GE states that when faced with the absence of entrainment data for the Test Cell, EPA "simply assumed" there would be "appreciable" entrainment during the months when eggs and larvae are most prevalent. GE is correct that EPA did not have, and GE did not submit, any entrainment data for the Test Cell. (The limited available entrainment data (MRI 1997) did not include information collected from the Test Cell.) In the absence of Test Cell-specific data, EPA developed a reasonable approach to estimating entrainment at the Test Cell in light of the available information. Since both the Test Cell and the Power Plant CWISs withdraw from the same general area of the Saugus River, and neither has any technology to prevent the entrainment of eggs and larvae in the water taken from the river, EPA applied the geometric mean density of eggs and larvae per gallon of water taken by the Power Plant and applied that value for the Test Cell. EPA then estimated entrainment for the Test Cell based on this rate of entrainment per gallon and the Test Cell's water withdrawal volumes.

Given the low volume of water withdrawals by the Test Cell on an *annual* basis under existing operating conditions, EPA determined that "the magnitude of the entrainment impacts at the Test Cell CWIS do not warrant the expenditure that would be required to install and operate any of the available technologies for reducing entrainment." Fact Sheet, Att. J, p. 47. This is consistent with GE's comment, which states that "the Test Cell CWIS … withdraws flow only a few days a month, resulting in a monthly average flow rate of 1.5 MGD …."

The current permit conditions for the Test Cell do not, however, preclude GE from operating the Test Cell at a much higher rate. EPA explained in the Fact Sheet, Att. J, pp. 40-41, that:

> [t]he Test Cell CWIS is equipped with two primary pumps that provide once-through cooling water for a test turbine. … The seawater pumps each have a design capacity of approximately 38.2 MGD (26,500 gpm). An additional 1,500 gpm pump supplies a high pressure spray wash system that clears debris from the traveling screen, resulting in a total design capacity of 78.5 MGD at the Test Cell CWIS. … The current permit limits the maximum daily flow of this CWIS to 45 MGD and average monthly flow to 27 MGD.

If the Test Cell operated at the maximum permitted water withdrawals year-round, then it would potentially entrain substantially greater numbers of eggs and larvae than the relatively low entrainment numbers that would be expected under existing operations.

GE has also maintained that "aircraft engine testing is scheduled most commonly during fall months (September to November)." Water withdrawals during these months do not pose the same entrainment threat because 97% of annual entrainment occurs during March through July. The existing permit, however, has no seasonal restrictions on water withdrawals. Thus, it would allow increased operations during March through July, when entrainment impacts could be relatively large compared to the overall annual water withdrawals and, depending on the overall withdrawal volume, could be comparable to the entrainment impacts at the Power Plant. Indeed, the highest monthly average flow (9.3 MGD) reported for the Test Cell was for April 2008, during the peak entrainment season.

In light of these facts, EPA determined that restricting intake flows using existing technology was the BTA for the Test Cell for reducing entrainment. EPA based these flow restrictions on both GE's description of the Test Cell's operations and an awareness of actual operations history at the facility. By setting a more stringent monthly average water withdrawal limit for the Test Cell from March through July, the permit includes enforceable operational limitations that minimize adverse environmental effects by assuring that the most intensive engine testing occurs primarily outside the peak entrainment period consistent with GE's description of operations at the Test Cell. EPA developed a more stringent seasonal average monthly flow limit for the Draft Permit based on existing operating conditions at the Test Cell as reported in the facility's discharge monitoring reports. EPA set an average monthly flow limit of 5 MGD for March through July, based on the 95th percentile of reported average monthly flows from February 2000 through June 2010. Without this more stringent limit, the permit would not ensure the seasonal operations profile of the Test Cell and it could not be considered a component of BTA for minimizing adverse impacts from entrainment. *See* Response to Comment 11.9 for further discussion of the Final Permit's average monthly flow limit for the Test Cell.

With regard to impingement, GE similarly comments that in the absence of Test Cell-specific impingement data, EPA estimated Test Cell impingement by using Test Cell intake flow rates and the rate of impingement per gallon of intake flow for the Power Plant CWISs. EPA both agrees with this comment's characterization of EPA's analysis and maintains that this was a reasonable approach in this case. The rest of GE's comment merely describes the substance of EPA's BTA determination with regard to minimizing impingement mortality at the Test Cell. See Response to Comment 11.9 for further discussion of the Final Permit's conditions related to minimizing impingement mortality at the Test Cell.

Comment 11.4: EPA's Analysis Mischaracterizes the Impacts of the Existing Power Plant and Test Cell CWISs.

As the following discussion demonstrates, EPA's analysis of the available impingement and entrainment studies for the Facility's CWISs overstates the levels of impingement and entrainment morality that those CWISs can reasonably be anticipated to cause based on current operations.

EPA's Impingement Mortality Characterization.

In Attachment J to Fact Sheet (p. 15), EPA estimates that Power Plant CWIS impinges approximately 64,000 adult and juvenile fish annually. Although EPA says that it based this estimate on the impingement data collected by MRI in 1994-1996 (MRI 1997) and average monthly flows at the Power Plant CWIS (*id.*, pp. 15-16; spreadsheet provided in May 16, 2011 email from N. Kowalaski/EPA to S. Lewis/GE), EPA's estimate is far higher than the MRI impingement study, properly applied, suggests is likely to occur. This is the case because EPA used arithmetic means, which exaggerated the effect of a single, unusually high sample value, rather than deriving annual impingement from monthly samples using geometric means, as indicated by the data distribution and justified by MRI (1997).

The site-specific impingement and entrainment monitoring study conducted by MRI (1997) estimated average annual impingement of 13,140 fish at the Power Plant CWIS. The estimate was based on a geometric mean impingement rate of 36 fish per 24 hours for the two-year study period (1994-1996) (36 fish per day x 365 days = 13,140 fish). MRI (1997) used the geometric mean because monthly means were highly skewed by an anomalously high number of fish impinged during a single impingement sampling event on October 25, 1996 (MRI, 1997; pages 9-10). In fact, National Weather Service historical data show that a major, record-setting storm event occurred in the days leading up to the sampling event on October 19-22, 1996, setting a single-day precipitation record in Boston on October 21[73] (Boston Weather, 2010; http://www.boston-weather.us/boston-october-weather.html). Cannon (2000) conducted a hydrometeorological assessment of the storm and characterized it as unique due to the extreme magnitude of precipitation and flooding, and rainfall totals on the order of a 500-year event at several locations in New England. The geometric mean is not as sensitive to a single large sample value as the arithmetic mean and is commonly used by fisheries managers, including the Atlantic States Marine Fisheries Commission, to calculate fish abundance. Based on the average monthly cooling water flow during the study (about 23 MGD), MRI (1997) estimated that 1.580 fish are impinged per million gallons of intake flow at the Power Plant CWIS.

Using the geometric mean of 1.580 fish per MGD derived by MRI (1997) and the maximum daily permitted cooling water flow limit of 35.6 MGD (Outfall 018), GE estimates that the Power Plant could impinge around 20,530 fish annually (35.6 MGD x 1.580 fish/MGD x 365 days = 20,530 fish).

Thus, EPA's estimate of Power Plant CWIS impingement (64,000 fish) is nearly five times higher than the MRI (1997) annual impingement estimate (13,140 fish) and three times higher than GE's impingement estimate based on the current permitted maximum daily flow volume (20,530 fish).

[73] Pages 9 and 10 of the MRI (1997) report discuss the impingement sampling event as occurring on October 25, 1996 and yielding an unusually large volume of fish. However, Table 3 in the same report shows a sampling date of October 18, 1996 (same day in month sampled in previous year [Table 2]). Nevertheless, review of NOAA buoy data for Station 44013 located 16 nautical miles east of Boston indicates that the storm was beginning to form by October 18 as indicated by falling air temperatures, increasing wind speeds and gusts, and shifting wind and mean wave direction, and these conditions would have been present during sampling.

In addition, EPA has substantially overestimated impingement *mortality* by assuming 100% mortality of fish impinged at the existing Power Plant CWIS, even though that CWIS already uses a fish collection and return system. EPA states that a through-screen velocity of 0.5 fps or less could save more than 60,000 juvenile and adult fish annually (94 percent of EPA's impingement estimate of 64,000 fish) at the Facility; however, that estimate does not appear to account for current impingement survival. To support its "100% impingement mortality" assumption, EPA notes that the fish are removed from the screens using a high pressure wash and returned to the waterbody in a fish/debris trough. Fact Sheet, Attachment J, p. 19. But site-specific monitoring and the results of a literature review indicate that the vast majority of fish impinged at the Power Plant CWIS are likely to initially survive impingement and passage through the collection and return system, and at least 76% are likely to survive for an extended period after their return to the Saugus River.

Specifically, the impingement studies conducted by MRI (1997) at the Power Plant CWIS from 1994 through 1996 reported high immediate impingement survival of the numerically dominant species. Immediate survival of impinged fish after passage through the screenwash sluiceway was 99.7% for grubby and winter flounder (the two species that numerically dominated impingement samples); 100% for cunner, windowpane, and shorthorn sculpin; and 82.6% for all remaining species combined (Fact Sheet, Attachment J, p. 16). MRI (1997) surmised that the good condition of impinged fish was due to continuous rotation of the traveling screens at the Power Plant CWIS. Thus, available site-specific data demonstrate that the vast majority of impinged fish initially survive impingement and passage through the existing fish return system to the Saugus River.

Trends and data from other studied sites with similar intake configurations provide further evidence that the majority of impinged fish at the Power Plant CWIS are likely to survive for an extended period after their return to the Saugus River. Latent impingement survival data collected at other power plant CWISs using similar conventional traveling screens and fish return systems (EPRI, 2003) show high latent (extended) survival rates for the same species that numerically dominated impingement samples at the GE Power Plant CWIS. For instance, average latent impingement survival of grubby and winter flounder at other sites was 76 percent and 87 percent, respectively (EPRI, 2003).

Applying the EPRI (2003) average latent survival rates for six of the top seven species impinged at GE (grubby, winter flounder, cunner, rainbow smelt, threespine stickleback, and shorthorn sculpin) to the MRI (1997) impingement estimate (20,530 fish), and using winter flounder survival as a surrogate for windowpane, current annual impingement mortality at the GE Power Plant CWIS is likely on the order of only 5,026 fish. *See* Technical Exhibit 18.

In summary, EPA appears to have substantially over-estimated the amount of impingement mortality likely to occur at the existing Power Plant CWIS. As a result, EPA's assessment of the need for further reductions and the potential benefits of requiring intake technology changes is fundamentally flawed.

EPA's Entrainment Characterization.

EPA's impact assessment and evaluation of the benefits of various technologies also appears to have relied on an inflated estimate of entrainment occurring at the Power Plant CWIS. EPA calculated that the Power Plant CWIS has the potential to entrain over 69 million fish eggs and larvae annually (Attachment J, p. 14; spreadsheet provided in May 16, 2011 email from N. Kowalaski/EPA to S. Lewis/GE). EPA based its estimate on the permitted flow volume of 35.6 MGD and the geometric mean number of eggs and larvae for the numerically dominant species reported in the site-specific impingement and entrainment monitoring study conducted by MRI (1997) for the two-year study period (1994-1996). Although EPA used the geometric mean density data from MRI (1997) for this calculation, it selected for each species only the maximum annual entrainment rate observed between the two study years (for some species the maximum occurred in 1994-1995 and others it occurred in 1995-1996), resulting in a composite worst-case estimate of entrainment that was 9% higher than the annual entrainment estimated for either of the two study years.

GE estimated annual entrainment at the Power Plant CWIS using the 1994-1995 and 1995-1996 geometric mean egg and larvae densities reported by MRI (1997) for each representative species, and the maximum daily permitted cooling water flow limit of 35.6 MGD. In the absence of site-specific data demonstrating survival of entrained fish eggs and larvae passing through the cooling water system, GE presumed 100% mortality of all entrained organisms, consistent with EPA's approach.

GE calculated annual fish (eggs and larvae) entrainment of 36,114,268 using the 1994-1995 data and 63,224,570 using the 1995-1996 data (Technical Exhibit 18). Mean annual entrainment for the two study years was 49,669,419. Despite the fact that GE adopted EPA's presumption of 100% entrainment morality, the estimate derived was considerably lower than EPA's. Specifically, EPA's estimate of annual entrainment is 39% higher than average mean annual entrainment for the two study years and 9% higher than the maximum annual entrainment, calculated by GE.

As EPA is well aware, tiny eggs and larvae that are small enough to become entrained have very high natural mortality levels and, as a result, are highly unlikely to survive even absent an encounter with the Facility's intake.[74] For § 316(b) implementation purposes, the Agency has consistently recognized the importance of placing entrainment values in a more meaningful context by converting entrained individuals in age-1 equivalents. *Id.; see also infra at Section XI.E.2.a.* Indeed, in its most recent § 316(b) proposal, EPA reiterates the need to evaluate not just the number of individuals lost to entrainment, but their importance to the ecosystem, for purposes of assessing the value of entrainment reductions. *See, e.g.*, 76 Fed. Reg. 22,285. In this case, EPA has not attempted to estimate how many of the eggs and larvae entrained by the

[74] *See, e.g., In re Pub. Serv. Co. of N .H. (Seabrook Station, Units 1 &2)*, 1 E.A.D. 332, 1977 EPA App. LEXIS 16, at *62 (EPA June 7, 1977) (determining that combined entrainment mortality of 100 billion clam larvae - less than 5 % of the adult population - would have an "insignificant effect on adult [clam] populations."); *In re Pub. Serv. Co. of N.H*, 1 E.A.D 455, 1978 EPA App. LEXIS 17, at *43 (Aug. 4, 1978) (explaining that, although "[fish] eggs and larvae may be . . . subject to . . . entrainment in substantial numbers," for most species "the impact of either intake entrainment or thermal discharge will be insignificant.")

facility are likely to survive to age-1. GE's experts have made that calculation, however, and as the discussion in Section XI.E.2 below shows, that number is *de minimis*.

Response to Comment 11.4

Impingement

Using data from the MRI study (1997) and intake flow data for the Power Plant, EPA estimated that the Power Plant's CWISs impinged 64,000 fish per year. GE comments that EPA's estimate is "far higher than the MRI impingement study, properly applied, suggests is likely to occur." According to GE, this is the case because EPA's figure is based on an *arithmetic mean* which "exaggerated" the effect of a single, unusually high sample value, rather than deriving an annual impingement value from the monthly samples using *geometric means*. In other words, GE argues that use of a geometric mean is indicated by the distribution of data in MRI (1997), and that using a geometric mean would yield a lower estimate. Using geometric means, GE estimates that the Power Plant impinges 20,530 fish per year (approximately one-third of EPA's estimate).

In EPA's view, there is very limited data from which to characterize impingement by the GE Power Plant CWISs. That said, EPA uses the best available data, while taking into account its limitations, in making its permit determinations. As the comment notes, the primary data used in the analyses by GE and EPA was collected during 1994 through 1996 and is documented in MRI (1997). As noted above, EPA estimated 64,000 fish impinged per year based on the data in MRI (1997) using arithmetic means in its calculations, while GE estimated 20,530 fish impinged per year based on the same data but using geometric means in its calculations. In either case, EPA views this as a substantial, unnecessary amount of impingement of fish from the Saugus River as a result of the Power Plant's CWIS operations. EPA also notes that the species of fish represented include certain species of particular public concern that are currently receiving special protection from government authorities (e.g., winter flounder, rainbow smelt).

EPA does not agree that using an annual geometric mean is the only valid approach justified by the data, as GE argues. Calculating a geometric mean is appropriate for a distribution of data with wide variability, as the MRI impingement data certainly seems to be on its face. However, EPA is also concerned that a geometric mean, especially calculated annually, may under-represent rare, peak values in the dataset and the limited data available in this case leaves EPA unsure what the actual distribution of impingement values would be if a more robust data set was available. Therefore, EPA does not agree that GE's calculation of the geometric mean is the only appropriate way to assess the data at hand.

Looking at the available data, the relatively higher values for October 25, 1996, are the primary reason for the disparity between the annual mean estimates based on the arithmetic mean versus the geometric mean. (The footnote in GE's comment indicates that the sampling may actually have occurred on October 18, 1996.) On that day, GE reported impinging 2,555 fish during the study at a rate of 109.2 fish per million gallons of water withdrawn, including over 1,000 grubby, 760 winter flounder, 380 windowpane, and 235 rainbow smelt. The rate of impingement on this study date was approximately four times higher than the next highest impingement rate (25.7 fish per million gallons in November 1995). GE characterizes this sample as "anomalously large" and suggests that a significant storm event may have been the cause of the relatively higher impingement values.

Yet, the available impingement data is simply too limited to determine if this type of event is truly an anomalous or uncharacteristic event in the sense that it is unlikely to occur again, or might occur only very rarely, such as less than once in 50 or 100 years. In EPA's experience, impingement at CWISs is often characterized by relatively steady levels punctuated by periodic or occasional larger or even much larger impingement events, such as the one that occurred in October 1996 at GE (and the various unusual impingement events reported at Brayton Point Station in 2000, 2002, 2003, 2005, 2006, 2007, and 2008). While these unusually higher events may not occur very frequently, they can be expected to occur periodically due to a variety of circumstances (e.g., weather events that could lead to currents that push schools of fish toward CWISs, occasional atypically large schools of fish passing and being drawn into a CWIS). Indeed, because of this aspect of impingement, most Region 1 permits for facilities with CWISs, including GE, have specific reporting requirements for "unusual impingement events" (typically defined as time-limited observations of 100 to150 fish impinged per 24 hours). The expectation of periodic higher impingement events could be contradicted if a facility has a long-term data set showing that it does not have such periodic events, but GE does not have such data.[75] In addition, if climate change leads to more frequent significant weather events, larger-scale impingement events could become more common in the future. Furthermore, it is also possible that steps to reduce fishing pressure and other sources of mortality and to enhance habitat quality could lead to greater numbers of fish being present in the Saugus River, which, in turn, could lead to greater impingement if improvements are not made to GE's CWIS. *See* Fact Sheet, Att. J, pp. 13, 35-37.

EPA concludes that the GE data set is inadequate to establish that the high impingement event evidenced in the data is truly anomalous at GE. EPA further concludes that an annual geometric mean of 1.58 fish per million gallons may not capture other valid, albeit infrequent, high impingement events that may have occurred between October and December of 1996. At the same time, EPA acknowledges the possible validity of GE's comment that using an arithmetic mean could potentially exaggerate the effect of the high impingement rate of October 1996. In an effort to respond to GE's concern that an arithmetic mean may exaggerate the effect of a single high impingement event, while still accurately representing the variability in impingement, EPA calculated the geometric mean impingement rate (per million gallons) for each month. With the exception of October and November, mean monthly values were similar for arithmetic and geometric means. EPA estimated annual impingement of 28,917 fish based on the monthly geometric mean impingement rate. As stated above, in any case, EPA views

[75] While EPA agrees with the suggestion embedded in GE's comment that weather conditions (e.g., wind, precipitation, extreme tides, storm surge) could contribute to higher impingement events, EPA is left with uncertainty regarding the results discussed in GE's comment. According to the comment, there was a storm from October 19 to October 22, 1996, with record-setting precipitation on October 21. Yet, due to inconsistency in the reports, it is unclear whether the high impingement values were obtained on October 25 or October 18. Thus, while weather conditions may possibly have contributed to the high impingement value obtained after (or before) the storm, it has not been demonstrated that is the case. It also has not been established, more generally, that such higher impingement events are limited only to highly extreme weather conditions.

impingement of 20,000+ fish per year to be a substantial amount of potentially avoidable impingement of fish from the Saugus River as a result of the Power Plant's CWIS operations.[76]

GE's comment also focuses on the question of impingement *mortality* (*i.e.*, the degree to which fish are killed as a result of impingement). As presented in the comment, GE estimates that 5,076 fish are killed from impingement each year at the Power Plant. As the comment explains, GE's figure is derived from:

> [a]pplying the EPRI (2003) average latent survival rates for six of the top seven species impinged at GE (grubby, winter flounder, cunner, rainbow smelt, threespine stickleback, and shorthorn sculpin) to the MRI (1997) impingement estimate (20,530 fish), and using winter flounder survival as a surrogate for windowpane, [to yield a] current annual impingement mortality at the GE Power Plant CWIS [that] is likely on the order of only 5,026 fish.

Thus, GE assumed impingement mortality of approximately 24% for the fish at issue. GE also points out that EPA, in effect, assumed 100% mortality for fish impinged at the Power Plant. GE deduces this from the fact that in the Fact Sheet, EPA estimated that 64,000 fish were impinged per year at the Power Plant, but that 60,000 could be *saved* by use of the VFDs, which EPA indicated would reduce impingement by 96%. GE argues that assuming 100% mortality for impinged fish is inappropriate in this case and, therefore, that EPA significantly overestimated impingement mortality.

As EPA explained in the Fact Sheet (at Att. J, p. 16) (emphasis added):

> [w]hile it is important to understand an intake structure's potential to impinge organisms, it is also important to assess the capability of the intake system's design and operation to effectively return impinged organisms back to the receiving waters alive and uninjured. At the time of the MRI (1997) study, the impingement rates and initial survival of impinged organisms at the Power Plant CWIS were assessed by catching all materials washed off the collecting screens in a 1/4-inch mesh collecting pen attached to the end of the screenwash sluiceway. The initial reported survival of impinged fish following handling by the collecting screens was 99.7% for grubby and winter flounder, 100% for cunner, windowpane, and shorthorn sculpin, and 82.6% for all remaining species. *The study did not address latent (e.g., >24 hours) survival. It is important to observe latent survival in impingement studies because injuries caused from impingement (e.g., loss of protective slime or de-scaling) may cause mortality even in individuals that initially survive.*

Moreover, EPA also explained that:

> [b]ased on review of existing technology and biological monitoring data, EPA concludes that under the current conditions the Power Plant CWIS does not

[76] It is also worth noting all of the various estimates of annual impingement, which range from 13,140 to 64,000, are of the same order of magnitude and constitute a significant amount of potentially avoidable impingement.

> minimize adverse environmental impacts due to impingement and entrainment. The existing TSV of 1 to 1.61 fps does not adequately protect juvenile and adult fish from impingement. In addition, the traveling screens do not effectively protect fish that are impinged during transport. Fish are rinsed with a high pressure spray and deposited in the same return trough as debris and both practices could cause physical injury.

Id. at p. 19. In addition, EPA also explained in the Fact Sheet the following:

> EPA evaluated the feasibility of upgrading the existing coarse mesh traveling screens at the Power Plant CWIS to reduce impingement mortality. Put simply, the facility's existing conventional screens are outdated and improved technologies are available to reduce impingement mortality. One such technology is known as "Ristroph screens" (named after the designer of the equipment). Ristroph screens improve fish survival following impingement and are now commonly used at power plants nationwide (EPRI 2007). While the Power Plant's current intake screens are not equipped with non-metallic fish buckets, improved seals, or smooth texture screen material, all of these features are available on Ristroph-style screens. Moreover, a low pressure spray system would be more protective of impinged organisms and is generally considered a standard feature of Ristroph-style screens (EPRI 2007). Finally, providing separate troughs for organisms and debris removed from the intake screens would better protect the organisms in the fish return system and could be provided in conjunction with a new Ristroph screen system. In sum, installing a low-pressure spray wash, improved fish return trough, and upgrading the conventional screens consistent with Ristroph screens would likely improve the survival of impinged fish.

Id. at p. 30. Based on these considerations, EPA was neither able to conclude that GE's existing technology represents the BTA with regard to minimizing impingement mortality under CWA § 316(b), nor able to quantify a particular rate of impingement survival. However, EPA also recognizes that, in the limited MRI study, initial survival was relatively high for some individuals, including many of the numerically dominant species such as grubby, winter flounder, and cunner. Therefore, it might have been more appropriate to characterize the benefits of VFDs in the Fact Sheet by saying that the technology would likely eliminate a certain degree of impingement, rather than saying it would save a certain percentage of fish, since it is likely that some percentage of the currently impinged fish would survive, though we do not know how many due to the absence of latent survival data and the generally limited amount of data overall.

GE's comment proposes that for numerically dominant species at GE, the assessment should assume latent survival rates at GE based on EPRI's evaluations of impingement survival for the same species impinged at other facilities. GE has not indicated, however, whether the EPRI data it used to estimate latent survival includes facilities with high or low pressure spray washes, separate or combined fish and debris return troughs to transport fish back to their habitat, modern Ristroph-type screen technology, or higher or lower intake velocities. (Aquatic organisms are more likely to be harmed or killed by impingement if they are pulled against the intake screens by higher velocities.) Nonetheless, GE appears to have provided a fairly conservative estimate of impingement mortality compared to the ranges presented in the EPRI data, which suggests that the same species may experience relatively high latent survival at GE. In response to GE's comment, and based on the results of the site-specific initial survival study (MRI 1997) and latent survival observed at other facilities (EPRI 2003), EPA recognizes that the existing traveling screen and fish return trough, although not representative of the best performing examples of this technology (i.e., "Ristroph" screens), may adequately minimize impingement mortality for the numerically dominant species impinged at GE, with the possible exception of rainbow smelt, although a site-specific assessment of latent mortality would likely be required to support this conclusion.

Ultimately, however, EPA concludes that in this case the dispute over survival rates is not determinative of the BTA for impingement mortality reduction at the Power Plant in the Final Permit. This is because, as EPA explained in the Fact Sheet (at Att. J, p. 24), EPA concluded that using the VFDs would reduce through-screen intake velocity at the Power Plant's CWIS's to 0.5 feet per second or less, which would, in turn, reduce impingement (and therefore mortality) by 96%. (In addition, using the VFDs was estimated to reduce entrainment by 20%. *Id.* at p. 25.) Furthermore, as EPA also explained, installing and using VFDs would cost relatively little, require no additional study, and would produce energy cost *savings*. Moreover, as GE indicates in Comment 11.2, the company "has volunteered" to install and use VFDs. *See id.* at Att. J, pp. 24-25, 39-40. Whether one considers 60,000, 28,000, or 5,000 to be a better estimate of the number of fish killed each year as a result of being impinged by GE's Power Plant, EPA regards this to be a significant amount of avoidable mortality to fish from the Saugus River ACEC. This is especially so when one remembers (a) that these are only estimates and actual levels of mortality could be higher, (b) that certain especially important and vulnerable species are or may be affected (e.g., winter flounder, rainbow smelt), and (c) that impingement morality is only one of many sources of stress to the organisms in question (along with entrainment, thermal discharges, overfishing, water pollution, etc.), In light of these considerations, EPA concludes that that VFDs represent the minimum BTA for impingement mortality reduction at the GE Power Plant's CWIS, whether one assumes an impingement mortality rate of 24% or 100%.

GE's comment does not address the Test Cell, but EPA notes that the Final Permit retains the Draft Permit's requirements for improvements to the CWISs' existing fish return trough. According to information supplied by GE, the fish return system currently deposits fish and other debris *on to the rip-rap above the low tide line*. Given this circumstance, it is reasonable for EPA to assume 100% impingement mortality for the Test Cell. As discussed in Comment/Response 11.3 above, there is no available data to identify the existing level of impingement at the Test Cell. In the Fact Sheet, EPA estimated that more than 4,000 fish per year could be impinged based on average monthly intake flow rates at the Test Cell and a monthly arithmetic mean impingement rate per million gallons of water withdrawn (based on data from the Power Plant). *See id.* at p. 47 and n. 30. Using the updated monthly geometric mean impingement rates, calculated in response to GE's comment, and average monthly intake flow at the Test Cell, EPA estimates annual impingement of about 1,300 fish at the Test Cell. GE has proposed to replace the existing debris/fish return trough, and given the obvious inadequacies of the Test Cell's current fish return trough and the unnecessary fish mortality that it appears to cause, the Draft Permit's technology-based requirements to reduce impingement mortality were based in part on GE's proposed upgrades. *See* Response to Comment 11.9 for further discussion of the Final Permit conditions for the Test Cell.

Entrainment by the Power Plant's CWISs

GE comments that EPA developed and relied upon an "inflated" estimate of entrainment of fish eggs and larvae by the Power Plant's CWIS. The company also states that from the two study years, EPA used the "maximum annual entrainment rate observed between the two study years (for some species the maximum occurred in 1994-1995 and others it occurred in 1995-1996), resulting in a composite worst-case estimate of entrainment that was 9% higher than the annual entrainment estimated for highest of the two study years." GE notes that it calculated an annual fish (eggs and larvae) entrainment of 36,114,268 using the 1994-1995 data, and 63,224,570 using the 1995-1996 data (Technical Exhibit 18). It also calculated the arithmetic mean annual entrainment for the two study years to be 49,669,419 (fish eggs and larvae) and comments that EPA's estimate is 39% higher than this mean value.

EPA has considered GE's comments but concludes that the Agency's use of 69 million eggs and larvae entrained per year by the Power Plant represents a reasonable, albeit conservative estimate based on the limited data available in this case. Experience shows that entrainment numbers can vary from year to year at an individual facility. Indeed, while there are only two years of entrainment data available, substantial sample variability was observed both within and among years. For example, the geometric mean densities of Atlantic mackerel and cunner/tautog eggs entrained in 1996 was nearly twice that entrained in 1995. Therefore, as GE commented, EPA used maximum annual entrainment rates for each species from the two years to calculate its annual estimate. EPA believes this was a reasonable, "worst-case" estimate, not an inflated estimate. At the same time, EPA agrees that averaging the values from the two years, as GE did, could be another reasonable approach to deriving an estimate of annual entrainment from the data at hand. In any event, whether one looks at the value for 1994-1995 (36,114,268 eggs and larvae entrained), the value for 1995-1996 (63,224,570 eggs and larvae entrained), the average of the two years that GE calculated (49,669,419 eggs and larvae entrained), or EPA's more conservative estimate of 69,000,000 per year, all of the estimates indicate that GE likely takes a very large number (in the range of eight figures) of eggs and larvae from the Saugus River ecosystem each year and kills them in the process of operating the Power Plant's CWIS.

GE comments, however, that these entrainment losses should be regarded to be *de minimis* for two reasons. First, GE suggests that because fish eggs and larvae have very high natural mortality levels, most are unlikely to survive even apart from being entrained by the Facility's CWIS and, therefore, killing them via such entrainment is a *de minimis* adverse effect. EPA disagrees with this comment. The entrainment losses of tens of millions of eggs and larvae in this case are far from *de minimis*. The fact that most entrained eggs and larvae would not survive to become adult fish because of natural sources of mortality even absent entrainment does not render their loss as a result of entrainment ecologically inconsequential.[77] In fact, research

[77] GE's comment states that " in its most recent § 316(b) proposal, EPA reiterates the need to evaluate not just the number of individuals lost to entrainment, but their importance to the ecosystem, for purposes of assessing the value

suggests that moderate variability in mortality rates among early life stages may have measurable effects, even as high as an order-of-magnitude difference, on abundance of a cohort at recruitment (Houde 2002). In other words, small changes in mortality rates for eggs and early larval stages may directly affect the abundance of fish of a particular size class (cohort) entering the fishery or reproductive life stages. The large numbers of eggs and larvae generated in the Saugus River estuary by the affected species reflects survival strategies that have evolved over time; individuals produce huge quantities of eggs and larvae to account for high levels of natural mortality. Adding a high rate of anthropogenic mortality to this ecosystem (i.e., the entrainment of tens of millions of eggs and larvae from cumulative impacts at the GE and Wheelabrator Saugus CWISs) may reduce populations of adult fish directly or threaten the species' health by reducing or eliminating any "compensatory reserve" that the species had to weather unusually high mortality events from natural causes (e.g., extreme weather effects). Moreover, reduced populations of adult fish could result in reduced egg and larval abundance for the affected species, and so on.

Furthermore, the fish eggs and larvae in question are an important part of the food web and energy budget of the affected ecosystems. These issues are all of particular concern given the importance and sensitivity of the Saugus River estuary, a state-designated ACEC and a spawning area for fish, and given the fact that entrainment is a cumulative adverse effect on the species that combines with other adverse effects (e.g., GE's discharges of waste heat and other pollutants, impingement by GE, overfishing, the cooling system operations of the Wheelabrator power plant, spawning habitat degradation) to put pressure on these species. EPA further explains the various ecological values of the eggs and larvae in Response 11.3 and the Fact Sheet, Att. J, pp. 14-15, 35-38.

GE also argues that EPA should have put the entrainment figures better into context by "converting" the eggs and larvae entrained into "age-1 equivalents." GE then indicates, however, that it discusses its age-1 equivalent analysis in a separate comment. EPA does not agree that it needed to convert the eggs and larvae to age-1 equivalents in order to provide better context to the entrainment losses in this case. EPA will further address this issue in response to the comment 11.5 in which GE discusses the issue in greater detail.

Comment 11.5: EPA Incorrectly Assumed that Impingement and Entrainment from the CWIS, at the Levels Estimated by the Agency, would cause Adverse Environmental Impact.

All of the available evidence (including the site-specific impingement and entrainment monitoring study (MRI, 1997), information on the occurrence of rare, threatened, and endangered species, and fishery management plans and monitoring data for commercially and recreationally important fisheries) indicates that operation of the CWISs at the Facility has not resulted in material adverse environmental impact to the Saugus River ecosystem. Furthermore,

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of entrainment reductions. *See, e.g.*, 76 Fed. Reg. 22,285." It is not clear to EPA which passage from the referenced page of the Federal Register notice GE is pointing to in its comment. Nevertheless, even GE's comment seems to recognize that EPA has not stated that the loss of large numbers of individual organisms from an ecosystem is immaterial and should not be considered an adverse environmental impact. EPA does not believe its approach for this permit is inconsistent with the Agency's discussion or approach discussed in the Federal Register notice.

continued operation of the CWISs, with implementation of the existing CWIS technologies and the additional operational measures proposed by GE, is unlikely to adversely impact the balance or diversity of the ecosystem's overall assemblage of organisms into the future.

The CWISs do not Adversely Impact Rare, Threatened, or Endangered Species.

The Saugus River fish assemblage in the vicinity of the Facility includes a diverse mix of marine and estuarine species, euryhaline freshwater species, and anadromous and catadromous species. However, no federally threatened or endangered fish species are presently known to occur near the Facility or were collected in impingement or entrainments samples.

Anadromous species collected in impingement samples included rainbow smelt and two herring species collectively referred to as river herring – blueback herring and alewife. The National Oceanographic and Atmospheric Administration's ("NOAA's") National Marine Fisheries Service ("NMFS") has identified rainbow smelt and river herring as species of concern in the coastal waters of New England generally. Each species of river herring, which range widely along the Atlantic coast, was impinged during only a single impingement sampling event (out of 39 total impingement sampling events) during the two-year study by MRI (1997). Neither river herring species was reported in entrainment samples or in ichthyoplankton samples taken from the river adjacent to the facility.

Rainbow smelt, which provide an important recreational fishery, were collected as juveniles or adults in only four of 39 total impingement sampling events (MRI, 1997). Only three rainbow smelt larvae were collected during the entire two-year study, two from ichthyoplankton samples taken in the river (out of 60 total sampling events) and one in an entrainment sample (out of 60 total entrainment sampling events). Thus, the site-specific studies show that rainbow smelt and river herring occur in negligible numbers and frequencies in fish impingement and entrainment samples at the Power Plant CWIS.

Losses to the Fishery from Impingement and Entrainment are *de minimis*.

Several commercially and recreationally important fishes occur in the Saugus River estuary near the Facility; however, EPA has not provided any evidence indicating that current operation of the CWISs is adversely affecting populations of any of these species, particularly given that, as EPA has recognized, the proportional area and volume of the Saugus River affected by the GE Power Plant CWIS are very small. As a result, the total numbers of fish impinged and entrained are negligible when converted to adult equivalents and production foregone and placed in the context of total fishery populations in the local area and region.

Although EPA concludes that its estimates of fish impingement mortality and entrainment represent "large numbers" (Fact Sheet, Attachment J, p. 15), EPA has made no attempt to place those numbers in any context by which their environmental significance can be fairly judged. Instead, the Agency "concludes that the greater the reduction in these impacts, the greater the benefits that will be achieved," without citing any support for that proposition. *Id*., p. 39. Indeed, the Agency concedes that it lacks the data from which to judge whether there is a threshold for impact reduction "below which ecological gains will be forfeited, or above which there will be no difference." *Id.* Equally important, the Agency did not attempt to quantify the incremental benefits of further reducing the relatively small numbers of fish lost by implementing the costly measures it proposes as "BTA."

Further analysis shows that the total numbers of commercially and recreationally important fish species impinged or entrained at the Power Plant CWIS are relatively small in proportion to the total fishery resources in the source waterbody. This is the case because the hydraulic zone of influence (HZI) relative to the cross section of the river and the volume of cooling water withdrawn is small compared to the total volume of the water column in the Saugus River. As delineated in the Cooling Water Intake Structure Information Document (CH2M HILL, 2008), the maximum HZI for the Power Plant CWIS at its currently permitted flow rate is centered along the deeper northern shore of the Saugus River and does not extend beyond the middle of the river or to the shallow, intertidal habitats along the southern shore. Its maximum area is about 182,930 square feet, and its maximum hydraulic radius is about 343 feet. The HZI also does not intrude into the saltmarsh habitats of Rumney Marsh in the Bear Creek and Pines River estuaries. The volume of water pumped at the Power Plant CWIS under the maximum permitted flow represents only 3 percent of the tidal excursion volume over one tidal cycle of ebb and flow (CH2M HILL, 2008). In addition, the site-specific impingement and entrainment monitoring data collected by MRI (1997) demonstrate that in practical terms, very few commercially and recreationally important fish are affected by operation of the Power Plant CWIS. As discussed *supra* at Section XI.D.2, annual impingement mortality is likely on the order of only 5,036 juvenile and adult fish (Technical Exhibit 18). These include annual impingement mortality losses on the order of only 608 rainbow smelt; 535 winter flounder; 175 cunner; 154 windowpane flounder; 63 yellowtail flounder; 33 river herring; 31 Atlantic cod; and 7 Atlantic herring. To place these small numbers into perspective, 608 rainbow smelt are equivalent to the number of fish that twelve recreational fishermen would be allowed to catch and possess in a single day along the coast of Massachusetts (322 CMR 6.00: Regulation of Catches).

To further characterize the potential impacts of fish impingement and entrainment at the Power Plant CWIS on important commercial and recreational fisheries, GE's experts quantified the estimated fish losses resulting from species-specific and life-stage specific impingement mortality and entrainment losses. These losses were quantified by calculating Age-1 equivalents (for entrained organisms), foregone fishery yield, and foregone biomass production (Technical Exhibit 18). The equations used in these biological models are described in detail in Chapter A5 of EPA's Regional Analysis (EPA, 2004). Life history parameters, including natural mortality, fishing mortality, and weight for each life stage that are inputs to the three models were taken from Appendix C1, Life History Parameter Values Used to Evaluate I&E in the North Atlantic Region (EPA, 2004).

Age-1 Equivalents

An Equivalent Adult Model ("EAM") was developed to express fish entrainment losses calculated from the MRI (1997) monitoring data as an equivalent number of Age-1 individuals (Technical Exhibit 18). An EAM was developed for each of the two monitoring years to assess the entrainment temporal variability. The total number of Age-1 equivalents from entrainment for both years ranged from 94,576 to 380,479 fish, with a mean of 237,528 individuals per year.

Forage species dominated the Age-1 equivalents, accounting for 98 percent of the mean Age-1 equivalents lost due to entrainment at the Power Plant CWIS. Two forage species, grubby and rock gunnel, comprised 90 percent of the Age-1 equivalents. The larvae of these two species were collected in the highest abundances in mid-March and April (MRI, 1997). Because March and April are cooler months with lower steam generation needs, the VFD's that GE has proposed to install most likely would be available to further reduce flow during this period, thereby further reducing the potential for entrainment.

The total number of fish lost annually from both entrainment and impingement mortality at the Power Plant CWIS is on the order of 242,554 fish. Fish lost due to entrainment account for over 98 percent of the total. Three forage species – American sandlance, grubby, and rock gunnel – account for 94 percent of the losses. These three species have no commercial or recreational value, nor are they otherwise in scarce supply as forage for more valued species. Five commercial species, including Atlantic herring, Atlantic mackerel, cunner, windowpane, and winter flounder (in descending order of relative abundance), collectively accounted for less than 4 percent of the total fish lost from operation of the Power Plant CWIS.

Foregone Fishery Yield

Direct losses to the fishery due to fish impingement mortality and entrainment at the Power Plant CWIS were evaluated by calculating the primary foregone fishery yield for the five numerically dominant commercially important species: Atlantic herring; Atlantic mackerel; cunner; windowpane; and winter flounder (Technical Exhibit 18). Primary foregone fishery yield is a measure of the pounds of commercially or recreationally important fish that are not harvested because the fish are lost to impingement and entrainment (EPA, 2004). The total primary lost yield for the five species was 235.9 pounds (lb.). Atlantic herring had the highest lost yield of 90.6 lb., followed by winter flounder (66.4 lb.), cunner (41.8 lb.), Atlantic mackerel (32.2 lb.), and windowpane (4.8 lb.). To help place the small size of these losses in perspective, average annual Massachusetts landings from 2005 to 2009 were 75,432,948 lb. for Atlantic herring; 4,535,635 lb. for winter flounder; 50,352,856 lb. for Atlantic mackerel; and 117,638 lb. for windowpane (National Marine Fisheries Service, 2011).

Foregone Biomass Production

The expected total amount of future growth of forage species lost as a result of impingement and entrainment at the Power Plant CWIS was estimated by calculating the foregone biomass production (Technical Exhibit 18). Foregone production was calculated for the three numerically dominant forage species at the Facility: American sand lance, grubby, and rock gunnel. The total lost production all three species was 3,374 lb. Rock gunnel had the highest foregone production of 1,531 lb., followed by grubby (1,510 lb.) and American sandlance (332 lb.).

The foregone production of forage species was then used to estimate the subsequent reduction in harvested species yield that results from a decrease in the food supply (EPA, 2004). Secondary and tertiary foregone yields were calculated to estimate the reduction in harvested species that result from loss of their prey base (Technical Exhibit 18). Secondary production is the portion of total forage production that has high trophic transfer because it is directly consumed by the harvested species. Tertiary production has a low trophic transfer because it is not consumed directly by the harvested species but instead reaches harvest species indirectly after passage through other parts of the food web (EPA 2004). Total secondary and tertiary production foregone were 60.7 and 24.3 lb., respectively.

Summary of Fishery Losses

In summary, the total foregone annual fishery yield due to the operation of the GE Power Plant CWIS is on the order of 321 lb. (235.9 lb. + 60.7 lb. + 24.3 lb = 320.9 lb.). To help place the small size of these losses in perspective, 2009 commercial fishing landings of winter flounder were 1,972 metric tons in Massachusetts and 2,140 metric tons in all New England states (National Marine Fisheries Service, 2011). Thus, the annual loss of only 320 lb of fish across all species represents an insignificant impact. This *de minimis* loss is insufficient to justify the substantial changes EPA has proposed.

Another way of understanding the implications of these losses is by assessing their value in economic terms. EPA did not attempt any economic valuation, although the Agency guidance and the recently proposed § 316(b) rule for existing facilities suggest such an analysis is appropriate for § 316b) purposes. *See, e.g.*, EPA "Guidelines for Preparing Economic Analyses," EPA 240-R-00-003 (Sept. 2000) ("EPA Economic Guidelines"); 77 Fed. Reg. 22,279, 22,288. GE's experts have prepared a preliminary estimate of the economic value of the combined impingement and entrainment losses that the existing Power Plant CWIS reasonably may be expected to cause. Multiplying the total loss in of commercially or recreationally important fish pounds (320.9) by the most recent NMFS statistics on the average ex-vessel price for landings in Massachusetts of $1.12 per pound[78] yields a total of $ 359.41. As EPA has recognized in other contexts, this type of gross value reflects the upper boundary for the value of losses assuming that all of the fish lost would be caught by producers (*i.e.,* commercial fishermen), when in fact much will not. In the previous and current § 316(b) rulemakings, EPA has recognized that the actual change in "producer surplus" is likely to range from zero to 40% of the gross value of change in catch. Applying this range to the gross value of $ 359.41 results in an anticipated value of between $ 0 and $ 143.76.[79]

In addition, it is important to note that this value (and the underlying number of organisms lost and resulting fishery yield foregone) reflects current Facility operations, and does not account for the reductions that would be achieved by the operational and other measures GE has proposed will be achieved. When those reductions are factored in, there is even less reason to believe that

[78] NMFS, 2009. NMFS Landings Query Results.
http://www.st.nmfs.noaa.gov/pls/webpls/MF_ANNUAL_LANDINGS.RESULTS accessed on May 6, 2010

[79] It also is possible that some portion of the estimated foregone fishery yield would be allocated to the recreational fishery. When changes in recreational catch are sufficiently large, they can affect the value of the fishing experience on a given trip and, in some instances, how many trips recreational fishers will take. In this case, given the very small number of organisms relative to the size of the fishery, the anticipated losses are likely too small to affect recreational catches or participation in the recreational fishery. Thus, GE allocated all of the economic value to the commercial fishery.

the Facility CWISs are causing adverse environmental impact, or that the benefits of EPA's BTA proposal will justify their substantial costs.

Response to Comment 11.5

GE's comment begins by stating that the available evidence shows that "operation of the CWISs at the Facility has not resulted in material adverse environmental impact to the Saugus River ecosystem." EPA disagrees with this comment. In Response 11.3, EPA explains how the term "adverse environmental impact" is defined under CWA § 316(b) and describes how the relevant data clearly demonstrates that GE's CWISs have caused and are causing adverse environmental impacts. In the same response, EPA also discusses how it factors in the import or magnitude of the adverse environmental impacts in question as part of its BTA determination. EPA has considered the points in GE's comment No. 11.5, above, pertaining to the magnitude of the adverse environmental impacts caused by the Facility's CWISs. EPA responds to these comments below.

GE further comments that "continued operation of the CWISs, with implementation of the existing CWIS technologies and the additional operational measures proposed by GE, is unlikely to adversely impact the balance or diversity of the ecosystem's overall assemblage of organisms into the future." This comment raises more complex issues. To begin with, the BTA technology standard specified in CWA § 316(b) does not *per se* turn on whether or not future operations are likely to adversely affect the balance or diversity of the community of organisms that ought to inhabit that ecosystem. Rather, the effect on community balance and diversity is one of the many factors that EPA may consider in assessing the magnitude or import of the adverse environmental effects in question, which, in turn, is considered when determining the BTA. In this regard, EPA has carefully considered these comments by GE.

In EPA's judgment, no analysis or data has been produced to demonstrate whether or not it is likely that GE's CWISs, whether considered alone or in conjunction with other adverse effects (e.g., Wheelabrator Saugus's operations, GE's discharges of waste heat and other pollutants, others sources of pollution, fishing pressure, spawning habitat degradation for anadromous fish), has adversely affected, or will adversely affect, the balance or diversity of the affected ecosystem's assemblage of organisms. In addition, EPA has not assumed that such adverse effects would occur. For example, while EPA pointed out that entrainment and impingement by GE's CWISs "impact both resident and migrating fish, including species experiencing population declines and recreationally and commercially important species," Fact Sheet, Att. J, p. 16, EPA did not state that the balance or diversity of the assemblage of organisms in the affected portion of the Saugus River had been reduced by this entrainment and impingement. *See id.* at pp. 14-16, 35-38. Rather, EPA stated, and explained its reasons for stating, that "reducing entrainment and impingement will also likely result in additional indirect benefits to the ecosystem and the public's use and enjoyment of it … [. Including, among other things,] increasing or maintaining biological diversity …." *Id.* at p. 35.

EPA also explained that increasing populations of fish in an aquatic ecosystem may bolster species and genetic diversity which, in turn, improves the health of that ecosystem. *Id.* at pp. 36-37. This is not the same thing as saying either that the existing operation had adversely affected the diversity or balance of the community organisms, or that GE's proposed future operations would do so. After all, GE proposed using VFDs to *reduce* entrainment and impingement, just not by as much as the BTA selected by EPA would do. *See id.* at pp. 39-40 (explaining that while GE favors the VFDs-only plan, EPA prefers the VFDs-and-wedgewire screens plan as the BTA because it would achieve greater entrainment and impingement reductions at a reasonable and relatively small additional cost; EPA also rejected the substantially more expensive closed-cycle cooling option because, based on current information, the greater costs did not appear to be warranted by the demonstrable benefits).

GE's comment then goes on to discuss a variety of issues related to the assessment of the CWISs' adverse impacts on aquatic life in the Saugus River. These issues include the following: effects on rare, threatened or endangered species; whether the impacts should be considered *de minimis*; "Age 1 Equivalents" analysis; foregone fishery yield; foregone biomass production; and overall fishery losses. EPA responds to these comments below.

Effects on Species of Special Concern

GE comments that "no federally threatened or endangered fish species are presently known to occur near the Facility or were collected in impingement or entrainments samples." EPA agrees with this comment.

At the same time, GE acknowledges that impingement samples at GE have collected rainbow smelt and river herring (comprised of blueback herring and alewife), both of which have been identified as species of concern in the coastal waters of New England by the National Oceanographic and Atmospheric Administration's ("NOAA's") National Marine Fisheries Service ("NMFS") (now commonly referred to as "NOAA Fisheries"). GE further comments, however, that entrainment and/or impingement of river herring and rainbow smelt by the Facility's CWISs is negligible (in amounts and frequency). Yet, while it is true that rainbow smelt were only collected on four out of 39 sampling dates during the two-year MRI study, on a single date in October 1996 GE impinged an estimated 235 fish in 24 hours. GE also estimates annual impingement mortality of 608 rainbow smelt.

EPA agrees that the available data from GE neither evidences a high level of entrainment or impingement of rainbow smelt or river herring, nor indicates an abundance of the eggs and larvae of these species in ichthyoplankton samples from the Saugus River. EPA has considered this data concerning rainbow smelt and river herring and factored it into our assessment of the magnitude of the adverse impact from GE's CWISs. In EPA's view, the data does not evidence a severe impact on those species of fish, but several countervailing points also must be noted: (1) given that the type of estuarine habitat around GE's CWIS should be suitable for rainbow smelt and river herring, these species could be present in higher numbers at times that were not captured by the limited sampling that has been done (only two years of entrainment, impingement, and in-river ichthyoplankton data has been collected at GE from 1994 to 1996; (2) due to the limited data set EPA has less confidence that entrainment and impingement of these species has not occurred at higher levels during other years (we would have greater confidence if the same results were found over more years of sampling); (3); it is possible that the presence of these species could increase if their populations grow as a result of conservation measures being taken by regulatory authorities (including environmental improvements implemented at Wheelabrator and GE under their new NPDES permits); and (4) the species could be adversely affected by losses of their prey to entrainment and impingement (e.g., zooplankton for larvae and small fish for adults).[80]

Furthermore, regardless of the special status, or lack thereof, of the aquatic life entrained and impinged by GE's CWISs, it must be remembered that, as EPA discussed in the Fact Sheet, the portion of the Saugus River directly affected by GE's CWISs (and pollutant discharges) is designated as both an Outstanding Resource Water (ORW) and an Area of Critical Environmental Concern (ACEC) by the Commonwealth of Massachusetts based on the outstanding quality, uniqueness, and significance of its natural and cultural resources, including its biological community. The purpose of the ACEC program is "to preserve, restore, and enhance the critical environmental resources and resource areas of the Commonwealth of Massachusetts." The goals of the program include increasing protection for ACEC resources and to facilitate and support the stewardship of ACECs. Projects in ACECs are closely reviewed to avoid or minimize adverse environmental impacts. The affected segment of the Saugus River is also designated a class SB water under Massachusetts Water Quality Standards and, as a result, these waters are supposed to provide "a good quality, healthful fish habitat" and a recreational fishing resource. Fact Sheet, Att. J, p. 10. The special designations applied to the Saugus River in recognition of the especially important and high quality habitat that it ought to provide heighten the significance of losing large numbers of aquatic organisms from the river to entrainment and impingement by GE, and they also highlight the importance of minimizing adverse impacts from the CWISs.

In addition, while GE may not have entrained or impinged any federally-listed or state-listed endangered or threatened species, based on the available data, the facility *has* entrained and impinged species of particular direct importance for fishing. Furthermore, GE has also entrained or impinged species that provide prey for these species that are targeted for fishing.[81] As EPA explained in the Fact Sheet:

> [s]everal of the fishes noted in the studies [of entrainment and impingement by GE] are desired species for recreational and/or commercial fishermen (e.g., winter flounder, bay anchovy, Atlantic cod, tautog and Atlantic mackerel). In fact, of the 42 species or groups of species recognized as commercial fishery resources by the National Marine Fisheries Service Northeast Fisheries Science Center, at least 20 species are present near the facility according to the 1989 and/or 1997 MRI studies. In addition, 12 of the species sampled during the MRI studies have

[80] As EPA explained in the Fact Sheet, Att. J, p. 36:

> [b]oth rainbow smelt and river herring have experienced declining populations in recent years, and minimizing adverse impacts to these populations is fundamental to their recovery. In fact, both rainbow smelt and river herring are listed as Species of Concern by the National Oceanographic and Atmospheric Administration (NOAA), and the Massachusetts Division of Marine Fisheries (MassDMF) provides further protection for river herring through a moratorium on the harvest, possession, and sale of river herring extended through 2011.

[81] EPA recognizes that all species of fish have ecological importance because of their role in the food web. For example, forage fish may, among other ecological functions, provide sustenance for other species of more direct interest to humans.

> fishery management plans or restrictions managed by the New England Fishery Management Council. Generally, these fishery management plans are designed to reduce fishing mortality and promote rebuilding of stocks to sustainable biomass levels in response to population declines resulting from overfishing. Several of the species subject to impingement and entrainment, including yellowtail flounder, American plaice, cod, white hake, and haddock, are overfished (meaning that stock biomass remains low compared to maximum sustainable yield biomass) and/or overfishing is currently occurring (meaning fishing mortality remains high compared to maximum sustainable yield). In addition to fishes, several species of invertebrates, including commercially and/or recreationally important species such as the horseshoe crab and American lobster, are present in the Saugus River.

Fact Sheet, Att. J, p. 13. EPA further explained that:

> [s]everal commercially and recreationally important species are among the species commonly impinged or entrained, including winter flounder, windowpane flounder, Atlantic mackerel, and Atlantic herring. As stated in the discussion of entrainment impacts, fishery management plans are in place for many of these species which restrict fishing for them in order to help rebuild stocks. With fishermen facing tight controls on the beneficial harvest of, for example, adult groundfish, it would be anomalous to allow manufacturing facilities such as GE Aviation to systematically kill millions of groundfish eggs and larvae each year in the process of withdrawing cooling water from public waterways because their CWISs have not been adequately controlled by the use of available technology. Increases in forage fish and invertebrate populations (e.g., cunner, tautog, and grubby) may also benefit commercially and recreationally important fish species … by increasing prey abundance.

Id. at p. 35. *See also* Massachusetts Division of Marine Fisheries – Species Profile: Tautog (as of 1/18/13, available at http://www.mass.gov/dfwele/dmf/recreationalfishing/tautog.htm (tautog is a popular inshore game fish). In sum, EPA regards GE's entrainment and impingement of the fish discussed above from the Saugus River to represent a serious adverse environmental effect.

Magnitude of Entrainment and Impingement Effects

In Technical Exhibit 18 (CH2M Hill 2011), GE estimated that the loss of age-1 equivalents from entrainment at the Power Plant ranged from 94,576 (1994-1995 data) to 380,479 individuals (1995-1996 data) with a mean of 237,528 individuals over the two years of the study. As discussed above in response to GE's comment, EPA considers the impacts from GE's CWIS adverse whether the individuals lost are of direct commercial or recreational importance, species of special concern, or whether they are purely elements of an ecologically valuable and productive estuary.

GE's primary argument that the impacts on the aquatic community are *de minimis* is that mortality of fish eggs and larvae at the Power Plant CWIS results in the loss of a negligible amount of harvestable fish (321 pounds) and therefore, the economic benefits of any technology would be similarly limited (GE's estimate is between $0 and $144). An analysis based only on the estimated monetized economic value of estimated losses to commercial and recreational fishery resources, such as that provided by GE, represents a very narrow perspective on the valuation of biological resources and entirely ignores the "non-use benefits" provided by a biologically productive estuary like the Saugus River. At a minimum, the method used to quantify the benefits in Comment 11.5 completely disregards any uses or services other than 1) those provided in the form of age-1 fish, 2) the lost harvestable weight of fish and 3) the lost harvestable weight of fish resulting from loss of forage fish.

Metrics such as age-1 equivalent fish, foregone fishery yield, and production foregone ignore functions of eggs and larvae in the ecological system other than as precursors to adult fish. Predation is likely the single largest cause of mortality for early life stages of fish, which suggests that eggs and larvae are an important source of food (Miller 2002). None of the metrics used to evaluate impacts of entrainment mortality in Comment 11.5 consider impacts of the loss of eggs and larvae as a food source in the river. Within the known Saugus River fish assemblage, American sand lance, Atlantic silversides, stickleback, Atlantic herring, and Atlantic mackerel are known predators on fish eggs and larvae, as are jellies and other planktonic organisms. The metrics commonly used to quantify and/or monetize the benefits of reducing entrainment mortality make no attempt to quantify benefits of the ichthyoplankton, where impacts are more directly applicable than at the level of harvestable fish species.

GE is correct that age-1 equivalents, forgone fishery yield, and production foregone are among the metrics that EPA has used in assessing the impacts of impingement and entrainment for its national 316(b) rulemaking efforts. EPA found that these metrics were helpful to standardize regional and national estimates of mortality across years, facilities, and geographical regions, as well as to standardize losses of aquatic organisms across different life stages. EPA also found these metrics to be useful in support of both economic benefits analysis on a national scale and estimates of changes in mortality as a result of entrainment reductions on a national scale under alternative regulatory options. EPA did not specify that these metrics *must* be used for BTA analyses under CWA § 316(b), whether in support of national rulemakings or in support of individual permit development on a BPJ basis.

Entrainment at GE during the MRI study generally was dominated by fish eggs and by larvae of forage fish. Because eggs have to overcome immense natural mortality to survive to the larval stage, and then continue to overcome similarly high natural mortality to survive to the next stages, even fewer eggs than larvae will survive to age-1 in an equivalency model. In addition, forage fish contribute less to the most commonly used metrics because they are not directly harvested. GE estimated that entrainment at the Power Plant results in an average annual loss of 242,554 age-1 equivalent fish (89% of which are rock gunnel and grubby) and 3,374 pounds of forage fish (sand lance, rock gunnel, and grubby) based on the two years of study data. Because the species most impacted by entrainment during the study were forage species, GE's estimated benefits (presented as the economic value of the potential increase in commercially and recreationally important species) are extremely low. GE further comments that 97% of the fish saved due to implementation of additional technologies would be small, demersal forage fish that are abundant in the Saugus River, although GE provides no estimate of the forage fish populations in the Saugus River. EPA does not agree that when conducting a site-specific BTA analysis, it is required to determine the best technology available based entirely on the estimated monetized benefits for commercial and recreational fish with no consideration of non-use benefits (see Response to Comment 11.6).

Finally, it is important to recognize that the area of the Saugus River in which GE is located is subject to impingement and entrainment impacts from multiple CWISs at the GE and Wheelabrator Saugus facilities. Wheelabrator Saugus impinges an estimated 4,300 fish annually (Normandeau 2012), many of which are individuals of the same species as the approximately 29,000 fish impinged at the Test Cell and Power Plant CWISs annually. Similarly, Wheelabrator Saugus entrained about 52.6 million fish eggs and larvae in 2011, which includes a high percentage of winter flounder larvae, rock gunnel larvae, labrid eggs, and windowpane eggs (Normandeau 2012). These same species of eggs and larvae also make up a relatively large proportion of the estimated 49 to 69 million eggs and larvae entrained at GE's CWISs annually. Therefore EPA considered the potentially substantial cumulative adverse impacts from impingement and entrainment at both facilities. The site-specific determination under CWA Section 316(b) for each facility is based on a host of factors unique to each individual CWIS, but in all cases EPA has required technology-based permit conditions that reflect the BTA for that particular facility. At the Wheelabrator Saugus CWIS, the location of the CWIS limited the availability of technologies and EPA determined that a combination of variable frequency drives and a new fish return system was the BTA. At GE's Power Plant, EPA determined that a combination of variable frequency drives and wedgewire screens is the BTA, while a more stringent annual monthly average flow and new fish return trough is the BTA at the Test Cell. The entrainment and impingement losses at GE (and Wheelabrator) are capable of being reduced by using available technology. EPA's BTA determinations reflect reasonable, feasible steps to achieve those reductions.

Comment 11.6: EPA's Assumption that Achieving the Predicted Reductions in Impingement and Entrainment will Produce Appreciable Benefits for the Saugus River is Unfounded.

In addition to the concerns EPA expresses about direct effects of the CWISs in terms of individual losses, the Agency posits that such losses

> can substantially degrade the quality of the aquatic habitat by adding to the system a significant anthropogenic source of mortality to resident organisms. In addition to considering these adverse impacts directly, their effects as cumulative stressors in conjunction with other existing stressors on the species should also be considered. Furthermore, losses of particular species could contribute to a decrease in the balance and diversity of the ecosystems overall assemblage of organisms.

Fact Sheet, Attachment J, p.12.

But EPA never attempts to make any quantitative or qualitative linkages between the nature and amount of losses attributable to the Facility CWISs and any specific ecosystem services in the

Saugus River, nor does it attempt any assessment of the extent to which reducing loses will improve or enhance any ecosystem services.

Instead, EPA cites a few sources related to aquatic habitat, food sources for migratory waterfowl, increasing or maintaining biodiversity, and other ecosystem services. But those sources provide no support for the proposition that the impingement and entrainment losses caused by the Facility constitute "a significant anthropogenic source of mortality to resident organism" capable of individually or cumulatively causing substantial degradation to the quality of aquatic habitat. EPA cites Holmlund and Hammer (1999) as support for the principle that fish populations are related to other ecosystem services, such as growth of algae and macrophytes, regulation of food web dynamics, recycling nutrients, and maintaining species and genetic diversity. This may be the case, but in the absence of any quantitative or qualitative assessment of how changes in impingement and entrainment at the Facility may contribute to changes in ecosystem services in the Saugus River, this general statement of principle is essentially meaningless.

EPA also notes that low phenotypic diversity, "which can be a result of loss of a percentage of the fish population (such as mortality associated with a CWIS) can decrease equilibrium catch and effort levels used by regulatory agencies to set quotas for commercial fishing stocks." It further cautions that "overestimating the maximum sustainable yield based on a conventional growth model in populations with low phenotypic variance may lead to overharvesting and potentially collapse the stock. (Akpalu, 2009)" (Fact Sheet, Appendix J, p. 37). But EPA made no attempt to show that the relatively *de minimis* impingement and entrainment losses associated with the Facility's CWISs are likely to have any effect on the phenotypic diversity of the Saugus River. Indeed, EPA made no attempt to assess what percentage of the population of any species would be lost, or to assess the implications of that loss to the resulting population, much less to overall phenotypic diversity. As discussed above, even looking at an upper bound estimate of losses and assuming all of those losses would have consequences for commercially and recreationally important species, the total pounds fish affect (320.9) is vanishingly small compared to the overall 2009 Massachusetts catch of approximately 356 million pounds. The suggestion that the very small loss associated with the Facility's CWIS is likely to adversely affect the overall ecosystem is implausible at best.

In addition, EPA cites Worm, et al. (2006) as support for the general principle that biodiversity is related to the resilience of marine ecosystems, thus protecting against the collapse of important fish species over time. But Worm et al. (2006) address the impacts of large changes in fish populations and diversity at a landscape scale. Thus, this paper does not support the conclusion for which EPA offers it, *i.e.*, that relatively small losses comprised primarily abundant forage species would affect either biodiversity or the resilience of the marine ecosystem.

Response to Comment 11.6

GE comments that while EPA points to a variety of adverse environmental effects that can result from habitat degradation associated with entrainment and impingement by CWISs, and cites to references supporting the notion that reduced biodiversity could contribute to undermining various ecosystem services, EPA does not demonstrates the GE's entrainment and impingement is causing or will cause these problems. GE further argues that its entrainment and impingement is causing only small losses which are unlikely to lead to the sort of larger scale or indirect adverse results pointed to by EPA.

EPA agrees with GE that the Agency's analysis in support of the BTA determination for the Draft Permit did not scientifically demonstrate that GE's entrainment and impingement have directly caused a loss of biodiversity or have undermined particular ecosystem services. That was not, however, the point of EPA's discussion in this regard. The first passage from EPA's analysis that GE quotes above is from a general discussion about the types of adverse effects that entrainment and impingement could individually cause or contribute to as a cumulative effect. Fact Sheet, App. J at p. 12. EPA sees no problem with its discussion taken in proper context.

Later in its analysis, EPA again discusses generally the type of ecological benefits that maybe provided as a result of maintaining an ecosystem's resident and migratory fish. *See* Fact Sheet, pp. 35-38. GE does not question the validity of the scientific sources cited by EPA, but argues that the Agency did not demonstrate that entrainment and impingement losses at GE are sufficient to cause the types of problems discussed in the referenced scientific papers. As a result, GE comments that EPA's discussion is, in effect, irrelevant (or "essentially meaningless") to the permit.

In EPA's view, GE's comment goes too far. EPA explained and documented the special public importance of the Saugus River ecosystem, the habitat it provides, and the aquatic organisms that inhabit it. Moreover, EPA explained and documented that, based on the limited available data, GE is taking millions of eggs and larvae and thousands of juvenile and adult fish from the Saugus River ACEC. Furthermore, EPA explained and documented its concern over the potential cumulative adverse effects of these losses on the affected ecosystem, when viewed together with other stressors such as GE's discharges of waste heat and other pollutants, Wheelabrator's cooling system operations (discharges and withdrawals), overfishing, habitat degradation, and other impacts. EPA then discussed the range of these adverse impacts, both ones that are clear (numbers of eggs and larvae entrained and fish impinged) and others that are not clear but are possible (localized population level effects), and considered these in the context of a qualitative assessment of the benefits and potential benefits of reducing entrainment and impingement. EPA stated as follows:

> In summary, achieving substantial reductions in impingement and entrainment by GE Aviation's CWISs will increase the number of commercial, recreational, and forage fish (eggs, larvae, juveniles and adults) as well as invertebrate species in the Saugus River. These improvements are also likely to contribute to increased populations of adult fish. In turn, reducing adverse impacts from impingement and entrainment could provide a number of direct, indirect, and non-use benefits both within the Saugus River and at a regional scale. Benefits may include, for example, preservation of habitat for migratory birds and other terrestrial animals dependent on the salt marsh, enhanced recreational opportunities, including birdwatching, fishing, and kayaking, and preservation of Rumney Marsh, an outstanding resource water and ACEC with intrinsic biological value particularly worthy of protection, as indicated by the state's ACEC designation. While EPA has not developed a monetized estimate of these benefits, the value to the public

> of the Saugus River ecosystem and its natural resources is evident from the federal, state and public commitment of limited financial resources and effort to protect these natural resources and the multiple special designations given these resources to promote their protection. Moreover, substantially reducing entrainment and impingement will contribute to "attainment of the objectives of the Act and § 316(b)," including (a) minimizing adverse environmental impacts from cooling water intake structures, (b) restoring and maintaining the physical and biological integrity of the Nation's waters, (c) achieving, wherever attainable, water quality providing for the protection and propagation of fish, shellfish and wildlife, and (d) providing for recreation, in and on the water.

Fact Sheet, Att. J, p. 38. Taking all of this into account and considering it in relation to the costs of various technologies, EPA concluded that the costs of closed-cycle cooling were not warranted in this case, but that the costs of the VFD option coupled with wedgewire screens were warranted. *Id.,* pp. 38-40.

Comment 11.7: EPA's Erred in Concluding that Retrofitting the Power Plant with Closed-Cycle Cooling is Technologically and Economically Available Cooling Water Intake Structure Technology for the Facility.

GE identified significant uncertainties, including uncertainties regarding the soil conditions, potential sources of interference, and other safety and environmental issues that require further evaluation before any determination that closed cycle cooling ("CCC") is feasible for the Facility could be justified. Developing that information would require detailed studies that fall outside the scope of the Section 308 letter pursuant to which GE submitted the preliminary evaluation on which EPA relied. Instead of developing or requesting that GE develop the needed information, EPA assumed, without adequate support, that retrofitting CCC is technically feasible and economically reasonable. EPA's assumption is incorrect, for the following reasons.

Soil.

As identified in GE's cooling tower analysis (CH2M HILL, 2008), the conceptual site for new mechanical draft cooling towers in a recirculating cooling water system for the Power Plant would be located in a parking lot next to the river. This site formerly contained underground concrete bunker tanks, which GE properly decommissioned. The tanks were cleaned and filled with clean soil that was compacted. Holes were drilled in the concrete floors of the abandoned-in-place underground storage tanks (USTs) to allow equalization of groundwater pressure within the USTs. In accordance with the Massachusetts Contingency Plan at 310 Code of Massachusetts Regulations 40.1000, a release abatement measure (RAM) plan would need to be developed and implemented for any excavation activities associated with construction. Disposal or recycling of soils and groundwater management under the RAM would require further studies and measures that would at a minimum add substantially to the cost of the retrofit. EPA's estimate of the cost of retrofitting closed-cycle cooling (which is already over $36 million) did not consider these additional costs.

Sources of Interference.

EPA acknowledges the substantial site-specific technological and construction challenges and uncertainties, as well as the high costs of installing mechanical draft cooling towers at a 112-year old facility. Some of those challenges were identified by GE in the cooling tower analysis (CH2M HILL, 2008). These include interferences with critical existing facility infrastructure and disruptions to Power Plant operations, which increase risks to safety and the continuity of Power Plant and manufacturing/testing operations during construction. EPA recognized that data sufficient to resolve uncertainties and fully determine site-specific costs were lacking. But instead of collecting or providing GE an opportunity to collect the necessary information, EPA simply concluded, based on the absence of information, that the technology would be economically and technically achievable.

EPA may not so lightly avoid its responsibility to fully consider the potential costs and risks of constructing cooling towers where, as is the case here, those risks are obvious and significant. Clear and immediate sources of substantial risk include interference from overhead steam transmission lines, power transmission lines, and jet fuel distribution lines located adjacent to the cooling tower site. These lines are supported by stanchions to a height approximately 25 to 30 feet above the ground, and construction equipment would need to pass under these lines, while cranes and other heavy machinery would be operating adjacent to the lines, and increasing the risk of blackouts that could temporarily shut down manufacturing and testing processes. In addition, construction activities would need to be limited to summer months when steam is not needed to heat the Facility. It would be necessary to reduce steam from 650 psig to 200 psig and 3 psig to support processes throughout the Facility; however, in doing so there are some inherent risks. If GE lost the ability to de-superheat the steam, the expansion rate could be greater than the infrastructure (i.e. pipe support hangers) could handle potentially resulting in significant damage to downstream piping and related infrastructure as well as causing a risk to manufacturing operations and potentially life safety. Finally, engine and component test operations that utilize 650 psig steam could not be conducted. Even if these risks could be minimized, the cost of doing so would likely be substantial. That cost was not considered.

Environmental Issues.

EPA acknowledges that non-water quality related environmental impacts identified by GE, including vapor plumes, salt drift, and noise, would require careful evaluation and would likely necessitate abatement technologies to minimize impacts. But EPA has not collected, or asked GE to collect, information necessary to determine the significance of those impacts, the likelihood that they could be abated to acceptable levels, and the cost of such abatement.

In responding to EPA's information request pursuant to CWA § 308(a), GE provided a cooling tower analysis addressing the specific requirements for Technology and Biological Assessment Information, Items 5(a) and 6(a)-(h). EPA requested a detailed description of the non-water quality impacts (including energy, air pollution, noise, public safety), which GE provided. As an example, the cooling efficiency of CCC is limited by air temperature, and CCC is less effective than a once-through river water cooling system. Installation of the CCC will cause the Power Plant to be less energy efficient and increase greenhouse gas emissions. But EPA did not ask GE to determine which non-water quality impacts would require abatement, identify appropriate technologies for abating those impacts, determine that the available technologies would achieve sufficient abatement to qualify for necessary permits and approvals, or calculate the costs of abatement. And EPA itself has presented no new site-specific information regarding the technical efficacy of abatement measures for mitigating non-water quality environmental impacts in this highly urban setting with three major transportation corridors and sensitive viewsheds (including Rumney Marshes ACEC) in close proximity, and Boston Logan International Airport located only 6 air miles south of the facility.

EPA chose not to pursue development of the requisite information, nor did it ask GE to do further studies of the issues identified in the § 308 response. Instead, EPA assumed adverse impacts could be abated to acceptable levels, and that the added cost of abatement would be reasonable and affordable. It did not base this conclusion on any information in the record. Instead, it relied on the absence of record evidence, noting that while GE commented on the huge cost of cooling towers, the company did not conclude that this technology would be unaffordable.[82] Fact Sheet, Attachment J, p. 23. But it is no surprise that GE did not assess the affordability of towers, given that EPA's October 25, 2007 § 308 letter did not ask GE to provide one. Instead, EPA's § 308(a) letter specifically requested "an estimate for the cost for installing and operating each of these technologies" (item 6g), which GE provided. EPA neither requested nor provided GE an opportunity to assess the affordability of closed cycle cooling to the company.

That said, GE does not believe that further assessment of retrofitting closed-cycle cooling at the Facility is warranted, give that the analysis already provided demonstrates that this technology would be economically unreasonable, potentially detrimental to ongoing facility operations during construction, and would not achieve significant ecological benefits in a cost-effective manner. Should GE be required and provided the opportunity to assess the affordability of closed cycle cooling, such an assessment may indicate that certain manufacturing or testing operations would no longer be economically viable at the Facility. Until such an assessment is made, the true magnitude of the costs of cooling towers and the related impact on affordability are unknown.

Other Problems.

As GE's cooling tower analysis showed, vapor plumes originating from the cooling towers and drifting upriver toward the Test Cell could adversely affect jet engine testing, which is sensitive to ambient humidity levels. Excessive humidity, under certain atmospheric conditions, occasionally forces the cancellation of tests. Jet engines are tested using ambient air and must be tested according to Federal Aviation Administration and military specifications, including specific humidity. An increase in frequency of scrubbed tests would result in lost time and costs to the facility's testing business. EPA has not adequately considered this site-specific risk to the

[82] Subsequent evaluations by GE of alternatives to replace its aging Power Plant indicate that GE would not retrofit CCC to its existing Power Plant as even the $37.5 million of costs of retrofitting CCC presented by EPA (which GE considers to be an underestimate), would be more than half the cost of replacing the entire Power Plant.

reliability of facility testing operations, especially considering that the Draft Permit would require the Test Cell to curtail its seasonal operations to minimize fish entrainment.

Response to Comment 11.7

In its comment, GE identifies several uncertainties that, according to the facility, must be evaluated further before any determination that closed-cycle cooling is feasible at GE could be justified. GE comments that soil disposal and groundwater management under a release abatement measure would require further study and would add to the estimated cost of the retrofit. GE also comments that EPA did not provide it with an opportunity to adequately assess potential sources of interference, which may impact manufacturing and testing processes and would likely add to the cost of the retrofit. Similarly, GE comments that EPA did not provide it with an opportunity to adequately assess the significance of non-water quality impacts or the cost of abatement of any mitigation technologies. Finally, GE comments that EPA did not consider the impacts of vapor plumes from any cooling towers on the reliability of testing operations.

At the outset, EPA does not agree that GE was not provided an opportunity to offer its views on any of the issues that it mentions related either to the feasibility or difficulty of converting to closed-cycle cooling or to the costs, non-water quality environmental effects or business ramifications of such a conversion. First, when it was clear to GE that EPA was considering the option of closed-cycle cooling, GE was clearly free to provide any information or opinion to EPA that it chose to provide. Second, GE obviously has been given further opportunity to address these matters in its comments on the Draft Permit. Finally, GE's comment is simply incorrect given that on October 25, 2007, EPA sent GE an information request letter under CWA § 308(a) which expressly requested that GE provide EPA with the company's assessment of, among other things, the estimated cost of converting to closed-cycle cooling, whether converting the Facility to closed-cycle cooling would be technically and economically feasible, the facility modifications that would be required to accommodate such a conversion, and the non-water quality environmental effects that would accompany such a conversion. GE provided its response to the information request in a document entitled, Cooling Tower Analysis Technology and Biological Assessment Information (February 2008).

GE's comment also incorrectly states that EPA merely assumed that closed-cycle cooling would be feasible at the Facility. EPA, in fact, analyzed the issues independently and, as part of this work, considered material submitted by GE. In the Executive Summary of the Cooling Tower Analysis Technology and Biological Assessment Information (February 2008), GE concluded that closed-cycle cooling, "while technically feasible from an engineering perspective, would be economically impractical and would impose an onerous burden on GE operations" (p. 2-8). After reviewing the site-specific information and analysis provided by GE, EPA concurred with GE's assessment that converting to closed-cycle cooling using mechanical draft cooling towers would be feasible at GE, but that the additional costs of closed-cycle cooling would not be "reasonable in light of the margin of increased benefits that would be involved." (Fact Sheet Attachment J, p.39). Thus, for the Draft Permit, EPA determined that closed-cycle cooling is not the BTA at GE and EPA maintains that conclusion after its additional analysis based on consideration of comments received on the Draft Permit. EPA did not find closed-cycle cooling to be the BTA at this facility principally because the cost of the technology is not warranted by the benefits that can be expected, based on existing information, to result from its implementation. Given that GE's comment relates primarily to factors that would increase the estimated cost or difficulty of a closed-cycle cooling retrofit (e.g., managing soils issues, potential impact abatement measures), if these comments were found valid, they would only bolster EPA's conclusion that the costs of converting to closed-cycle cooling are not warranted by the benefits for this facility.

While EPA concluded that converting to closed-cycle cooling was not the BTA for GE, EPA did specify in the Draft Permit that converting to closed-cycle cooling would meet the requirements of Section 316(b) of the Clean Water Act and, therefore, would be an acceptable technology should the facility pursue it. This provision has been modified in the Final Permit consistent with EPA's conclusions both in Attachment J to the Fact Sheet and in response to this comment. Part I.C.3 of the Final Permit authorizes, but does not require, GE to employ a year-round maximum daily intake rate commensurate with closed-cycle cooling to minimize impingement mortality and entrainment at the Power Plant CWIS. In other words, closed-cycle cooling would meet the Power Plant CWIS requirements but is a not required technology even in the event that the BTA (a combination of fine-mesh wedgewire screens and variable frequency drives) cannot be implemented as directed for some reason (e.g., the U.S. Army Corps of Engineers fails to approve installation of wedgewire screens in the Saugus River).

In response to the myriad issues related to implementing mechanical draft cooling towers at GE, including soil conditions, site interferences, and non-water quality impacts, EPA agrees that a more detailed, site-specific design analysis would likely be required if the facility were to pursue implementation of closed-cycle cooling to meet the technology-based requirements of CWA Section 316(b). There is nothing unusual about this, as EPA does not typically require a permittee to submit a full detailed design of new pollution control equipment at this stage of the permit process. GE has not, however, made a convincing argument to contradict its 2008 assessment or demonstrate that cooling towers are infeasible. GE previously argued that the cost of converting to closed-cycle cooling would be onerous and "economically impractical,"[83] and GE's present comments supplement its views in this regard.

While EPA acknowledges that GE has commented that various issues, such as soils composition and non-water quality environmental effects, could lead to ever greater expense for such a conversion, GE also commented that, for various reasons, "GE does not believe that further assessment of retrofitting closed-cycle cooling at the Facility is warranted." EPA essentially agrees with this comment based on current information. Because EPA has not required implementation of closed-cycle cooling as BTA in either the Draft or Final Permits, EPA agrees that further site-specific analysis of the potential complications for construction and installation of cooling towers is not warranted at this time.

[83] In using the phrase "impractical," EPA understands GE to be commenting that the required expenditures would not make sense. In other words, the costs would be unwarranted in light of the benefits to be achieved and the other negative ramifications of converting the cooling system to closed-cycle cooling. *See The American Heritage Dictionary (2d College Ed.)* (1982) (definitions of "impractical" and "impracticable" and Usage note distinguishing the two terms).

Comment 11.8: EPA's Proposal to Require the Power Plant CWIS to Retrofit fine Mesh Wedgewire Screens Ignored Technical Impediments and Significant Costs.

Technical Feasibility.

EPA lacks sufficient evidence to support its proposed determination that BTA for reducing entrainment by the Power Plant CWIS is a fine-mesh wedgewire screen with a slot or mesh size no greater than 0.5 mm and a pressurized system to clear debris from the screens. Fact Sheet, Attachment J, pp. 39-40. As the sole basis for this determination, EPA relied on a field study of 0.5-mm wedgewire screens in Narragansett Bay, Rhode Island, which the Agency concluded was representative of the performance of fine-mesh wedgewire screens in a similar tidal river setting (EPRI, 2005). But the Narragansett Bay field evaluation was conducted using a barge-mounted test facility consisting of much smaller wedgewire screen assemblies deployed near the surface of a much deeper waterbody than the Saugus River. The depth of Narragansett Bay at the EPRI test site was 15.7 m (52 ft) compared to only 19 feet at the Facility. Also, the test barge was deployed at a distance about 100 m from the shoreline in a large bay, compared to the shoreline intake location at the bottom of the river at the GE Power Plant CWIS. Therefore, the Narragansett test facility encountered none of the water body conditions, including widely fluctuating depth, debris loading, sedimentation, biofouling, and other conditions leading to maintenance issues and potential performance limitations of fine-mesh screens in a bottom intake location, close to the shoreline, in a highly fluctuating tidal river similar to the Saugus River. The study did not evaluate or address the site-specific preparation and maintenance issues that would challenge the technical feasibility and performance of a fine-mesh wedgewire screen system at this Facility.

Cost.

EPA also did not adequately evaluate the extent to which site-specific factors identified by GE would substantially increase the costs associated with their installation and maintenance of fine-mesh wedgewire screens. As GE's evaluation of this technology showed (CH2M HILL, 2008), the installation of wedgewire screens in the Saugus River could require extensive site preparation and dredging of the riverbed in the vicinity of the existing CWIS to assure adequate clearance in the water column above the screens. As EPA itself has recognized in technical development documents for § 316(b) rulemaking purposes, localized conditions of siltation and biofouling of wedgewire screens can be key limitations to their performance due to clogging and the creation of hot spots of increased through-screen velocity, and increase their maintenance costs (EPA, 2004). Maintenance of fine-mesh wedgewire screens in the Saugus River would likely be labor - intensive and problematic as a result of biofouling and clogging of the screens, sedimentation, and debris. Actual field testing of fine mesh wedgewire screens in brackish water of a proposed intake canal required the screens to be removed and cleaned as often as once every 3 weeks (EPA, 2011). Additional pump energy also would be required due to the increased head losses associated with the screening system. While acknowledging potential problems of biofouling and related effects on technology efficacy, and the possible need for manual cleaning (e.g., by scuba divers or a rail system and crane), EPA did not adequately evaluate the additional costs associated with the likelihood of substantial dredging and other feasibility constraints in its draft BTA determination.

Performance.

EPA lacks sufficient data on the performance of fine-mesh wedgewire screens for reducing entrainment in a tidal river setting comparable to the Saugus River to justify its selection as BTA at the Power Plant CWIS. Most available performance data for wedgewire screens are based on coarse-mesh slot sizes as well as on data collected during barge and laboratory studies. As evaluated by GE in the Cooling Water Intake Structure Information Document (CH2M HILL, 2008), a 0.5-mm slot size is considered to be experimental, especially for a tidal river. As assessed by EPA (2011), limited biological data are available on the performance of fine mesh wedgewire screens in use at actual facilities, and these facilities tend to have lower intake flows than the GE Power Plant.

Equally important, the efficacy of fine-mesh wedgewire screen technology for reducing entrainment mortality (that is, losses (rather than exclusion) of entrainable-sized organisms) is highly uncertain. As mesh size decreases, there is a risk that eggs and larvae that would have been entrained instead become impinged by the fine-mesh screen. As EPA recognized in the preamble to its recently proposed § 316(b) rule for existing facilities, using screens with finer mesh can convert entrainment mortality to impingement mortality without necessarily protecting any more aquatic organisms because many larvae may die as a result of the impact and impingement on fine mesh screens. 76 Fed. Reg. 22,186-22,188. As it further noted, the Agency "does not have data on the performance of fine mesh wedgewire screens on entrainment survival; therefore, EPA has only considered wedgewire screens for impingement mortality." 76 Fed. Reg. 22,201.

Non-Water Quality Impacts.

Installation of fine-mesh wedgewire screens at the Power Plant CWIS also would introduce non-water quality impacts on the navigational channel of the Saugus River. EPA did not acknowledge or fully evaluate those impacts in making its BTA determination. This omission stands in marked contrast to the Agency's approach with respect to the BTA determination for the Wheelabrator Saugus facility. There, EPA concluded that that wedgewire screens in the Saugus River likely would interfere with the use of the navigation channel, citing policies of the Army Corps of Engineers (U.S. ACOE, July 1996, AR#64) and the state (310 C.M.R. 9.35(2)(a)) (Wheelabrator Saugus Fact Sheet, pp. 45-46 (EPA, 2010)). In this case, however, EPA cites these same policies as being restrictive but refers to e-mail communication with the Army Corps of Engineers as evidence that those restrictions would not prevent permitting of the screens. Specifically, EPA notes that the ACOE email indicates that the Corps "would not be opposed to permitting structures in the river that do not impact the channel or increase shoaling." Even a cursory review of the emails reveals that the emails on which EPA relies amount to nothing more than an acknowledgement that *if* impacts to the navigation channel can be avoided, the ACOE would be willing to consider permitting the screens. Indeed, the ACOE cautions that he would be concerned not just about direct effects on the navigation channel and possible shoaling, but with the "1 on 3 side slope area" as well. In short, the ACOE email provides no evidence that navigation effects can be avoided, nor does it suggest that a permit would be granted.

GE's analysis indicates that construction of wedgewire screens would require extensive site preparation and could require substantial dredging activity. EPA did not analyze the shoaling potential of wedgewire screens or fully consider other potential regulatory constraints to site preparation, including dredging, as part of its BTA determination. In addition, although the screens would not be visible from the surface, their footprint and presence along the deeper, more navigable northern side of the river could pose navigational hazards under low tide conditions to boating, commercial fishing, and other public uses of the river.

Dredging is prohibited under the Rumney Marshes ACEC designation unless specifically exempted from the designation (Rumney Marshes ACEC Designation, August 22, 1988). The Saugus River dredging project was specifically excluded from the designation based on its potential benefits to commercial fishing access. Installation of wedgewire screens in the river next to the Power Plant CWIS would potentially impact navigation, including commercial fishing access, through dredging for site preparation, regular manual cleaning operations to address biofouling or sedimentation of the screens, and displacement of benthic and pelagic fisheries habitat. Waivers to ACEC designations are not granted lightly and represent an added regulatory requirement to installing and maintaining wedgewire screens, one which would likely involve federal consistency review by the Massachusetts Office of Coastal Zone Management. EPA did not fully consider these issues and regulatory requirements or the associated permitting costs in its draft BTA determination.

In addition, site preparation and installation of fine-mesh wedgewire screens would displace benthic and pelagic aquatic habitat, thereby limiting potential benefits to the Saugus River ecosystem. EPA did not consider these impacts in its BTA determination.

Response to Comment 11.8

During development of the Draft Permit, EPA determined that the BTA for the GE Aviation Power Plant was a combination of reduced intake flows through the use of pumps with variable frequency drives and operation of fine mesh cylindrical wedgewire screens. EPA came to this determination after reviewing, among other things, GE's evaluation of wedgewire screen technology and other available information on the potential efficacy of placing such screens in the Saugus River to reduce adverse environmental impacts from GE's CWIS.

GE concluded that the feasibility of fine mesh wedgewire screens "would be limited by the screen configuration, mesh size openings, water body conditions, and potential for adverse impacts to the Saugus River" (Technology Evaluation p. 5-13). EPA evaluated the proposed size of the screens compared to the depth and area in front of the Power Plant CWIS, the potential sweeping flow, the size of the mesh compared to commonly entrained life stages at GE, and the potential impacts to habitat and navigation. EPA concluded that "the site-specific conditions at GE Aviation (sufficient sweeping flow, low intake volume, limited size of the installation, and adequate river depth and width at the proposed site) make wedgewire screens particularly well-suited for this facility" (p. 27 of Attachment J to the Fact Sheet). EPA has revisited its determination in response to GE's comment.

Technical Feasibility

GE comments that EPA used a field study in Narragansett Bay "as the sole basis for this determination." EPA disagrees that the sole basis for determining that wedgewire screens are the BTA at GE is a single field study. EPA did rely on the Narragansett Bay field study to support the evaluation of adequate sweeping flow in the Saugus River and to estimate the potential reduction in entrainment mortality of eggs at the GE facility. In addition to the field study referenced in GE's comment, EPA considered many site-specific factors including the size of the screens, the depth and area in front of the Power Plant CWIS, and site-specific entrainment data. Furthermore, EPA also considered the analysis provided by GE in response to EPA's request for information (Cooling Water Intake Structure Information Document, February 2008) an other reports on wedgewire screen technology, including EPA's analysis of wedgewire screen in preparation of the Final 316(b) Rule, analyses developed for the installation of wedgewire screens as other facilities (e.g., Indian Point Power Station), and other empirical studies. All of these factors contributed to EPA's BTA determination.

EPA acknowledges that there are differences in the design and implementation of wedgewire screens between the field study and what would be installed at GE. EPA does not, however, believe that the fact that the screens in the field study were deployed near the surface in a deeper waterbody would cause the screens to be unavailable at GE. The field study was conducted in a tidal river that also experienced fluctuating water depth and with a biological community similar to that found in the Saugus River. In addition, other deployments of wedgewire screens have been bottom oriented or located closer to shore (e.g., IBM facility in Poughkeepsie, Charles Point Resource Recovery Facility, Bethlehem Energy Center, Brooklyn Navy Yard, *see* EPRI 2008 and HDR 2010). The manufacturers of wedgewire screens maintain that a minimum water depth equal to twice the diameter of the screens is required (Cook Legacy). According to GE's evaluation of this technology and based on available water depth at the Power Plant CWIS, "the tee-screen diameter may be as large as 7.6 feet and still meet the design water depth requirements at mean low water." GE has proposed screens with diameters ranging from 5 to 6 feet depending on mesh size, well within this maximum screen diameter. Therefore, GE has not presented a persuasive argument that differences between the conditions at the location of the field study and the conditions in the Saugus River would render wedgewire screens technically infeasible at GE.

Cost

GE comments that EPA did not consider the additional costs of site preparation and dredging in the initial cost estimate. EPA disagrees with this comment because EPA did consider such costs and GE has not established any error or inadequacy in EPA's work in this regard. According to the permittee, "GE's evaluation of this technology showed the installation of wedgewire screens in the Saugus River could require extensive site preparation and dredging of the riverbed in the vicinity of the existing CWIS to assure adequate clearance in the water column above the screens." Yet, neither GE's initial technology evaluation nor its comments on the Draft Permit provide any information to support the need for extensive site preparations and dredging. As stated above, GE's evaluation concluded that screens with a diameter of 7.6 feet or less would meet the design water depth requirements at mean low water. GE's proposed screen diameters of 5 to 6 feet would meet this criterion. Therefore, it does not appear that extensive site preparation, including dredging, would be needed to ensure adequate screen clearance. GE's initial cost estimate for wedgewire screens was provided by GE in Appendix E of the Cooling Water Intake Structure Information Response, and it included $200,000 for site preparation and dredging. EPA utilized these costs in its evaluation of the technology. GE has not demonstrated that dredging (or related cost) beyond what the company evaluated in 2008, and what EPA considered in its BTA determination, would be required.

Both GE and EPA, in evaluating wedgewire screens, acknowledge that fouling of the screens could interfere with screen performance and that the screening system would likely need to be equipped with technology, including an airburst system, to address the potential problem. GE included an estimate of $46,000 per screen for the cost of an airburst system in the capital cost estimate for wedgewire screens. Screens coated with antifouling agents, such as screens made of copper-nickel alloy, have been used to reduce biofouling as compared to traditional stainless steel screens. Screens with an antifouling coating, however, are more expensive than the traditional screens evaluated by GE. Using the former would increase the capital cost for this technology as compared to GE's 2008 estimate based on traditional screens. To assess the potential extent of such a cost increase, EPA reviewed the cost estimates for 72-inch diameter screens with antifouling coating for the Indian Point Power Generating Facility on the Hudson River (Enercon 2010). EPA used this information to approximate the increase in costs for similar screens at GE, with the understanding that this estimate represents a general approximation and does not account for any site specific factors that could affect the cost of screens for GE. Based on this evaluation, EPA found that screens with an antifouling coating could increase capital costs by about 23%, but also may reduce expenditures and effort for maintenance (e.g., manual cleaning by divers) as compared to traditional screens. Even with the more expensive screens, the total capital cost of wedgewire screens at GE would be relatively low (less than $3,000,000) as compared to the cost of closed-cycle cooling and would likely reduce entrainment mortality substantially more than the approximate 20% reduction achieved by using variable frequency drives alone.

Wedgewire screens have been used in other marine settings, including in Boston Harbor (see Gillette Final NPDES Permit No. MA0003832), and major maintenance issues that would result in their being technically infeasible have not been reported. In addition, wedgewire screens have been installed at several facilities with intake flows higher than GE's, including the Brooklyn Navy Yard Co-Generation Plant on the East River in New York (55 to 72 MGD), the Charles Point Resource Recovery Plant in Peekskill, New York (55 MGD), and the Oak Creek Power Facility in Lake Michigan (2.2 BGD). GE is correct that, to EPA's knowledge, there is no full-scale installation of 0.5 mm slot wedgewire screens in the United States, but EPA has explained that certain information indicates that such an installation would be available. *See* Fact Sheet, App. J, pp. 25-29.

Performance

EPA acknowledges that while there have been numerous studies on the efficacy of fine-mesh wedgewire screens to reduce entrainment of early life stages, few studies have reported survival of eggs and larvae that come into contact with the screens. In the preamble to the new proposed

CWA § 316(b) regulations, EPA notes that some technologies designed to exclude organisms from being entrained by a CWIS may result in very high entrainment reductions, but that the excluded organisms do not necessarily survive interactions with the exclusion technology (typically some type of screen) (76 Federal Register 22198, April 20, 2011). EPA considered this uncertainty about survival in its BTA determination for the GE NPDES permit, concluding that "results of the limited available survival data suggest that while larvae are unlikely to survive impingement on fine mesh screens, this technology may effectively reduce entrainment mortality for eggs and crustacean larvae" (p. 28 Attachment J to the Fact Sheet). In its analysis of potential reductions in entrainment mortality from wedgewire screens with a 0.5 mm slot size, EPA conservatively assumed that 95% of the eggs that would have been entrained would be excluded and would survive, while 0% of the larvae would. In other words, EPA assumed that all larvae that would have been entrained would suffer impingement mortality and any reduction in mortality for larvae identified by EPA was solely attributed to the use of variable frequency drives to reduce intake flow. Thus, EPA did consider the efficacy of fine-mesh screens for reducing mortality from either larval entrainment or impingement, but, as GE states in the Cooling Water Intake Structure Information Document, eggs comprised the majority of entrainment total at the power plant and, therefore, "reduction in egg entrainment is the most important metric in reducing overall entrainment" (p. 5-13).

There is some evidence suggesting that extremely low intake velocities can allow some egg and larval life stages to avoid the intake due to the hydrodynamic influences of the cross current (EPRI 2003). In one study of 0.5 mm to 2.0 mm wedgewire screens, striped bass yolk sac larvae were observed to orient into the sweeping current and actively swam against the through-slot current (Heuer and Tomljanovich 1978). In another study of 0.6 mm wedgewire screens, moderately sized larvae (about 8.5 mm) showed positive rheotaxis (swimming into current) and actively resisted impingement, while larger larvae (12 mm) propelled themselves along the screens and down the edge. For both size classes, most of the larvae tested became free of the screens within 3 minutes of being released (Karchesky and McDonald 2007).

In sum, there is some uncertainty about the efficacy of wedgewire screens for reducing entrainment mortality of early life stages. In this case, however, given the site specific conditions of the Saugus River, the limited number of screens needed, and the projected low slot velocity, EPA believes that fine-mesh wedgewire screens are an available technology that, in combination with the use of variable frequency drives, will likely reduce entrainment mortality as compared to the existing traveling screen.

Non-water Quality Impacts

GE comments that EPA did not consider the potential non-water quality impacts from the screens, including loss of benthic and pelagic habitat and impacts on the navigational channel. Impacts to benthic and pelagic habitat during preparation and installation time periods would likely be limited in duration. Further, the existing habitat at the intake would likely not be considered high quality because of the high risk of impingement and entrainment. Reducing this risk would outweigh the limited loss of habitat that might be associated with the installation and use of the BTA technologies.

EPA agrees with GE that wedgewire screens could have the potential to impact navigation in the Saugus River. Although GE estimates that few screens would be required and that they would likely be located towards the bottom and submerged at all tidal stages, the screens could conceivably impact travel in front of the Power Plant CWIS. As a result, EPA considered this issue carefully. GE attempts to contrast the Agency's approach for the BTA determination at the Wheelabrator Saugus facility, in which EPA determined that the screens would impact navigation, to the GE BTA determination in which EPA determined that navigation would not be affected to an unacceptable degree. Yet, although the two facilities are located on the same segment of the Saugus River, there are important differences between the two. GE's CWIS is located on the deeper, northern shore of the river where there is likely adequate area between the navigational channel and the shore to locate the limited number of screens to meet GE's flow requirements. The CWIS at the Wheelabrator Saugus facility is located on the southern shoreline, which is characterized by an expansive mudflat that extends from the shore nearly to the navigational channel. A narrow, dredged channel supplies water to the Wheelabrator Saugus CWIS at low tide. This intake channel is not large enough to support the number of screens required for Wheelabrator Saugus's flow. Therefore, the only location with adequate area to support a cylindrical wedgewire screen installation in the vicinity of the Wheelabrator Saugus CWIS is in the navigational channel. For this reason, EPA concluded that the screens would interfere with navigation if installed for Wheelabrator Saugus.

The screens may require a surface-oriented marker of some kind to notify boaters of the potential hazard. EPA acknowledges that any final design for wedgewire screens would be subject to approval by the Army Corps of Engineers (USACE). As GE correctly notes, installation of the screens would also be subject to restrictions on dredging in the Rumney Marsh ACEC and federal consistency review by the Massachusetts Office of Coastal Zone Management if the facility determines that dredging would be required. However, the impacts to the Saugus River would likely be limited to the construction period and the result of the screens would likely benefit the ecosystem by reducing the adverse impacts from the cooling water intake structure.

Summary

EPA applies technology-based requirements to minimize adverse environmental impact associated with cooling water intake structures under Section 316(b) of the Clean Water Act. Wedgewire screens have been employed since the 1970s to reduce impacts at CWISs and this technology continues to improve (e.g., use of new materials to reduce complications related to fouling). After reviewing GE's initial analysis of the availability of wedgewire screens, EPA's BTA determination for the Draft Permit, and GE's comments on the technical feasibility, cost, performance, and non-water quality impacts of wedgewire screens, EPA acknowledges that site-specific factors could affect the design of the technology and costs may be increased if antifouling coatings are required. However, GE has not demonstrated any factor that would cause this technology to be unavailable at GE.

In the evaluation of wedgewire screens, GE comments that "the feasibility would be limited by the screen configuration, mesh size openings, water body conditions, and the potential for adverse impacts to the Saugus River." Based on the available data provided by GE, EPA did not find any of these factors to be a barrier to the availability of wedgewire screens for the Saugus

River. However, EPA appreciates that the design and installation of this technology is subject to a host of site-specific factors, some of which may only become apparent during a more detailed design phase.

The Final Permit specifies parameters for the design of wedgewire screens to reduce entrainment, including a slot size of 0.5 mm. EPA acknowledges that site-specific factors may cause more or less fouling and debris loading, even with the use of the airburst system or antifouling coatings, and that these factors may not be fully understood until the design and installation of the technology. A slot size of 0.5 mm has not been widely used, but EPA has determined that, in conjunction with the VFDs, it is the BTA for reducing entrainment at GE. However, EPA also acknowledges there may be some benefit to balancing the biological and operational effectiveness of the screens. In other words, a slightly larger slot size may be as effective as or more effective than a 0.5 mm slot size if a larger slot size will better maintain the hydrodynamic characteristics of the screens and minimize fouling that would interfere with the screen's effectiveness, including maintaining the intake and approach velocities necessary to reduce entrainment and impingement mortality.[84] For this reason, the Final Permit allows the permittee some flexibility in the final slot size if the permittee can demonstrate through a comparative study of slot sizes, including biological monitoring, bench-scale testing, or other means, that an alternative slot size would provide a reasonably equivalent degree of biological protection, considering slot size, species behavior, and the ratio of slot velocity to current velocity, to that estimated to be provided by a 0.5 mm screen. In addition, design of the full scale screen installation will likely require identification of the optimal airburst frequency, antifouling coating material, and height off the river bottom to reduce the potential for siltation, among other site-specific factors.

The Final Permit maintains specific BTA requirements, but allows the permittee flexibility in the design and installation of the screens. The BTA requirements will be implemented over time according to a compliance schedule. *See* Part I.C.5 of the Final Permit and Responses to Comments 11.1 and 14, below. The Final Permit specifies a slot size of 0.5 mm, but, in response to GE's comment about the experimental nature of this mesh size and possible complications due to fouling, EPA would accept a larger slot size if the permittee can demonstrate, based on a site-specific study completed during the design phase, that the performance of the larger mesh is equivalent or superior to 0.5 mm screens. EPA understands that the installation of the technology is contingent upon receiving regulatory approval from other state and federal agencies. The compliance schedule allows time to pursue permitting and review with the appropriate state, federal, and local entities. If, during the design phase, it is determined that the technology is unavailable due to lack of regulatory approval (e.g., USACE requirements preclude the installation), than the technology-based permit conditions related to wedgewire screens may be modified. At present, EPA conversations with the USACE have not identified an impediment to wedgewire screen installation and, as discussed above, EPA has found that such an installation appears to be feasible without causing problems for navigation in the area.

[84] Fouling of the screens can result in occlusion of the screen openings, which, in turn, can lead to increased through-screen intake velocities.

Comment 11.9: EPA's Proposed BTA Determination for the Test Cell CWIS Requires Reconsideration.

EPA's proposed determination would require that the existing coarse-mesh traveling screen also be improved with new fish lifting buckets, a low pressure spraywash, and separate fish and debris return troughs. It also would require GE to reduce flow on a seasonal basis.

Although GE does not object to the proposed requirement to upgrade the fish return by replacing the current return trough with a new one, the remainder of the proposed requirements are unnecessary and unreasonable. As GE's evaluation (CH2M HILL, 2008) showed, the a modified Ristroph/Fletcher screening system in conjunction with the dual-flow screen configuration that currently exists at the Test Cell CWIS is unlikely to prove as effective at reducing impingement mortality as might be the case if applied to a traditional flow-through traveling screens. Fish and organisms impinged on the descending side of the screen would be exposed to intake velocities for twice as long they otherwise would be on a traditional screen and would not be held in water in the fish lifting buckets on the descending side because the buckets would be inverted. For this reason, the costs of improving the existing coarse-mesh dual-flow screen with fish lifting buckets, a low pressure spraywash, and separate fish and debris return troughs would not be justified by the limited potential impingement mortality reduction benefits. Therefore, GE requests that EPA modify its BTA determination to remove these requirements.

The seasonal flow reduction limits present business and operational problems for GE as the limitations would prevent or severely limit engine and component testing during March 1 through July 31st every year. The Test Cell serves two important purposes that support GE's business. First, it is a research and development facility that is used to develop new compressors for GE products. It is the only General Electric facility capable of performing certain types of tests, and by its nature, research and development does not progress according to a detailed or defined schedule. Test schedules may shift significantly during the compressor design and assembly phases. Once a compressor test rig arrives at the Facility, tests usually run 12 hrs/ day supplying engineering data on the design of the new compressor. Typical water usage during this period is approximately 25 MGD for durations up to 90 days and possibly longer. Reductions to the level proposed by EPA would restrict test operation to about 8 days per month during the March through July time period significantly increasing the time required to complete the test. These delays impact GE's ability to introduce and qualify new compressor designs and resolve problems for existing customers, including the U.S. Navy. Testing of the GeNX and F414 compressors expected in 2011 and 2012 could be adversely impacted by EPA's proposed limitations. The Test Cell's second mission is to supply RAM air for the F414 engine during qualification testing required by the US Navy. These tests run for two to three months, and are currently scheduled to occur annually over the next few years. These tests support redesigns for the F414 engine, which the US Navy has funded. The redesigns require qualification testing prior to deploying to the fleet. The tests could be delayed by EPA's proposed limitations, adversely affecting national security interests. In addition, GE did not account for EPA's seasonal limitations in negotiating its delivery contracts and schedule with the US Navy.

Response to Comment 11.9

GE comments that the dual-flow screen configuration at the Test Cell is incompatible with certain screening system improvements required in the Draft Permit, specifically fish-lifting buckets, a low pressure spraywash, and separate debris and fish return troughs. Yet, contrary to this comment, other facilities have operated dual-flow screens with Ristroph-style improvements with good results (e.g., Roseton Generating Station, Dunkirk Station, Arthur Kill Station) (EPRI 2007).

Nevertheless, in response to GE's comment, EPA has re-considered the limited operation of the traveling screen and low annual capacity at the Test Cell, which, if enforceable, would likely minimize the potential for impingement and entrainment. The intake velocity through the screen is 0.85 fps at a maximum operating flow of 40.3 MGD. Because the actual operating flow is generally much lower than 40.3 MGD, the through-screen velocity at the Test Cell on most days is less than 0.85 fps. At the currently permitted average monthly flow of 27 MGD, the through-screen velocity is 0.57 fps and at the maximum average monthly reported flow of 9.3 MGD (between 2000 and 2012) the through-screen velocity is 0.2 fps. In other words, although the through-screen velocity at the Test Cell is more than 0.5 fps (but less than 1 fps) during maximum daily permitted flow, the CWIS generally operates at the flow for a limited number of days each month. Thus, the operating through-screen velocity is typically less than 0.5 fps. EPA estimated impingement at the Test Cell to range between 1,300 to more than 4,000 fish per year, based on the impingement rate at the Power Plant and annual capacity at the Test Cell. A site-specific study at the Power Plant suggests that many of the species commonly impinged at GE exhibit high initial survival provided that the traveling screen is equipped with a fish return trough that transports impinged fish back to the receiving water at a location that minimizes the potential for re-impingement and discharges to submerged habitat.

Based on the low annual capacity and typically low through-screen velocity, EPA has eliminated the requirements to upgrade the traveling screen with fish-lifting buckets, low pressure spraywash, and separate fish from debris at this time, because it is unclear if the additional costs of these upgrades would be warranted by the marginal benefits they would provide above the required improvements to the fish return trough. The Final Permit requires the permittee to upgrade the existing fish return trough in order to minimize impingement mortality at the Test Cell. During this permit cycle, impingement monitoring during Test Cell operation will provide data to determine if any additional improvements are necessary to protect fish from impingement mortality.

The requirement to minimize entrainment mortality by reducing average monthly flows during peak entrainment season was based on GE's own statement that the seasonal operation of the Test Cell ("most commonly during the fall months of September to November") minimizes the potential for entrainment. Based on entrainment data collected at the Power Plant, eggs and larvae are most prevalent at the intake from March through July. If the operation of the Test Cell is generally limited to colder months when densities of eggs and larvae are relatively low, that would reduce the potential for entrainment mortality. However, in the current permit this factor cannot be considered BTA because it is not enforceable. GE maintains that operation is limited during those times when eggs and larvae would be most prevalent. However, nothing in the current permit prohibits the facility from operating at much higher flows during this period, which would not necessarily minimize entrainment. A more stringent average monthly limit during the peak entrainment period would guarantee that the Test Cell continues to operate only for limited periods when the potential for entrainment is highest. This operational restriction, combined with the relatively low annual capacity of the Test Cell, will likely contribute to reducing the potential for entrainment morality.

EPA based the Draft Permit average monthly flow limit of 5 MGD from March through July on reported flows at the Test Cell. The 90th percentile for average monthly flow at Outfall 014 from February 2000 through June 2012 is 4.8 MGD. Generally, DMR data reported for the Test Cell indicates that GE could meet a more stringent average monthly limit during the peak entrainment season as part of the requirements to reduce entrainment mortality at the Test Cell CWIS. In response to the above comment, EPA asked GE to evaluate the potential to reduce average monthly flow on a seasonal basis while maintaining viable operation of the Test Cell. In an October 15, 2012 email from Steven Lewis (GE) to Nicole Aquillano (EPA), GE proposed an average monthly flow limit of 18 MGD from March 1 through July 31, which represents a 33% reduction in flow compared to the currently average monthly flow limit of 27 MGD. Actual operational flows, based on DMR data, are likely to be less than 18 MGD. EPA is satisfied that limiting average monthly flows at the Test Cell to 18 MGD will ensure that the potential for entrainment continues to be minimized as a result of the limited capacity and that this more stringent flow limit will not unduly interfere with the GE's operation of the Test Cell. Therefore, the Final Permit includes an average monthly flow limit of 18 MGD from March 1 through July 30 and an average monthly flow limit of 27 MGD from August 1 through February 28.

Comment 11.10: The Proposed Monitoring Requirements for Impingement and Entrainment are Unreasonably Burdensome and Unnecessary to Ensure Proper Operation and Maintenance of BTA Technologies.

Entrainment Monitoring for the Power Plant CWIS.

a) Detailed Entrainment Monitoring is Unwarranted.

EPA proposes to require entrainment monitoring during operation of the Power Plant CWIS beginning no later than 90 days after the effective date of the permit. Weekly monitoring would be required for eight months, from March through October, and twice per month during the four remaining months. GE would be required to collect samples representing morning, afternoon, and nighttime entrainment, across three different days, from a representative location within the intake structure.

EPA has provided no justification for imposing such intensive entrainment monitoring requirements for the duration of the permit, nor has it explained how the monitoring results would be used to measure compliance. Intensive monitoring of entrainment is unnecessary to demonstrate compliance with a performance standard, because EPA has not imposed any standard, nor could it based on the record on which it relied. Nor is such monitoring justified in order to ensure that the technology is properly designed, operated and maintained. According to EPA, the entrainment reduction efficacy of wedgewire screens already has been well established in the technical literature, and that performance depends primarily on the presence of sufficient ambient current (sweeping flows) to carry organisms to bypass the structure. Assuming for the sake of argument that EPA is correct, the primary factors determining performance of fine mesh wedgewire screens will be the site-specific placement of the screens in relation to ambient velocity vectors (which the Agency could review and approve before the screens were installed) and the effective routine maintenance and cleaning of the screens using either an airburst or brush-clean system. Assuming that the wedgewire screen system has been properly installed and is cleaned routinely according to specifications, there would be no performance-based justification for requiring any entrainment monitoring. Therefore, if, despite GE's requests for reconsideration, EPA retains the requirement for fine mesh wedgewire screens, the Agency should remove any requirement for entrainment monitoring of flow reduction measures or wedgewire screens from the final permit. Instead, appropriate monitoring would involve verifying that the screen system has been installed in accordance with the approved design and measures; measuring hydraulic conditions to ensure that the system meets these guidelines and criteria; and performing routine maintenance in accordance with manufacturer specifications.

b) In the Event EPA Determines that any Entrainment Monitoring is Warranted, EPA should Ensure that the Duration and Frequency of that Monitoring are Reasonable.

If EPA identifies a reasonable basis for imposing any entrainment monitoring requirements, those requirements should be reasonably tailored to the conditions at this site. EPA has not provided any justification for weekly entrainment monitoring for eight months of the year and twice-per-month monitoring the other four months of the year, nor has EPA justified the need for entrainment monitoring during non-consecutive periods or over periods of multiple days. The high costs of such an intensive monitoring program would not be warranted by the limited value of the monitoring data, especially considering the negligible impacts of current levels of entrainment to the fishery. GE requests that EPA consider reducing the frequency of any required entrainment monitoring to no more than once-per-month, with two entrainment samples collected each event to represent day and night.

GE also requests that any required entrainment monitoring be limited to a period of no more than two years following installation of the required BTA for reducing entrainment. Two years would provide an adequate period of time to characterize entrainment losses associated with the required BTA.

c) Entrainment Monitoring and Reporting should not be Required until GE has had a Reasonable Opportunity to Install the Technology and make sure it is Fully Operational.

Should any form of entrainment monitoring or reporting be required at the Power Plant CWIS, such requirements should become effective only after GE has had a reasonable opportunity to design, permit, install, and start-up the technology. As EPA has recognized in it prior Phase II rule and its recent § 316(b) proposed rule for existing facilities, nothing in the CWA prevents

EPA from affording a reasonable compliance schedule for implementing § 316(b) requirements.[85]

Initiating entrainment monitoring prior to installation of any process changes or technologies required to operate and maintain the BTA for reducing impingement mortality would serve no meaningful purpose. Hence, impingement mortality monitoring should not be required until the required BTA is fully installed and operational.

Impingement Monitoring of the Test Cell CWIS.

a) Impingement Monitoring of the Test Cell CWIS is Unwarranted.

EPA proposes to require impingement monitoring during operation of the Test Cell CWIS beginning no later than 90 days after the effective date of the permit. GE would be required to perform impingement monitoring a minimum of once per week when the Test Cell is operating. To the extent practicable, a sampling event would consist of three, non-consecutive 4-hour collections that represent morning, afternoon, and night. Fewer than three samples and/or consecutive 4-hour collections may be conducted if the Test Cell CWIS does not operate long enough for three non-consecutive collections to be sampled.

GE disagrees with the need for any impingement monitoring of improvements made to the existing coarse-mesh traveling or fish return system at the Test Cell CWIS. The impingement reduction efficacy of coarse-mesh traveling screens combined with the use of a fish-friendly return system is well established in the technical literature, and EPA has not provided any justification for such an intensive impingement monitoring program, especially given the sporadic, seasonal operation of the Test Cell CWIS. The intensive effort, difficult logistics, and high costs of the required impingement monitoring program would not be justified by the very limited capacity utilization of the design intake flow and the likely negative impacts these requirements would have on the ability of the Test Cell to competitively perform its aircraft engine testing mission. Therefore, GE requests that EPA remove the requirement for impingement monitoring from the final permit.

Instead, GE proposes to verify that the technology improvements are installed in accordance with the approved design and construction measures; that elevation drops and turns in the return trough satisfy the design requirements; that the traveling screens are being rotated continuously during Test Cell CWIS operation; and that routine maintenance of the screens and debris/fish return system is being performed in accordance with good engineering practice, thereby enabling the safe return of fish at low tide to the Saugus River.

[85] *See* 69 Fed. Reg. 41,576, 41,596-97, 41,621 (July 9, 2004) (authorizing permittees to request up to 3.5 years to submit required information, including selection of compliance alternatives, leaving selection of deadline for installing compliance technology to discretion of permit writer, and authorizing permittees to submit a technology installation and operation plan for purposes of demonstrating compliance with standard); 76 Fed. Reg. 22,282 (proposing to establish compliance schedules of up to 8 years for impingement standards).

b) In the Event EPA Determines that any Impingement Monitoring is Warranted, EPA should Ensure that the Duration and Frequency of that Monitoring are Reasonable.

Assuming that any impingement monitoring at all can be justified, EPA has not provided any rationale for weekly monitoring during Test Cell CWIS operation and for requiring non-consecutive sampling periods that serve to extend effort, complicate logistics, and increase monitoring costs. The high costs of such an intensive monitoring effort would not be warranted by the limited value of the monitoring data, especially considering the infrequent operation of the Test Cell and low capacity utilization of the CWIS design capacity, which already minimizes the potential of adverse impacts due to impingement mortality. GE requests that EPA consider reducing the frequency of any required impingement monitoring to no more than once per month when the Test Cell is operating, with no more than two 4-hour collections representing day and night, and allowing these two collections to made within a single 24-hour period. In addition, GE requests reducing the frequency of any latent survival testing to no more than three times per year.

GE also requests that any impingement monitoring requirements be less prescriptive in regard to the specific methods for collecting impingement samples to allow for due consideration of logistics, site access, safety, efficiency, and costs. For example, a practical alternative to placing stainless steel baskets into the return sluiceway could be diverting the return sluiceway flow through a flow-through holding pen with a 3/8-inch mesh net. GE would like to preserve such flexibility to adjust specific methods to site-specific conditions and allow opportunities for innovation and efficiency in achieving the monitoring objectives with the least amount of effort and costs.

GE further requests that any required impingement mortality monitoring be limited to a period of no more than two years following installation of the required BTA for reducing impingement mortality. Two years would provide an adequate period of time to characterize impingement mortality losses associated with the required BTA.

c) Impingement Monitoring and Reporting should not be Required until GE has had a Reasonable Opportunity to Install the Technology and make sure it is Fully Operational.

Should any form of entrainment monitoring or reporting be required at the Test Cell CWIS, such requirements should become effective only after GE has had a reasonable opportunity to design, permit, install, and start-up the technology. As EPA has recognized in it prior Phase II rule and its recent § 316(b) proposed rule for existing facilities, nothing in the CWA prevents EPA from affording a reasonable compliance schedule for implementing § 316(b) requirements. *See supra, n. 22.*

Initiating impingement monitoring prior to installation of any process changes or technologies required to operate and maintain the BTA for reducing impingement mortality would serve no meaningful purpose. Hence, impingement mortality monitoring should not be required until the required BTA is fully installed and operational.

Response to Comment 11.10

In response to GE's comments above, EPA has re-evaluated the entrainment and impingement monitoring requirements included in the Draft Permit and made certain changes to them for the Final Permit.

Power Plant Entrainment Monitoring

EPA has considered GE's comments and disagrees that entrainment monitoring is unwarranted. While the Final Permit's CWIS requirements are technology-based, these requirements are rooted in EPA's best professional judgment based on the limited available entrainment data, which is more than 15 years old. The additional entrainment data will help to confirm that these requirements are the BTA for the Power Plant in the next permit cycle.

However, EPA acknowledges GE's concerns about the frequency of monitoring and has reduced monitoring frequency the Final Permit. The Final Permit includes requirements to monitor certain aspects of the screening system, including monthly monitoring of the through-screen velocity at each screen during maximum permitted flow, periodic visual inspections and routine cleaning of the screens, and scheduled operation of the air burst system. In addition, the Final Permit includes a requirement to monitor entrainment twice per month from March to September and once per month from October through February and has reduced the number of samples from three time periods to one night and one day sample per event. In addition, EPA has required monitoring to continue for two years beginning after the wedgewire screens are operational.

Test Cell Impingement Monitoring

GE comments that impingement monitoring should not be required at the Test Cell because the CWIS has low utilization capacity and seasonal, intermittent use and because the scientific literature establishes the impingement reduction efficacy of traveling screens combined with the use of a fish-friendly return system. While the literature may have established that, taken together, Ristroph-style traveling screens (including smooth mesh, low pressure spraywash, fish buckets, and a return designed to minimize predation and re-impingement) successfully minimize impingement mortality for many species (EPRI 2007), GE's Test Cell CWIS is not required to implement all of the improvements associated with Ristroph-style screens. In response to GE's comments, EPA has decided that, given the limited capacity and generally low through-screen velocity (though not less than 0.85 fps at maximum permitted capacity), the specified improvements to the fish return trough is the BTA for impingement mortality reduction at the Test Cell. The Final Permit requires the permittee to replace the existing fish return trough with one that returns fish to the water at all tidal stages while avoiding sharp drops or turns. Additional improvements to the traveling screen are not required at this time.

GE comments that the impingement monitoring requirements at the Test Cell should be reduced. However, EPA maintains that impingement monitoring will provide data to enable EPA to determine if the fish return system, including the new trough, sufficiently minimizes impingement mortality at the Test Cell in the next permit cycle. EPA fails to see, and GE has not explained, how three, 4-hour sampling periods per week during the limited periods when the Test Cell is operating will have negative impacts on the ability of the Test Cell to competitively perform aircraft engine testing. Having said that, EPA has agreed to make some of GE's suggested changes. Since the impingement monitoring requirements are associated with assessment of the new fish return trough, the Final Permit delays monitoring until after the new fish return trough is fully functional. In addition, the Final Permit limits latent survival testing to three times per year (spring, fall, and winter).

12. EPA Needs to Correct and/or Clarify Certain Aspects of the Draft Permit.

Comment 12.0:

The phrase "periods leading up to forecasted wet weather" has significant compliance implications (e.g., an obligation to manually activate the pumps in the vaults during these periods to draw down water levels) but is not defined in the Draft Permit. To provide fair notice to GE of its compliance obligations, EPA must define this phrase. Absent a clear and rational definition, GE proposes that it be deleted from the Draft Permit.

In its WET testing requirements, EPA requires GE to report the concentrations of a number of chemical parameters, including total metals concentrations, in the effluent sample on the DMR. EPA states that "these samples, taken in accordance with WET testing requirements, may be used to satisfy other sampling requirements as specified in the table above." However, EPA has specified monthly grab samples for metals at the outfalls and quarterly composite samples for WET testing at the same outfalls, so one cannot be used in lieu of the other. GE has already commented that the frequency and number of sampling requirements needs to be reduced. EPA should eliminate the requirement in the Draft Permit for separate metals grab sampling at outfalls that are periodically WET tested.

In its requirements for analysis of PAHs, EPA requires specific numeric MLs, defined as the level at which the entire analytical system gives recognizable mass spectra and acceptable calibration points, for PAH compounds. EPA has erroneously specified MLs that are below the method detection levels for benzo[a]anthracene, benzo[b]fluoranthene, and benzo[k]fluoranthene. PAH analysis is also commonly impacted by matrix interferences, such as TSS levels, that will affect the MLs for a particular sample. Instead of specifying MLs, EPA should require that samples be analyzed for PAHs using approved Method 8270LL (lower limit).

As noted elsewhere in these comments, Outfall 018 does not receive stormwater flows and, as a result, there is no need for EPA's proposed Outfall 018B wet weather designation.

The requirements in Part I.B.8, related to the pollution prevention team, stormwater pollutant sources and best management practices, are duplicative of Parts I.B.3 and 7 and should be removed.

EPA's prohibition on foam or sheen is unreasonable in that it does not (1) acknowledge or conform with previous determinations by the Agency relating to the Facility, or (2) account for natural organic matter in the tidal estuary and in the intake water returned to the estuary. GE's existing NPDES permit specifies that "there shall be no discharge or floating solids, oil sheen, or visible foam *in other than trace amounts*." (emphasis added.) After GE requested clarification as to the definition of "trace amounts," EPA confirmed and agreed that a trace sheen occurs where: 1) the source can be eliminated immediately and the extent of the sheen is clearly defined allowing it to be captured and removed immediately, or 2) conditions at the water surface quickly dissipate the sheen.[86]

EPA cites the Massachusetts Water Quality Standards (314 CMR 4.05(4)(b)(7)) as justification for changing this provision in the Draft Permit to read: "the discharge shall not contain a visible oil sheen, foam, or floating solids at any time." As EPA quotes in p. 15 of the Fact Sheet, the state standards provide that a Class SB water "shall be **free** from oil, grease, and petrochemicals that produce a visible film on the surface water, impart an oily taste to the water or an oily or other undesirable taste to the edible portions of aquatic life, coat the banks or bottom of the water course or are deleterious or become toxic to aquatic life." (emphasis added). EPA's previous interpretation of "free" as meaning that SB waters should be "unimpaired" or "unencumbered" by visible oil sheen, foam or solids took into account that trace amounts of sheen, film or foam that can be easily removed or that dissipate readily do not impair the designated uses of SB waters. Allowing trace amounts of sheen, film, or foam is reasonable, consistent with the intent of the regulations to protect designated uses, and practicable given GE's experience with discharging salt water back into a tidal estuary.

The Facility does experience biological films and sheens in the warm spring season. This phenomenon may be caused by natural events such as the presence of iron, decomposition of organic matter, or the presence of certain types of bacteria. Naturally occurring sheens are usually silver or relatively dull in color and if disturbed, will break up into a number of small patches of sheen. Oil of a petrochemical nature produces a sheen oriented in rainbow-like lines, or streaks floating on the water surface, and GE agrees that this type of sheen is impermissible and should be prohibited. However, EPA's language does not distinguish between this type of condition and vegetative scum and foam that are present in tidal convergence lines or "tidelines." Sometimes called streaks, stringers, or fingers, they are commonly found floating in near-shore and offshore waters. They are usually just a collection of sea grasses, seaweeds and protein scum or foam that are moved around by the tides and wind. In addition, discharges into these bio-scums can produce a brief bubbling or foaming effect that readily dissipates.

By changing its interpretation of "free" to mean "shall not contain," EPA appears to be requiring the immediate reporting of all such events, and each event would constitute a permit violation. GE has no wish to administratively burden EPA or other agencies with unnecessary reporting that results in no environmental benefit. GE is also concerned with the impossibility of complying with the provision as written, and the potential for penalties and enforcement based upon a natural occurrence in the tidal estuary. GE proposes that the current NPDES permit language allowing trace amounts of visible sheen, foam or film be retained.

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[86] *See* Technical Exhibit 19 [December 5, 2000 David Johnson (GE) to George Harding (EPA, Reg #1)].

Response to Comment 12.0:

In Comment 12.0, GE identifies a number of issues (not necessarily related to one another) regarding specific language in the Draft Permit. EPA responds separately below to each issue raised.

1. Wet Weather

GE requests EPA define the phrase "periods leading up to forecasted wet weather." However, as discussed elsewhere in this RTC document, in consideration of GE's objections about cost and feasibility of certain of the requirements contained in, and the overall approach of, the Draft Permit, this phrase is not contained in the Final Permit. The only BMP that requires the permittee to consider forecasted conditions specifies "Prior to a storm event forecasted to generate 0.1 inches or more of precipitation." Part I.B.1.b of the Final Permit requires the permittee to use the National Weather Service's Precipitation Forecast for the Boston area to determine when to operate the vaults at the "low alarm" level. One source of this precipitation forecast is http://graphical.weather.gov/sectors/box.php. EPA believes that the permittee's requirements related to forecasted conditions specific to the BMP at Part I.B.1.b and discussed in Attachment A is sufficient for GE to meet compliance obligations.

2. Metals Sampling

GE states that because EPA has specified monthly grab samples for metals at the outfalls and quarterly composite samples for WET testing at the same outfalls, one cannot be used in lieu of the other. The Draft Permit included a provision in the footnotes for WET testing that stated "these samples, taken in accordance with the WET testing requirements, may be used to satisfy other sampling requirements as specified in the table above." This provision explicitly authorized GE to use the quarterly composite (reduced to twice a year in the Final Permit) WET test sample results in lieu of requiring another metal grab sample for the same time period (reduced to quarterly in the Final Permit). Still, in consideration of GE's comments regarding the nature of the discharges from the drainage system outfalls during wet weather, the Final Permit has changed the sample type from composite to grab for the WET testing in order to capture a representative sample of commingled wet and dry weather flows when the tide gate initially opens. The following clarification has been added to the Final Permit in the footnotes for WET testing requirements at Tables I.A.1 and I.A.2: "Analyses conducted for WET testing may also be used to satisfy the monthly or quarterly sampling requirements as long as the timing of sampling for the parameters coincides with WET testing for selected pollutants."

In addition, the Final Permit has eliminated monitoring requirements for metals at Outfalls 014 and 018A with the exception of twice yearly monitoring in compliance with WET testing requirements.

3. PAHs

GE requests that instead of specifying MLs, EPA should require that samples be analyzed for PAHs using approved Method 8270LL (lower limit). The *Technical Support Document for*

Water quality-based Toxics Control (EPA 1991) defines minimum level is the level at which the entire analytical system gives a recognizable mass spectra and acceptable calibration points. This level corresponds to the lower points at which the calibration curve is determined based on the analysis of the pollutant(s) of concern in reagent water. NPDES permits commonly specify MLs, rather than identify a method for analysis. EPA reviewed NPDES permits with monitoring requirements or permit limits for PAHs issued to dischargers in Massachusetts and has found that these permits specify MLs similar to those in GE's Draft Permit.[87]

Regarding the three pollutants that GE refers to in its comment, the MLs for benzo(a)anthracene, benzo(b)flouranthene, and benzo(k)flouranthene in the Draft Permit are 0.05 µg/L, which are consistent with the MLs using Method 610HPLC (0.013 µg/L, 0.023 µg/L, and 0.017, respectively) described in 40 C.F.R. Part 136 Appendix B. As such, EPA did not erroneously specified MLs that are below the method detection levels.

However, EPA acknowledges GE's assertion about the possibility of interferences that may affect MLs of a particular sample. In addition, the MLs under Method 610HPLC are substantially lower than the method detection limits necessary to comply with the numeric permit limits for PAHs at Outfall 027A or the reporting requirements for Group I PAHs at the drainage system outfalls. On the other hand, the lower limit of quantitation for PAHs with Method 8270 (the method requested by GE) in groundwater is 10 µg/L, which may be suitable for Group II PAHs and for reporting Group I PAHs in wet weather discharges at the drainage system outfall, but is not appropriate to meet the permit limit of 10 µg/L for Total Group I PAHs at Outfall 027A. The Total Group I PAH value is equal to the sum of the individual Group I PAHs. At a limit of 10 µg/L, each of the seven individual Group I PAHs must be less than 1.4 µg/L. Rather than requiring GE to use a specific method for analysis of PAHs, EPA has specified MLs that can be met either by the approved methods at 40 C.F.R. Part 136 (Method 610HPLC or Method 625) or, is some cases, by Method 8270. GE is authorized to use whichever method it chooses as long as the MLs are consistent with those specified in the permit.

Accordingly, the relevant footnote for the drainage system outfalls in the Final Permit states: "The minimum level (ML) for analysis of Polynuclear Aromatic Hydrocarbons (PAHs) shall be no greater than 10 µg/L. Analysis must be completed using an EPA approved method in 40 C.F.R. Part 136, Table IC – List of Approved Test Procedures for Non-Pesticide Organic Compounds or, alternatively, using EPA approved method 8270D."

The relevant footnote for Outfall 027A in the Final Permit states: "The minimum level (ML) for analysis of Group I Polynuclear Aromatic Hydrocarbons (PAHs) shall be no greater than 1 µg/L. Analysis must be completed using an EPA approved method in 40 C.F.R. Part 136, Table IC – List of Approved Test Procedures for Non-Pesticide Organic Compounds. The ML for analysis of Group II Polynuclear Aromatic Hydrocarbons (PAHs) shall be no greater than 10 µg/L. Analysis must be completed using an EPA approved method in 40 C.F.R. Part 136, Table IC –

[87] Examples include the ExxonMobil Final Permit Modification MA0000833, effective October 12, 2011, the Conoco Phillips Final Permit MA0004006, effective August 25, 2006.

List of Approved Test Procedures for Non-Pesticide Organic Compounds or, alternatively, using EPA approved method 8270D."

4. Stormwater at Outfall 018

As stated previously in this RTC document, the Final Permit has eliminated all requirements relating to wet weather discharges through Outfall 018B. Authorized discharges through Outfall 018A include NCCW from power plant generating equipment, turbine condensate, steam condensate, boiler startup/soot blower drains/boiler draining for maintenance, de-aerator storage tanks, boiler blowdown, and flows from internal Outfall 018C.

5. Stormwater Pollution Prevention Plan

GE states in its comments that "[t]he requirements in Part I.B.8, related to the pollution prevention team, stormwater pollutant sources and best management practices, are duplicative of Parts I.B.3 and 7 and should be removed. The requirements at Part I.B.3 and I.B.7 are consistent with the MSGP effective in 2009 and include annual certification requirements not included in the site specific BMPs under Part I.B.8. EPA has eliminated the requirements contained in the Draft Permit Part I.B.8 from the Final Permit because these requirements will be satisfied by complying with other aspects of Part I.B of the Final Permit, including Parts I.B.1. and I.B.2.a through c.

6. Narrative Water Quality Standard for Foam and Sheen

GE comments that "EPA's prohibition on foam or sheen is unreasonable in that it does not (1) acknowledge or conform with previous determinations by the Agency relating to the Facility, or (2) account for natural organic matter in the tidal estuary and in the intake water returned to the estuary. GE's existing NPDES permit specifies that "there shall be no discharge or floating solids, oil sheen, or visible foam *in other than trace amounts*" (emphasis added). After GE requested clarification as to the definition of "trace amounts," EPA confirmed and agreed that a trace sheen occurs where: 1) the source can be eliminated immediately and the extent of the sheen is clearly defined allowing it to be captured and removed immediately, or 2) conditions at the water surface quickly dissipate the sheen."

During the course of developing the Final Permit, EPA reviewed the Massachusetts Surface Water Quality Standards at 314 CMR 4.05(4)(b) for Class SB waters, which contains requirements relating to solids and oil and grease. The standards provide that:

Solids: These waters shall be free from floating, suspended and settleable solids in concentrations or combinations that would impair any use assigned to this class, that would cause aesthetically objectionable conditions, or that would impair the benthic biota or degrade the chemical composition of the bottom.

Oil and Grease: These waters shall be free from oil, grease and petrochemicals that produce a visible film on the surface of the water, impart an oily taste to the water or an oily or other undesirable taste to the edible portions of aquatic life, coat the banks or bottom of the water course, or are deleterious or become toxic to aquatic life.

There is no indication in the standards quoted above that a discharge of solids or oil and grease in "trace amounts" is acceptable. Rather, the standards indicate that Class SB waters shall be free from visible sheens or floating solids. The Final Permit has updated the language for the narrative requirements for solids at Part I.A.15 and oil and grease at Part I.A.16 to be consistent with the applicable Massachusetts Surface Water Quality Standards at 314 CMR 4.05(4)(b) for Class SB Waters.

13. Some of EPA's Expectations and Assumptions Related to Operations and Practices at the Facility are not Accurate and Need to be Corrected.

Comment 13.1: Treatment by GAC Alone is more Effective than Treatment using both the GAC and DAF.

EPA assumes that "pollutant discharges would be reduced the most by operating the CDTS in the mode utilizing both DAF and GAC treatment." Fact Sheet p. 8. However, this assumption is not correct. To fully understand this issue, it is critical to first address the original design philosophy of the CDTS, and to compare this design philosophy to GE's actual operating experience over the last ten years.

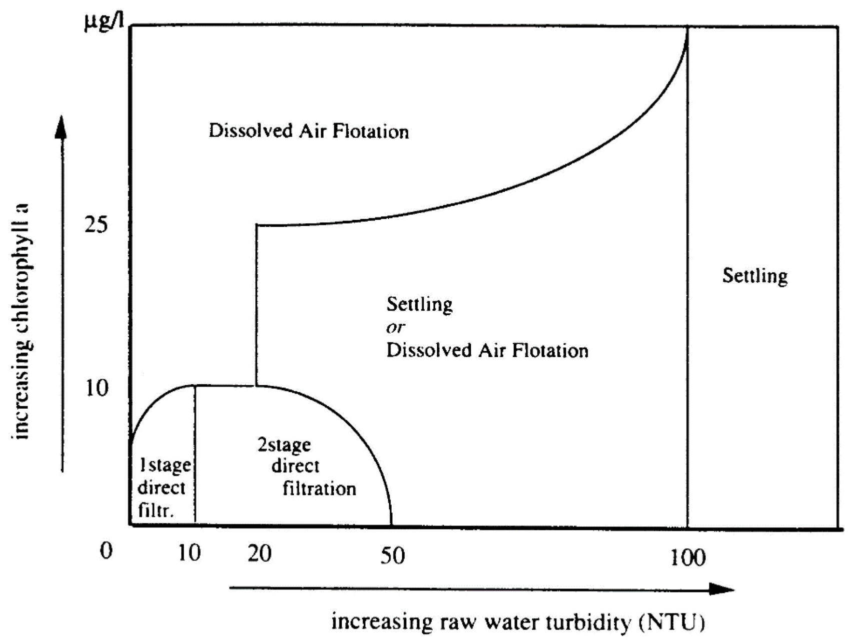
The design and installation of the CDTS was an element of GE's comprehensive sheen reduction program. During the design process, GE's understanding of the sheen issue was evolving. As a result, the CDTS design philosophy accommodated a wide range of influent characteristics and provided the operating flexibility necessary to achieve the discharge performance standards. In this regard, a key unknown was the amount of free product or floating oil and grease that would be present in the wastewater pumped from the respective drainage system vaults to the CDTS. To address this unknown, dissolved air flotation (DAF) technology was selected as an element of the treatment system to provide the capability for the removal of free product and floating oil and grease should these pollutants exist in sufficient quantity.

Other technologies (i.e., unit processes) utilized in the CDTS include influent equalization and skimming, and granular activated carbon (GAC) polishing. In addition, the system incorporated the existing skimmers and oil water separators associated with each respective drainage system vault. The system design was reviewed and approved by EPA and MADEP in the context that the proposed operating strategy would allow GE the flexibility to operate the desired unit processes as deemed necessary to achieve the discharge quality objectives.

Following start-up, operating experience quickly revealed that meaningful concentrations of floating product or oil and grease do not exist in the wastewater and therefore operation of the DAF system is unnecessary. Trace levels of floating materials are removed by the skimmers and oil water separators associated with each drainage system vault and the resulting influent wastewater received at the CDTS only requires polishing with the GAC system. Operation of the DAF, therefore, is not required.

To facilitate removal of colloidal suspended solids potentially present in the wastewater and flotation of free product and oil and grease, the DAF system was also equipped with chemical coagulation using polyaluminum chloride (PAC) and flocculation using an anionic emulsion polymer. However, it is important to understand that operation of the DAF system also creates adverse effects on the GAC system. That is, without the presence of sufficient colloidal solids (as discussed below), the coagulant and polymer will pass through the DAF system and impact the performance of the GAC system. Specifically, polymer that escapes the DAF system will tend to bind the carbon and potentially create short circuiting (i.e., rat holes), and polymer will also be adsorbed by the carbon thereby shortening the useful life of the carbon. PAC that escapes the DAF would not be adsorbed by the carbon and would be discharged to the Saugus River.

With respect to colloidal suspended solids, DAF technology would be an appropriate technology selection to remove solids created from the coagulation/flocculation process. The figure below provides a summary of when to utilize primary treatment processes to remove solids. As shown in the figure, at turbidities less than 20 NTU, a direct filtration process (e.g., GAC) is suitable for proper treatment without the need for primary treatment (e.g., DAF). DAF is typically used for moderate turbidity levels, high algal counts, and limited amounts of silty material. The primary clarification process provides better removal of larger sized coagulated particulates prior to filtration.



Source: "Treatment Process Selection for Particle Removal," AWWA Research Foundation. International Water Supply Association, 1998.

CDTS influent data do not show elevated suspended solids or turbidity, and turbidities are typically less than 20 NTU. In addition, the CDTS has been operating without the DAF system and additional or excessive headloss across the GAC system has not been observed – further proof that primary treatment (i.e., DAF) for solids removal and oil and grease removal is not necessary.

It is further noted that the two GAC columns are operated in series and are routinely monitored between the two columns in order to identify breakthrough of the first column prior to exhausting the removal capacity of the second column. Monitoring occurs on a weekly basis and, on average, contaminant breakthrough of the first column occurs once every two years. Proper operation and maintenance, including the need for adequate back-up systems, necessitates that GE run the two GAC columns in series rather than parallel.

In summary, GE's engineering experience confirms that utilizing the DAF system in combination with the GAC system will not improve discharge quality and, in fact, will adversely affect the GAC performance. Moreover, the ten year operating history of the CDTS clearly demonstrates that primary treatment using the DAF system for dry weather flow is not required and the discharge quality obtained using the GAC system alone is excellent.

Response to Comment 13.1:

GE's comment provides a detailed explanation of how the company's operating experience at the CDTS indicates that better treatment is provided overall by not using the DAF units in light of the characteristics of the wastewater receiving treatment. Although it is not clear from the comment whether GE is objecting to a particular permit condition here, EPA notes that Part I.A.13 of the Draft Permit states, "the permittee shall properly operate and maintain all treatment systems." The Fact Sheet (p. 8) indicates that this condition was intended to require the permittee to operate both the DAF and GAC systems "given that pollutant discharges would be reduced the most by operating the CDTS in the mode utilizing both DAF and GAC treatment." While GE likely shared this view when it installed the DAF units, its comment indicates that it has since learned from experience, as described above, that better, more efficient treatment may be achieved at this time without using the DAF units. Therefore, to avoid any confusion, EPA has eliminated the above-mentioned condition (i.e., Draft Permit Part I.A.13) from the Final Permit. The Final Permit Part I.A.2 authorizes discharge of "treated effluent from the consolidated drains treatment system" and includes several technology-based numeric limits based on use of activated carbon. In addition, Part II of the Final Permit continues to contain standard permit condition II.B.1 ("Proper Operation and Maintenance"). *See also* 40 C.F.R. § 122.41(e). Thus, the Final Permit will require the permittee to continue to treat effluent at the CDTS in the manner that is most effective to remove pollutants and maintain the technology, which was the overarching intent of the permit condition in the Draft Permit.

Comment 13.2: GE has Concerns about the Feasibility, Effectiveness and Implementability of Specific SWPPP BMPs Proposed by EPA.

As mentioned previously, GE has already developed a SWPPP, which contains a comprehensive suite of site-specific BMPs to control and minimize the potential for pollutants in stormwater. GE shares EPA's position that successful stormwater management hinges on an ongoing and iterative process of developing, implementing, correcting, improving and replacing BMPs, consistent with site-specific needs, changes and constraints. However, GE is concerned that certain BMPs proposed by EPA are too prescriptive and may not be feasible, effective or implementable. GE's specific concerns are presented below.

Response to Comment 13.2:

Because GE elaborates in subsequent comments immediately below on the general point articulated above in Comment 13.2, EPA responds specifically to those more detailed comments below.

Comment 13.2.1: *Part I.B.10.a.i. "The CDTS outfall gates shall open only during wet weather after the first flush of pollutants has been transferred to the CDTS for treatment."*

GE has raised its concerns with this provision in other sections of these comments, including the manner in which "wet weather" and "first flush" are defined or interpreted for compliance purposes. GE notes that the gates must open whenever necessary to prevent flooding so as to protect both personnel and equipment, which is a good engineering practice. As GE has demonstrated, the minimal dry weather flow remaining in the vaults along with the "first flush" of stormwater do not have any reasonable potential to cause or contribute to an exceedance of applicable water quality standards. Moreover, GE cannot feasibly capture and treat this commingled flow without extensive changes to the CDTS.

Response to Comment 13.2.1:

EPA remains concerned about discharges of untreated dry weather flow from the Drainage System Outfalls directly to the Saugus River during wet weather conditions. The intent of the Draft Permit was to eliminate these discharges (and have this potentially contaminated wastewater treated at the CDTS) to the maximum extent practicable through a combination of the following available measures (some of which are already used at the facility to some extent):

- isolate contaminated groundwater through storm drain inspection and repair;
- collect and treat contaminated groundwater separately through an alternative groundwater extraction system (such as wells or trenches) and provide treatment prior to discharge to either the Drainage System outfall vaults or the Saugus River;
- treat commingled contaminated groundwater, stormwater, and other wastewater flows prior to their discharge to the receiving water; and/or
- isolate non-allowable non-stormwater discharges through re-piping directly to the CDTS.

The Draft Permit also included a narrative condition that called for GE to eliminate to the maximum extent practicable the discharge of untreated non-allowable non-stormwater flows (other than allowable non-stormwater discharges) commingled with stormwater, along with a list of BMPs designed to achieve this goal. The Final Permit has eliminated these BMPs, including the one that GE specifically objects to in the comment.

Instead, the Final Permit applies a technology-based, BMP approach to addressing the dry weather flows at the drainage system outfalls. First, the Final Permit requires that the drainage system outfall tide gates discharge only during wet weather (as defined in the Final Permit), with the exception of minor weeping around the bottom edge of gates due to hydrostatic pressure. EPA believes that these permit conditions are consistent both with proper maintenance and control of the outfall gates, which are operated consistent with the Massachusetts Administrative Consent Order to "substantially eliminate" the discharge of dry weather flows to the Saugus River, and with GE's comments.

Second, the Final Permit requires that the permittee minimize the volume of dry weather flow that is discharged, untreated, to the Saugus River during wet weather by lowering the elevation of the drainage vaults to the "low alarm" level prior to a storm event forecasted to generate 0.1 inches or more of precipitation (and thus trigger the tide gates to open). EPA believes this requirement is a feasible measure to reduce untreated pollutant discharges to the Saugus River, and is consistent with GE's current operation of the vaults. More detailed discussion of these requirements is provided in Attachment A.

Comment 13.2.2: *Part I.B.10.a.ii. "The CDTS outfall gates shall remain closed and without leaks, during all periods of dry weather."*

GE disputes the inclusion of a dry weather BMP in a wet weather SWPPP. Even if such a BMP were relevant in the stormwater context, it does not meet the "good engineering" standard. As discussed above, it is technically impracticable to hermetically seal mechanized steel outfall gates that operate on metal tracks. With routine inspection and maintenance, leaks around the gates are minimized in accordance with good engineering practice. In addition, the small amount of weeping around the bottom edges of gates due to the hydrostatic pressure created by the water behind the gates has no reasonable potential to affect the quality of the commingled discharge.

Response to Comment 13.2.2:

EPA acknowledges that this "dry weather" BMP was included in the SWPPP, since it directly related to the absence of wet weather flow and to the proper maintenance and operation of equipment designed to address both dry and wet weather flows. The Final Permit Part I.B. is titled more generally "Best Management Practices" and includes a section for site-specific best management practices for the operation of the drainage system outfalls and a separate section for the SWPPP. EPA believes this new format addresses GE's comments regarding the inclusion of dry weather BMPs in a wet weather SWPPP.

GE states that the "weeping around the bottom edges of gates due to the hydrostatic pressure created by the water behind the gates has no reasonable potential to affect the quality of the commingled discharge." In the event of a leaking gate, EPA is concerned with the discharge of dry weather flows directly to the receiving water, as stated in the above comment. While minor weeping may be technically impractical to eliminate, any dry weather discharge should be minimized.

Consistent with GE's comment above, the Final Permit Part I.B.1.a requires that

"The Drainage System Outfall gates shall remain closed without leaks, except for minor weeping around the bottom edge of the gate due to hydrostatic pressure, during all periods of dry weather."

EPA agrees that this BMP is consistent with good engineering practice while not requiring GE to address those leaks that may be technically infeasible to eliminate.

Comment 13.2.3: *Part I.B.10.b.iii. "Manually operate the transfer pumps from all eight vaults leading up to significant storm event to reduce the dry weather flows to a low level in the vaults, and as a result to help eliminate to the maximum extent practicable, the amount of non-allowable non-stormwater flows that are commingled with stormwater in the Drainage System vaults and discharged to the Saugus River."*

The provision is replete with definitional problems that have already been discussed. It appears that EPA's goal is to minimize the accumulation of dry weather flow in the vaults so that this flow is not discharged when the vaults open during a storm. However, this goal is inconsistent with Part I.B.10.b.i, which would require GE to reconfigure the vault system to ensure that during dry weather all flow in the Drainage System is transferred to the CDTS for treatment prior to discharge, which would include all dry weather flow in the vaults leading up to a storm and would require more than just reducing the dry weather flow to a low level. Further, in Part I.B.10.f, EPA would require GE to "ensure the sonic sensor in each outfall vault is operated normally so that the water level in the skimming chamber is never lower than the baffle designed to retain floating material for skimming." Reading these three, seemingly inconsistent provisions together, GE is left to wonder what EPA wants, and what it would take to comply -- is GE supposed to (1) capture as much dry weather flow in the vaults as possible for treatment, or (2) reduce as much dry weather flow in the vaults as possible to minimize or eliminate the potential for a commingled discharge during wet weather, or (3) maintain dry weather flow levels in the vaults so that the skimmer and baffle can retain floating materials? GE respectfully submits that each of these is internally inconsistent with the other, and must be reconciled before the permit is finalized.

Response to Comment 13.2.3:

As is evident in the Draft Permit and Fact Sheet, EPA's goal is and has been to minimize untreated discharges of polluted water from the Drainage System Outfalls to the Saugus River. EPA continues to regard this to be an entirely appropriate goal under the CWA. *See* 33 U.S.C. § 1251(a)(1); 1311(b)(2)(A). In this regard, EPA intended the permit provisions in question to, in the words of GE, "minimize the accumulation of dry weather flow in the vaults so that this flow is not discharged when the vaults open during a storm." The Final Permit requires that the volume of dry weather in the vaults is minimized prior to a storm event, but, as explained previously in these Responses to Comments, does not include a requirement to transfer the first thirty minutes of wet weather to the CDTS. The Final Permit retains the requirement to maintain the level in the skimming chamber above the baffle, but specifies "except when authorized to operate at the 'low alarm' level to minimize dry weather flow in the vault prior to a forecasted storm event." The Final Permit's approach therefore addresses GE's concerns regarding any potential inconsistencies.

Comment 13.2.4: *Part I.B.10.b.v. "Isolate each source of non-allowable non-stormwater flow, to the maximum extent practicable, and re-pipe it directly to the CDTS for treatment."*

EPA's suggested BMP is impracticable and does not represent good engineering practice. The drainage system collection vaults and oil skimmers are an integral element of the CDTS system and were designed to provide collection of all DWF sources within each respective drainage basin and to provide preliminary treatment prior to pumping to the CDTS; thus bypassing them is generally not a good idea. First, the vaults are centralized collection points for a large complex drainage system in a manufacturing facility where things can change. Using this approach, even though GE might not know the exact location where a source of "non-allowable, non-stormwater" flow is entering the drainage system, the flow can still be captured. The vault system facilitates collection of non-stormwater flows generated by activities that occur in different areas of the site [e.g. drain cleanouts, A/C roof washwater not containing detergents, excavation dewatering (after appropriate testing), and stormwater drain dye tracer water]. Equipment generating non-stormwater flows may relocate or may consist of many sump pumps that are distributed around the Facility, such as the steam conduit sump pumps. The second purpose of the vaults is to provide initial buffering and preliminary treatment for oil and grease removal. Without this preliminary treatment step, the downstream granular activated carbon treatment system at the CDTS would be exhausted more frequently and operating costs would increase.

Eight vaults currently collect flows from miles of drainage lines, a setup that minimizes the amount of overhead piping that runs directly to the CDTS and the number of pumps that need to be operated to convey wastewater to the CDTS for treatment. Additional overhead piping must be insulated, is expensive to construct and maintain, and needs to be minimized to prevent interferences with other overhead utility lines, shop operations, and vehicles moving around the facility. Smaller DWF sources located near the existing CDTS conveyance header could possibly utilize the existing overhead piping; however, larger DWF sources and sources not located near the existing header would require construction of new dedicated overhead piping conveyance systems at costs ranging from $150 to $250 per linear foot. Furthermore, isolating each DWF source would require a collection and automated pumping system, and would increase operations and maintenance costs. Pumping through overhead piping instead of using gravity to drain line to the vaults also increases energy usage.

To assess the infrastructure needs and capital costs required to isolate and convey three major DWF sources to the CDTS, including the steam conduit drains, the power house boiler blowdown, and the boiler water treatment system backwash waters, GE developed a preliminary planning-level cost estimate as presented in Technical Exhibit 20. For example, the facility maintains 36 steam conduit collection sump pumps that are spread out across the facility. The existing pumps are only designed to lift the conduit drain water to the closest available drain and are not sized to pump the drain water across the site through an overhead conveyance piping network. Therefore the pumps would require upgrade and replacement. The estimated capital cost to collect, convey and treat the aforementioned sources to the CDTS is $6.8 million. The estimate does not include the capital costs associated with the isolation, collection, and conveyance of the remaining non-allowable, non-stormwater flows.

With respect to the boiler blowdown, the CDTS is not the appropriate treatment technology for this wastewater. The primary constituents of concern for boiler blowdown are pH and temperature. The CDTS does not include a pH adjustment process nor a temperature quenching or cooling process. Thus, routing the boiler blowdown to the existing CDTS would serve no environmental benefit. Segregation, collection, conveyance, and treatment of boiler blowdown would require design and construction of new systems – estimated at a cost of $2.4 million as shown in the Technical Exhibit. Treatment of boiler blowdown would require storage tanks to facilitate cooling, followed by pH adjustment including a chemical additional and control system.

Collection of the boiler water treatment backwash waters and conveyance to the CDTS for treatment is estimated at $0.3 million.

Finally, GE has been operating the CDTS for over 10 years, and during that time period, GE has only identified one non-stormwater source where GE decided based on location, the amount of flow, and the characteristics of the flow that it was prudent to pipe a source of non-stormwater directly to the CDTS (the 29G/T groundwater treatment system). Again GE is in the best position to decide how to manage different flows at its Facility in relation to treatment in the CDTS.

Response to Comment 13.2.4:

As indicated elsewhere and throughout this RTC document, the Draft Permit's requirement to "[i]solate each source of non-allowable non-stormwater flow, to the maximum extent practicable, and re-pipe it directly to the CDTS for treatment" has not been retained in the Final Permit. The Final Permit includes BMPs designed to minimize the discharge of untreated dry weather flows to the Saugus River in both dry and wet weather.

Comment 13.2.5: *Part B.10.c. "During wet weather conditions, during periods leading up to forecasted wet weather conditions, and whenever any outfall gate is open, eliminate, to the maximum extent practicable, the generation of non-allowable non-stormwater flows that would be discharged from the Drainage System Outfalls. To satisfy this requirement the following discharges are prohibited…"*

"Intermittent Discharges Consisting of de-aerator Storage Tanks, Building 64-A Sump, Test Cell Washdown, Stormwater Collected in Secondary Containment Dikes and Truck Unloading Areas, Hydrant Testing, Sprinkler System Testing Water, Stormwater Dye Tracing." [Part B.10.c.i]

The Building 64-A sump water and test cell washdown water discharge to the LWSC municipal sewer system, not to the Drainage System, so this requirement is not applicable and should be removed from the Permit.

Stormwater collected in the secondary containment dike and in the truck unloading areas is *not* "non-stormwater." GE cannot feasibly eliminate it during a storm event. And the prohibition would be the exception that swallows the rule, since in Part B.10.f, EPA has already prohibited the discharge of sheens (as opposed to all stormwater collected in the dikes and unloading area, most of which is uncontaminated).

GE has 361 sprinkler systems and drains that must be tested three times per year, along with 93 fire hydrants that must be tested once per year. Water is discharged onto the parking lots, and then flows to Drainage System. Hydrant testing and sprinkler system test water originates in the city's water supply and is potable. GE does not use chemical additives in this water. By the time it is discharged and due to storage time in the pipes and flushing, any chlorine residual will have dissipated. These flows do not present water quality concerns, which is why EPA allows tens of thousands of industrial permittees to discharge these flows under the MGSP.

GE needs to conduct periodic dye tracer testing to maintain the integrity of its old and complex system of drains and outfalls. GE does not perform dye tracer testing during wet weather because the dye is not visible during such an event. GE does not believe that non-toxic, biodegradable dyes run afoul of applicable state water quality standards or are "aesthetically objectionable." However, as drafted, the permit would prohibit the use of such dyes. Although GE has made a substantial progress over the last five years to map the entire Facility drain system, GE still must manage this system and remain vigilant to detect and prevent any unknown connections or failures in historic plugs or disconnects throughout the 112-year old Facility infrastructure. Tracing the location and drainage pathway of such pipes is necessary at times for maintenance and to verify the accuracy and availability of the Facility's drawings. If the purpose of the exercise is to find out where a pipe discharges because it is unknown, it is difficult to prevent discharge until the dye makes the drainage pathway visible. Minimization may be reasonable but prohibition is impractical and ignores good engineering practice in utilizing non-toxic biodegradable tracer dyes designed to dissipate quickly. Rather than an absolute prohibition, EPA should require that only non-toxic, biodegradable dyes be used; that use be minimized in accordance with good engineering practice, and that EPA and MADEP be notified prior to the use of dyes in the stormwater drainage system at the Facility.

"Any Discharge of 'Blowdown' during Wet Weather and during Periods Leading up to Forecasted Wet Weather Conditions, to the Maximum Extent Practicable. Blowdown consists of Condensate Blowdown, Steam Conduit Blowdown, Boiler Blowdown and Cooling Tower Blowdown." [Part B.10.c.iii]

The term "blowdown" is not applicable to GE's steam conduit or condensate system as neither system produces blowdown. "Blowdown" is generally an automated feature of equipment, such as boilers and cooling towers, which need to control water chemistry (e.g. pH, conductivity, mineral content) in order to function effectively. These systems maintain concentration using a "bleed and feed" system. The concentration is electronically monitored and if the concentration increases to an unacceptable level, the system dumps (or blows down) the concentrated water and initiates a feed of clean water. These two actions work together to bring the water solution into optimal range. Unbalanced water chemistry can result in equipment malfunction, acidic discharges, corrosion and pathogen buildup leading to potential boiler equipment failure. Boiler equipment failure and malfunctions can result in excessive air emissions and permit exceedances. Blowdown cannot be tied to the weather forecast without risking adverse consequences to the equipment that provide power and other utilities to the Facility. EPA's proposed BMP is technically infeasible, creates other potential environmental problems and does not reflect good engineering practice. Therefore, this BMP should be deleted in its entirety.

"Any Discharge from Routine Maintenance that Generates Wastewater Discharges during Wet Weather and Periods Leading up to Forecasted Wet Weather Conditions, to the Maximum Extent Practicable. Routine Maintenance Consists of: Boiler Startup/Soot Blower Drains/Boiler Draining for Maintenance (Intermittent), Boiler Filter Backwash, Ion Exchange Regeneration and Backwash." [Part I.B.10.c.iv]

All flows generated in the Power Plant either discharge to Outfall 018 or 019. Outfall 018 does not contain a stormwater component, and BMPs in a SWPPP are not applicable to non-stormwater flows. EPA inconsistently seeks to impose numeric limitations for Outfall 018 based on the Steam Electric ELGs, which allow these types of flows, and at the same time to prohibit such discharges during wet weather. Outfall 019 does contain a stormwater component. During dry weather, the flows from routine maintenance are diverted to the CDTS for treatment; during wet weather, GE has demonstrated that there is no reasonable potential for these flows to affect water quality. In addition, the need for routine maintenance is not tied to the weather forecast but to conditions of the equipment; EPA's prohibition does not reflect good engineering practice. This BMP should be deleted in its entirety.

Prohibition on "any Discharge from any remaining non-allowable non-stormwater discharge flows during wet weather and during periods leading up to forecasted wet weather conditions, to the maximum extent practicable. These non-allowable non-stormwater flows include at a minimum, potable water used upon NCCW system failure, steam conduit water, excavation dewatering, contaminated groundwater and cooling water (not including discharges of NCCW through Outfall 014 and 018.) [Part I.B.10.c.v]

EPA seeks to insert a catch-all BMP relating to the elimination of all "non-allowable non-stormwater flows" during wet weather even though the generation of many of these flows is often directly related to wet weather. EPA also fails to consider the age and complexity of the drainage system. GE has already corrected EPA's assumptions regarding contaminated groundwater in Section III above. GE's other concerns are set forth below.

Water generated from excavation dewatering is either stormwater or groundwater that has infiltrated into the excavation. Any prohibition associated with such a discharge should be based on its water quality impacts, not the weather conditions at the point of discharge. As an existing BMP, GE tests water generated from the dewatering of excavations. Based on the test results, the flow is either 1) discharged to the CDTS equalization tanks for treatment; 2) discharged to the LWSC municipal sewer system with permission; 3) shipped offsite for disposal or 4) if the water is uncontaminated, discharged to the storm sewer system. This BMP is consistent with regulatory requirements, reflects good engineering practice, and should be maintained.

Steam conduit water is produced when water accumulates in the sumps in the underground concrete vaults surrounding the steam piping, some of this water could be considered stormwater, some could be considered groundwater. Either way, accumulation is likely to occur more frequently during wet weather. The sump pumps trigger automatically based on the water level not the weather forecast. EPA's BMP would force GE to allow its steam conduit to potentially flood and damage equipment rather than allow the pumps to discharge. This is not a good engineering practice and should be removed from the permit.

To the extent EPA is prohibiting the discharge of non-contact cooling water that originates in the city water supply, EPA has no basis for requiring this BMP as EPA allows for the continual discharge of this type of non-stormwater flow under the MGSP. For the Facility, such flows would be occasional and intermittent as GE would only discharge this water in the event that a cooling tower failure occurs and immediate shutdown of equipment being cooled is impracticable. Potable water would replace the recirculating water from the cooling tower to keep the heat exchangers from overheating until repairs or shutdown of cooled equipment could be accomplished. Since GE pays for potable water, GE has a built-in financial incentive to avoid long-term reliance on once-through cooling supplied by the municipal system. GE does not dispute that contact cooling water should not be discharged during any period where its collection and treatment in the CDTS cannot be assured.

Response to Comment 13.2.5:

GE's comments in this section essentially relate to Part I.B.10.c of the Draft Permit, which prohibits the generation of non-allowable, non-stormwater flows during wet weather and during periods leading up to forecasted wet weather conditions, including but not limited to blowdown, cleaning water, excavation dewatering, and stormwater dye tracing. Part I.B.10.c of the Draft Permit has been eliminated in the Final Permit. As noted earlier and throughout this RTC document, the Final Permit includes BMPs designed to minimize the discharge of untreated dry weather flows to the Saugus River.

GE states that dye tracer testing is not performed during wet weather because the dye is not visible during such an event. Therefore, any discharge of dye to the receiving water is an indicator of a discharge of dry weather flows. Consistent with GE's comments, EPA has added the following requirement to Part I.A.10 of the Final Permit: "The permittee is authorized to use non-toxic, biodegradable dyes during dry weather, in minimal amounts, in accordance with good engineering practice, with prior notification to EPA and MassDEP. Discharge of any dye directly to the receiving water shall be reported to EPA on the cover letter to the DMR of the month immediately following the discharge."

GE comments on the hydrant testing and sprinkler system test water. Fire hydrant flushing is listed as an allowable non-stormwater flow under the MSGP. Additionally "potable water, including water line flushings" is an allowable non-stormwater flow under the MSGP. GE also states that no chemical additives are added to this water. In consideration of GE's comments, the Final Permit does not contain any requirements related to hydrant testing and sprinkler system test water.

Stormwater collected in the secondary containment dike shall be inspected prior to discharge. Any collected water containing a visible sheen shall be disposed of offsite or transferred to the CDTS for treatment prior to discharge. After inspection and a determination that there is no visible sheen, the water may be discharged. Therefore, the prohibition of the discharge of this water during wet weather does not appear in the Final Permit and the BMP concerning this water has been revised (see Response to Comment 13.2.7, below).

GE states that eliminating blowdown discharges at the Facility is technically infeasible without risking adverse consequences to its equipment. Based on GE's comment and explanation, EPA has dropped the prohibition of the discharge of blowdown during wet weather and periods leading up to wet weather from the Final Permit, along with all of Part I.B.10.c.

GE states that as an existing BMP, GE tests water generated from the dewatering of excavations. Based on the test results, the flow is either 1) discharged to the CDTS equalization tanks for treatment; 2) discharged to the LWSC municipal sewer system with permission; 3) shipped offsite for disposal or 4) if the water is uncontaminated, discharged to the storm sewer system. Therefore, the prohibition of discharges of dewatering from excavations has been replaced with a BMP in Part I.B.2.c.ix of the Final Permit requiring GE to continue to test dewatering from excavations and discharge it to the CDTS equalization tanks, the LWSC municipal sewer system, or ship it offsite for disposal. The Final Permit does not authorize excavation dewatering to be discharged to the storm sewer system because EPA believes that this wastewater can be treated with the BAT for dry weather flows (the CDTS) or otherwise disposed of without needing to discharge to the drainage system.

Additionally, GE states that the Building 64-A sump water and test cell washdown water discharge to the LWSC municipal sewer system. Therefore the prohibition of these discharges is not applicable. Consistent with GE's comments, Part I.A.11 of the Final Permit includes a requirement that these waters continue to be discharged to the LWSC municipal sewer system.

GE states that all flows generated at the Power Plant either discharge to Outfall 018 or 019. EPA has addressed GE's comments on wet weather discharges from Outfall 018 in these responses to Comments. The Final Permit does not authorize discharges from Outfall 018 specific to wet weather. However, the information provided in the comment regarding Outfall 019 is new and EPA was not aware of this outfall when the Draft Permit was issued. Based on GE's permit application and supplemental information, EPA believed that all flows associated with the Power Plant discharged only through Outfall 018. GE submitted this new information in response to EPA's CWA information request dated October 19, 2011, stating that discharges generated at the Power Plant also discharge through Outfall 019 and consist of: water softener backwash and rinse (city water), water softener regeneration (city water and brine solution), and carbon filter backwash (city water). EPA believes the Final Permit requirements are consistent with the current operation of Outfall 019 as part of the drainage system outfalls. During dry weather, flows will continue to be transferred to the CDTS for treatment, while wet weather discharges will be monitored and reported consistent with the other drainage system outfalls.

Comment 13.2.6: *Part I.B.10.d. "In the event of any generation of non-allowable non-stormwater flows during wet weather conditions or during periods leading up to forecasted wet weather conditions, the permittee shall record the type of flow generated, the corresponding weather conditions, the reason the flow was generated during wet weather conditions and the fate of the non-stormwater flow in question. The permittee shall submit this information to EPA in an annual report, due by March 31st each year."*

This recordkeeping BMP is arbitrary and capricious, unduly burdensome, and technically impracticable given the age of the Facility, the types of non-allowable non-stormwater flows of concern to EPA, and the complexity of the drainage system. There is no method for GE to detect and manage all non-allowable, non-stormwater flows of the types identified in Part I.B.10.c of the Draft Permit. For all the reasons stated above, EPA's focus on elimination of these flows is not justified. In turn, tracking and recordkeeping of this magnitude is unnecessary. To underscore this point, GE cannot detect -- during wet weather, periods leading up to forecasted wet weather, or at any other time -- when some contaminated groundwater might infiltrate through a crack in a pipe somewhere in the 12 miles of drainage lines. As explained above, the age and complexity of the drainage system was one factor considered by GE in designing the CDTS system with vaults to collect flows from various upstream locations in the drainage system.

Response to Comment 13.2.6:

As previously discussed in this RTC document, the Final Permit requires BMPs to minimize the discharge of dry weather flows during wet weather by reducing the volume of dry weather flow in the vaults prior to the start of a storm event predicted to generate sufficient precipitation to trigger the tide gates. Accordingly, the Final Permit does not include any requirements related to the generation of "non-allowable, non-stormwater flows" and the BMP that is the subject of GE's comment has been removed from the Final Permit.

The intent of the BMP in the Final Permit is to minimize the discharge of dry weather flow during the first flush of wet weather. To this end, and related to the reporting requirements at issue in GE's comment, Parts I.A.1 and I.B.1.b of the Final Permit require the permittee to monitor and report the average monthly and daily maximum volume of dry weather flow pumped to the CDTS prior to a storm event at each of the drainage system outfalls. Reporting these flows will likely ensure that the permittee complies with the BMP but avoids the potentially burdensome requirements related to the type, source, and fate of dry weather flows to which GE objects.

Comment 13.2.7: *Part I.B.10.f. "Inspect all stormwater collected with the secondary containment areas at the jet fuel farm, around tanks, in the truck unloading ramps, in the Outfall 032 drainage area and from other areas for evidence of an oil sheen or other contamination prior such water being routed to the CDTS. In the event a sheen is observed, the permittee shall eliminate the sheen prior to discharging the water from the containment area or dispose of the water offsite."*

GE objects to this requirement on several grounds. GE's wastewater treatment operators are in the best position to decide which flows can be treated in the CDTS and which should be excluded. The CDTS was designed and has operated effectively for over a decade treating wastewater with oily sheens; in fact, the elimination of sheens from GE's discharge to the Saugus River was one of the primary reasons for installation of the CDTS. EPA's exclusion has no technical basis. This BMP should be deleted in its entirety.

Response to Comment 13.2.7:

The Final Permit requires that stormwater collected in the secondary containment areas be inspected prior to discharge. Any collected stormwater containing a visible sheen shall be disposed of offsite or transferred to the CDTS for treatment prior to discharge. Therefore, Part I.B.2.c.i of the Final Permit has been revised as follows to authorize treatment in the CDTS:

> Inspect all stormwater collected with the secondary containment areas at the jet fuel farm, around tanks, in the truck unloading ramps, in the Outfall 032 drainage area and from other areas for evidence of an oil sheen or other contamination prior to discharge to the drainage system. In the event a sheen is observed, the permittee shall eliminate the sheen prior to discharging the water from the containment area to the drainage system. Otherwise, water containing a sheen shall be discharged to the CDTS for treatment or disposed of offsite.

Comment 13.2.8: *Part I.B.10.g. "Perform regular cleaning of the Drainage System pipelines."*

It is unclear how EPA would interpret "regular cleaning" in a compliance or enforcement proceeding. Rather than subject GE to the risk of subjective interpretation and enforcement, EPA should allow GE to develop a site-specific BMP for drain cleaning as part of its updated SWPPP based on appropriate variables such as the extent of sand usage on roads during the winter season.

Response to Comment 13.2.8:

EPA agrees that "regular cleaning" should be defined based on site-specific factors, to be described in the SWPPP. Part I.B.2.c.ii of the Final Permit at has been changed to state, "Perform regular cleaning of the Drainage System pipelines. The term 'regular cleaning' shall be defined based on site-specific factors and described in the facility's SWPPP, which shall include requirements for the disposal of all solids offsite which are accumulated as a result of the cleaning, the minimization of the amount of solids left behind in the storm drains, the disposal of all collected solids off-site in a manner that complies with federal, state and local laws, regulations and ordinances, and ensuring that all drainage system cleaning water is disposed of offsite or goes directly to the CDTS for treatment."

Comment 13.2.9: *Part I.B.10.l. "Discharge of any water containing additives (except cooling water to 014 and 018) is prohibited.*"

The cooling water discharged through Outfalls 014 and 018 is river water to which GE only adds heat, so the exception language makes no sense. The types of equipment requiring additives include cooling towers, boilers and water treatment systems like the DAF. If GE is required to run the DAF (which we have disputed elsewhere in these comments), then GE will need to use additives, such as coagulant and flocculent, in the treatment process. In addition, GE uses additives to maintain balanced water chemistry in its cooling towers and boilers. A complete list of these additives is included in Technical Exhibit 21. Additives allow for the continued recirculation and conservation of water. By way of example, closed cycle cooling towers favored by EPA could not function without the use of additives. The additives reduce corrosion of the equipment and prevent the growth of microorganisms. Without additives, metals oxidize and become soluble in water, thus increasing the potential for discharges of pollutants to the receiving water. Additives protect the life of equipment and reduce failures in utility and boiler systems, including boiler malfunctions that could lead to excessive air emissions. In addition, the use of additives is expensive, so GE has a built-in financial incentive to ensure that concentrations are kept as low as possible while still achieving the goal of appropriately controlling water chemistry.

Response to Comment 13.2.9:

The Final Permit's BMP approach to addressing dry weather flows will not alter current operations or require GE to run the DAF and, therefore, to use additives such as coagulant and flocculent in the treatment process. Technical Exhibit 21, provided by GE with its comments on the Draft Permit, lists additives that are expected to be discharged. According to GE, only the additives used in the boilers are contribute to the NPDES discharge; all other additives are either not discharged or the discharged is captured as sludge and managed as solid waste, including the coagulant and flocculent. Part I.B.2.c.v of the Final Permit authorizes the use of approved additives listed in Technical Exhibit 21 and the prohibition of any discharge containing additives (Part I.B.10.l) in the Draft Permit has been eliminated. The requirements included in the Final Permit, in particular, the technology-based effluent limitations at Outfall 018C and twice yearly WET testing at Outfall 018 (both of which include discharges from the boiler), will ensure that water quality is maintained with the use of approved additives. Approved additives are only those listed in Exhibit 21, which is included as Attachment 4 to the Final Permit. Use of additional additives at the facility requires prior approval by EPA.[88]

[88] In the course of its comment, GE refers to "closed cycle cooling towers [as being] favored by EPA …." GE's comment in this regard is not only immaterial to the permit terms at issue, but it is also incorrect or potentially misleading. While EPA has found in various contexts that of the various cooling system technology options, closed-cycle cooling can achieve the greatest reductions in entrainment, impingement and thermal discharges, and that it may be appropriate to require this technology in some cases, these technology decisions are presently made on a case-by-case basis. Contrary to the implication of GE's comment, EPA has neither determined that closed-cycle cooling must be used on an industrial category-wide basis nor determined that closed-cycle cooling must be used at GE.

Comment 13.2.10: *Part I.B.10.m. "Develop and implement BMPs consistent with the sector specific BMPs included in Sector AB (Transportation equipment, industrial and commercial machinery) and Sector O (Steam Electric Generating Facilities) of the MSGP."*

GE has not sought coverage under the MGSP. GE's existing individual permit reflects site-specific SWPPP and BMP requirements, as does the proposed renewal permit. As a result, further cross-referencing of the MSGP is neither necessary nor appropriate.

Response to Comment 13.2.10:

Requiring BMPs consistent with those requirements imposed on facilities that are similar to the facility being permitted commonly occurs in individual NPDES permitting, pursuant to BPJ. However, EPA acknowledges that this facility is not a steam electric generation facility and the full suite of BMPs under that sector of the MSGP might not be appropriate for GE. Therefore, EPA has eliminated the BMP to which GE objects in its comment and Parts I.B.2.c.vi through viii of the Final Permit include site-specific BMPs related to the transport, storage, and use of fuel that EPA believes are appropriate for GE.

14. Even Assuming that Certain New Limits and Conditions are Necessary and Appropriate, EPA cannot Impose those Limits and Conditions without First Determining whether Schedules are Needed for GE to Achieve Compliance.

Comment 14.0:

To the extent that EPA continues to believe that it has the authority to impose the new limits, conditions and prohibitions set forth in the Draft Permit (including those disputed by GE in this comment document), it cannot do so without offering appropriate compliance schedules for each new provision. Such schedules are authorized by federal and state law, and are routinely granted by EPA in these circumstances.[89]

In this permit proceeding, EPA retains primary responsibility to "prescribe conditions … to assure compliance with the requirements of [§402(a)(1) of the Clean Water Act] and such other requirements as [it] deems appropriate." 33 U.S.C. §1342(a)(2). While EPA has some measure of discretion here, that discretion is not unfettered. At a minimum, EPA must consider the need for "other requirements" in the permit, especially where, as here, EPA's own guidance calls for such consideration. *See* EPA Permit Writers' Manual, EPA 833-B-96-003 (noting that one justification for a special condition in a permit is "[t]o incorporate compliance schedules in situations that include new/revised water quality standards application," as in the case here).

As EPA seems to acknowledge, GE simply cannot comply with many of the new limits, conditions and prohibitions on day one of the new permit cycle. For some of these limits and conditions, major capital investments, engineering, construction and/or process changes will be needed to achieve compliance. Examples include, without limitation, EPA's proposed changes

[89] *See* 314 Mass. Code Regs. §4.03(1)(b)(2)(2008); *In the Matter of Star-Kist Caribe, Inc.*, 4 E.A.D. 33 (EPA Environmental Appeals Board, May 26, 1992).

to the Drainage System, CDTS and cooling water intake structures (see schedule for these projects in Technical Exhibit 22). EPA's failure to consider and allow schedules of compliance for GE to achieve compliance with substantial new requirements would amount to clear error.

Response to Comment 14.0:

EPA agrees with GE that when new permit conditions are issued that require installation of new equipment that will reasonably take some time to complete, a compliance schedule typically ought to be developed to provide a clear, enforceable timeline for achieving permit compliance. EPA has made this clear in many permit proceedings over the years. *See, e.g.*, EPA Region 1, "Responses to Comments, Public Review of Brayton Point Station NPDES Permit MA0003654" (Oct. 3, 2003), p. I-6 (accessible at http://www.epa.gov/region1/braytonpoint/pdfs/finalpermit/sectionI.pdf). The question that remains, however, is whether the compliance schedule should be included in the permit itself or in a separate enforceable instrument, such as an administrative compliance order under CWA § 309(a) (*i.e.*, a non-penalty scheduling order), or a consent decree.

Under 40 C.F.R. § 122.47(a)(1), a schedule for attaining future compliance with technology-based effluent limits whose statutory compliance deadline has already passed cannot be included in an NPDES permit. The deadline for compliance with BAT, BPT and BCT technology standards is 1989. *See* 40 C.F.R. § 125.3 (deadline for compliance with BAT, BPT and BCT technology standards is 1989); 33 U.S.C. § 1311(b)(2). Therefore, a schedule for attaining compliance with these standards would be included in an instrument outside of the permit. By the same token, EPA cannot put a compliance schedule in a permit for achieving compliance with water quality-based effluent requirements, unless the applicable state standards themselves provide for such future compliance. Otherwise, the statutory deadline of 1977 for achieving water quality standards compliance has already passed. *See* 33 U.S.C. § 1311(b)(1)(C). Thus, compliance schedules for achieving compliance with water quality-based effluent limits would also be handled outside the permit unless the state water quality standard at issue, itself, provided for compliance at some time in the future. *See In the Matter of Star-Kist Caribe, Inc.*, 4 E.A.D. 33, 34-36 (EAB 1992). In the latter case a compliance schedule could be included in the permit consistent with the terms of the water quality standards. It is not entirely clear to EPA whether GE's comment is consistent with the above discussion, or whether the company is suggesting that compliance schedules should be included in NPDES permits in all cases. If GE is making the latter argument, then EPA disagrees.

The Draft Permit's requirements for the drainage system would have necessitated some construction activity and, no doubt, helped to precipitate this comment by GE. The Final Permit, however, does not require proposed changes to the drainage system or CDTS that would require major capital investments, engineering, construction, and/or process changes. As described in more detail in Attachment A to this RTC, the Final Permit's requirements pertaining to the drainage system and the CDTS, which are primarily based on technology standards, can be complied with through operational steps that GE can implement immediately. As a result, EPA does not think a compliance schedule is needed for GE to achieve permit compliance. If GE disagrees after reviewing the changes that EPA made to the Final Permit, the company can approach the Agency about the possibility of developing a compliance schedule outside the permit.

The situation with regard to cooling water intake structure requirements under CWA § 316(b) is somewhat more complicated and is discussed above in Response to Comment 11.1. GE's Final Permit does require certain improvements to the Facility's cooling water intake structures which will require some time to plan and install in order to achieve compliance. EPA gave GE the opportunity to comment as to an appropriate compliance timeline and GE submitted a proposed timeline with its comments on the Draft Permit. EPA previously interpreted CWA § 316(b) to incorporate the compliance deadlines from CWA § 301(b)(2) and, as a result, any compliance schedule would have been handled outside an NPDES permit. *See, e.g., Cronin v. Browner,* 898 F.Supp. 1052 (S.D.N.Y. 1995); *EPA General Counsel's Opinion No. 41* (1976). *See also* EPA Region 1, "Responses to Comments, Public Review of Brayton Point Station NPDES Permit MA0003654" (Oct. 3, 2003), p. I-6 (accessible at http://www.epa.gov/region1/braytonpoint/pdfs/finalpermit/sectionI.pdf). EPA has more recently changed its legal interpretation, however, and has now determined that because there is no stated compliance deadline within the "four corners" of CWA § 316(b), compliance with the BTA standard is due *as soon as practicable*. *See* 79 Fed. Reg. 48359.[90] As a result, a compliance schedule may be, but does not necessarily have to be, included in an NPDES permit to govern attainment of compliance with CWA § 316(b) requirements. *See* 79 Fed. Reg. 48433, 48438 (40 C.F.R. §§ 125.94(b)(1) and (2) ("The Director may establish interim compliance milestones in the permit."), and 125.98(c)). In this case, EPA has included a compliance schedule in the permit by which the permittee is to achieve compliance with the Final Permit's requirements under CWA § 316(b). This is discussed in more detail in EPA's Response to Comment 11.1, above.

15. Conclusion

Comment 15.0:

GE is fundamentally opposed to the Draft Permit and has grave concerns about the new limitations and conditions imposed therein. GE would welcome the opportunity to meet with the Agencies to review these comments and concerns, and to provide whatever additional information that the Agencies may request in order to properly revise and correct the Draft Permit.

Response to Comment 15.0:

EPA has undertaken a thorough review of a large body of information in developing the Final Permit. Much of that information was provided by GE over time at EPA's request. EPA and GE had numerous communications about the permit as it was being developed. Upon GE's request, EPA and GE met in October 2013 to clarify specific details regarding the operation of the drainage system outfalls in response to GE's comments and supplemental technical exhibits.

[90] Although the New CWA § 316(b) Regulations are not yet in effect, EPA has clearly stated its new legal interpretation and Region 1's practice conforms to this interpretation, just as our prior practice conformed to the earlier interpretation.

EPA appreciates GE's willingness provide the information that has assisted EPA's efforts to develop a NPDES Permit for the Lynn facility that complies with the technology-based and water quality-based requirements of the CWA and its implementing regulations.

16. Comment from National Marine Fisheries Service

These comments are offered by the Protected Resources Division of NOAA's National Marine Fisheries Service (NMFS). While several species of listed whales and sea turtles occur seasonally in waters off the Massachusetts coast and populations of the federally endangered shortnose sturgeon occur in the Connecticut and Merrimack Rivers, no listed species are known to occur in the Saugus River. As such, no further coordination with NMFS PRD is necessary.

Response to Comment 16:

No further coordination with NMFS is necessary.

17. Comment from Massachusetts Department of Environmental Protection

MassDEP comments that the correct address on page 49 of the permit should read 205B Lowell Street, not 205 Lowell Ave.

Response to Comment 17:

The address for Massachusetts Department of Environmental Protection – NERO, Bureau of Waste Prevention, has been revised.

18. Comments submitted by Saugus River Watershed Council Received After the Close of the Public Comment Period

Comments were submitted by Saugus River Watershed Council (SRWC) on August 12, 2011 after the close of the 90-day extension to the public comment period on June 1, 2011. SRWC submitted a number of comments focused on 1) the BMPs for wet and dry weather flows, 2) the effluent limitations and monitoring requirements at the drainage system outfalls and Outfall 027A (CDTS), and 3) the effluent limitations and permit conditions for the non-stormwater outfalls (014, 018, and 020). Although EPA is not required to respond to these comments because they were submitted after the close of the public comment period, EPA has chosen to consider the SRWC's comments on the Draft Permit as summarized below.

1) BMPs for wet and dry weather flows
    - SRWC supports the proposed requirement to eliminate all dry weather discharges, including non-allowable non-stormwater flows, to the Saugus River. SRWC concurs that it is technologically feasible and economically achievable for GE to eliminate untreated dry weather pollutant discharges from the drainage outfalls. SRWC also supports the requirement that drainage pipes be inspected and the lining repaired to reduce groundwater infiltration. SRWC recommends a strict timeline for actions to address infiltrated groundwater discharges be included in the permit to ensure that the

discharge of contaminated groundwater to the Saugus River comes to an end as soon as possible.

- SRWC supports the proposed requirement to treat the first flush of stormwater in the CDTS prior to discharge.
- SRWC urges EPA to ensure that there are clear consequences for GE if any unlawful discharges of contaminated groundwater take place. SRWC maintains it is not clear from the permit what the consequences will be if the proposed BMPs are not successful at ensuring the discharge to the Saugus River meets water quality criteria.
- SRWC supports the requirements to develop site-specific BMPs to minimize infiltration of contaminated groundwater into the drainage system. SRWC requests that the SWPPP, any plan to address infiltrated groundwater, and annual reports summarizing actions taken be made available to the public.
- SRWC remains concerned that the language indicating that permit requirements must be met "to the maximum extent possible" leaves the door open for GE to continue not meeting the requirements of its NPDES permit without adequate consequences.
- SRWC remains concerned about GE's inability to identify all pipes connected to the drainage system and believe that the company should be held accountable for further identifying historic pipes at the site so that their efforts to address contaminated groundwater infiltration will be as effective as possible.
- SRWC supports the requirements to pump excavation dewatering to the CDTS and to containerize and transfer this water to the Lynn WPCF or dispose offsite if the total petroleum hydrocarbons are 5.0 mg/L or greater; the prohibition of drainage system cleaning water; the prohibition of discharge of water containing additives to the Saugus River; and the prohibition of visible levels of dye used in stormwater tracing activities.

2) Effluent limitations and monitoring requirements at the drainage system outfalls and Outfall 027A (CDTS)
    - SRWC supports the proposed requirement to utilize both the dissolved air flotation in addition to the granulated activated carbon in the CDTS.
    - SRWC supports monitoring for total cyanide at Outfall 027A and recommends that a limit be established in the permit.
    - SRWC comments that the purpose of reporting zero on the DMR is unclear and that detection amounts above a minimum detection level of 0.03 using Modified Method 8082 should be reported.
    - Regarding the discharge of metals from the drainage system outfalls, SRWC recommends that the permit include specific language requiring how metals monitoring data will be used, a timeline for BMP implementation, and EPA review of monitoring results.
    - SRWC supports the requirement to monitor metals at Outfall 027A (CDTS) and recommends limits for heavy metals detected in groundwater at the site. SRWC comments that the Draft Permit does not include any explanation as to why limits for metals are not part of the permit.

3) Non-stormwater Outfalls (014, 018, 020)
   - SRWC supports requirements to inspect pipes at Outfalls 014, 018, and 020 to determine the extent of contaminated groundwater infiltration, to implement pipe lining projects to eliminate infiltration, and to reconfigure outfalls to eliminate the discharge of untreated non-allowable non-stormwater flows directly to the receiving water. SRWC also supports the effluent limitations and monitoring requirements related to the discharge of non-allowable non-stormwater through these outfalls.
   - SRWC supports the monitoring requirements that will be used to evaluate the effectiveness of BMPs for the non-stormwater outfalls. SRWC comments that it is not clear what actions, if any, will be taken if the monitoring results show that these contaminants are still entering the river and recommends additional language to ensure that additional BMP actions can be added to the permit if needed.
   - SRWC requests clarification on the draft permit limits for copper and selenium at Outfall 018A.
   - SRWC recommends the addition of flow limits and an oil and grease limit of 15 mg/L for dry weather discharges from Outfall 018C.
   - SRWC comments that although the proposed temperature limit of 90°F from Outfalls 014 and 018 is an improvement over the current permit, the receiving waters would be better protected if the permit implemented a requirement based on closed-cycle cooling as best available technology as described on page 76 of the Fact Sheet.
   - SRWC supports the Draft Permit conditions to minimize impingement and entrainment at the CWISs and supports the addition of limits associated with fish migration periods as well as a bioaccumulation survey to support other permit requirements that limit contaminants in the effluent discharged to the river.

Response to Comment 18:

EPA recognizes SRWC's support of the Draft Permit limits and conditions and maintains that, while many of these requirements have been modified or removed in the Final Permit, EPA believes that the Final Permit conditions will meet the technology-based requirements of the CWA and also satisfy water quality standards. These permit conditions include requiring the permittee to continue to treat dry weather flow from all drainage system outfalls in the CDTS, implementing BMPs to minimize the discharge of untreated dry weather flows combined with monitoring of discharges from the drainage system outfalls, and effluent limitations and conditions at the non-stormwater outfalls.

1) BMPs for wet and dry weather flows

As is evident in the Draft Permit and Fact Sheet, and in the Final Permit and Response to Comments, EPA's goal is and has been to minimize untreated discharges of polluted water from the Drainage System Outfalls to the Saugus River. In its comments, SRWC generally voices support for the Draft Permit requirements that would eliminate dry weather discharges to the Saugus River, including the requirements to treat the first flush of wet weather in the CDTS and eliminate the generation of non-allowable, non-stormwater flows during wet weather. In consideration of the comments on the Draft Permit and supporting data and analysis, EPA has revised its approach to wet and dry weather discharges in the Final Permit.

In Attachment A hereto, EPA reevaluated the BAT analysis for wet and dry weather flows based in part on recent monitoring data of dry and wet weather requested by EPA, and GE's comments on the Draft Permit, including an analysis of the feasibility and cost of eliminating dry weather discharges to the drainage system outfalls and treating the first flush of stormwater in the CDTS (GE Technical Exhibits 15 and 17). EPA determined that the BAT for dry weather flows is use of the existing CDTS prior to discharge through Outfall 027A. The technology-based limits for Outfall 027A in the Final Permit reflect the use of this technology. The Final Permit applies a technology-based, BMP approach to addressing the dry weather flows at the drainage system outfalls. First, the Final Permit requires that the drainage system outfall tide gates discharge only during wet weather (as defined in the Final Permit), with the exception of minor weeping around the bottom edge of gates due to hydrostatic pressure. EPA believes that these permit conditions are consistent both with proper maintenance and control of the outfall gates, which are operated consistent with the Massachusetts Administrative Consent Order to "substantially eliminate" the discharge of dry weather flows to the Saugus River, and with GE's comments. Second, the Final Permit requires that the permittee minimize the volume of dry weather flow that is discharged, untreated, to the Saugus River during wet weather by lowering the elevation of the drainage vaults to the "low alarm" level prior to a storm event forecasted to generate 0.1 inches or more of precipitation (and thus trigger the tide gates to open). EPA believes this requirement is a feasible measure to reduce untreated pollutant discharges to the Saugus River, and is consistent with GE's current operation of the vaults. EPA directs SRWC to Attachment A for a comprehensive discussion of its BAT analysis for wet and dry weather flows, as well as EPA's response to GE's comments 3.2 and 13.2.4.

EPA also concluded that the BAT during wet weather is a BMP to minimize the volume of dry weather flow in the vaults when the gate is likely to be triggered due to a storm event. Because flows discharged from the vault outfalls during wet weather bypass the oil-water separator and the CDTS, numeric limits based on the use of these technologies are not appropriate for wet weather flows.

As a results of EPA's BAT analysis, many of the Draft Permit's BMPs for dry and wet weather flows from the drainage system that SRWC supported have changed substantially or have been eliminated in the Final Permit. This includes the requirement to develop and submitting a plan for controlling infiltration of groundwater and inflow on non-allowable, non-stormwater flows to the drainage system outfalls, which SRWC had requested be made public. EPA believes that the specified BMP to minimize the discharge of comingled dry weather flows from the drainage system outfalls during wet weather, combined with monitoring of the drainage system outfalls, is currently the best approach for handling pollutant discharges from the drainage system outfalls in the Final Permit. This approach would also generally be consistent with the standard to "substantially eliminate" dry weather discharges set in the ACO. The Final Permit retains the requirement to develop, implement, and maintain a SWPPP, and annual reports certifying compliance with the SWPPP will be available for inspection by EPA and MassDEP.

SRWC comments that the phrase “to the maximum extent practicable” (used in Parts I.B.10.b and c) “leaves the door open for GE continue not meeting the requirements of its NPDES permit without adequate consequences.” First, EPA points out that, to its knowledge and based on its discharge monitoring reports through June 2014, GE has not exceeded the effluent limitations of its current permit. Second, EPA believes that with the treatment of dry weather flows in the CDTS, GE will continue to meet the effluent limitations and conditions of the Final Permit. Finally, for the reasons summarized above and discussed at length in Attachment A and in responses to comment 3.2, the permit requirements that included the language “to the maximum extent practicable” (including eliminating the discharge of non-allowable, non-stormwater flows to the receiving water and eliminating the generation of non-allowable, non-stormwater flows during wet weather and leading up to wet weather) have been removed from the Final Permit and replaced with site-specific BMPs prohibiting discharges from the drainage system outfalls during dry weather, requiring that dry weather flows are treated at the CDTS prior to discharge, and minimizing the discharge of dry weather flows during wet weather. Therefore, the Final Permit has eliminated the phrase “to the maximum extent practicable.” EPA believes that the permittee will comply with the BMPs in the Final Permit under all conditions and requires the permittee to monitor and report both the number of gate openings and the estimated volume of dry weather flow transferred to the CDTS for each drainage system outfall.

SRWC supports the Draft Permit requirements related to discharges from excavation dewatering, drainage system cleaning, chemical additives, and stormwater dye tracing. EPA maintains that the discharge of these wastewaters continue to be limited in the Final Permit with minor changes in the requirements in response to comments on the Draft Permit as follows:

The Draft Permit required discharges from excavation dewatering to be eliminated (to the maximum extent practicable) during wet weather and periods leading up to wet weather. In Comment 13.2.5, GE demonstrated that water generated from excavation dewatering is tested and, based on the results, is either 1) discharged to the CDTS equalization tanks for treatment; 2) discharged to the LWSC municipal sewer system with permission; 3) shipped offsite for disposal or 4) if the water is uncontaminated, discharged to the storm sewer system. The Final Permit includes a BMP requiring GE to continue to test excavation dewatering and discharge either to the CDTS equalization tanks, the LWSC system, or ship offsite for disposal. The Final Permit does not authorize discharges of excavation dewatering to the storm sewer system.

The Draft Permit required regular cleaning of the drainage system pipelines. In Comment 13.2.8, GE maintains that it is unclear how EPA would interpret “regular cleaning” in a compliance or enforcement proceeding. EPA agrees that “regular cleaning” should be defined based on site-specific factors described in the SWPPP. The Final Permit condition at Part I.B.2.c.ii has been changed to state, “Perform regular cleaning of the Drainage System pipelines. The term “regular cleaning” shall be defined based on site-specific factors and described in the facility’s SWPPP, which shall include requirements for the disposal of all solids offsite which are accumulated as a result of the cleaning, the minimization of the amount of solids left behind in the storm drains, the disposal of all collected solids off-site in a manner that complies with federal, state and local laws, regulations and ordinances, and ensuring that all drainage system cleaning water is disposed of offsite or goes directly to the CDTS for treatment.”

The Draft Permit prohibited the discharge of water containing additives with the exception of cooling water through Outfalls 014 and 018. In comment 13.2.9, GE demonstrated that other additives are necessary to maintain balanced water chemistry, protect the life of equipment and reduce failures in utility and boiler systems, or properly operate the DAF. EPA considered this comment and agreed that prohibiting *any* water containing additives might restrict GE from properly maintain and operating equipment. GE submitted a complete list of these additives is with its comments on the Draft Permit (Technical Exhibit 21), which EPA incorporated into the Final Permit as Attachment 4. The Final Permit prohibits discharge of water containing non-approved additives.

The Draft Permit required discharges from stormwater dye tracing to be eliminated (to the maximum extent practicable) during wet weather and periods leading up to wet weather. Dye tracer testing to maintain the integrity the system of drains and outfalls and to detect any unknown connections or failures in historic plugs or disconnects. In Comment 13.2.5, GE demonstrated that dye tracer testing is not performed during wet weather because the dye is not visible during such an event. Part I.A.10 of the Final Permit authorizes the use of non-toxic, biodegradable dyes during dry weather, in minimal amounts, in accordance with good engineering practice, with prior notification to EPA and MassDEP. The Final Permit also requires that discharge of any dye directly to the receiving water shall be reported to EPA on the cover letter to the DMR of the month immediately following the discharge. EPA believes that these conditions will allow GE to continue to maintain its drainage system while ensuring that the water quality standards are met.

2) Effluent limitations and monitoring requirements at the drainage system outfalls and Outfall 027A

SRWC supports the use of the CDTS, specifically the Draft Permit requirement to operate the dissolved air flotation (DAF) in addition to the granulated activated carbon (GAC). EPA agrees that the CDTS, as currently designed and operated, reflects the "best available technology" for treatment of contaminated groundwater and other dry weather flows. Attachment A provides a detailed BAT analysis in which EPA concludes that BAT for dry weather flows is the CDTS. In Comment 13.1, GE provided a detailed explanation of how the company's operating experience at the CDTS indicates that better treatment is provided overall by not using the DAF units in light of the characteristics of the wastewater receiving treatment. The Final Permit at Part I.A.2 authorizes discharge of "treated effluent from the consolidated drains treatment system" and includes several technology-based numeric limits based on use of activated carbon. In addition, Part II of the Final Permit continues to contain standard permit condition II.B.1 ("Proper Operation and Maintenance"). *See also* 40 C.F.R. § 122.41(e). Thus, the Final Permit requires the permittee to continue to treat effluent at the CDTS in the manner that is most effective to remove pollutants and maintain the technology, which was the overarching intent of the permit condition in the Draft Permit.

At Outfall 027A, the Draft Permit required reporting of numerical results for PCBs less than the minimum level of 0.065 (using Modified Method 8082) as zero in the DMR but reporting results in a separate attachment to the DMR. SRWC comments that the purpose of reporting zero on the DMR is unclear and that detection amounts above a minimum detection level of 0.03 using

Modified Method 8082 should be reported. EPA agrees that this reporting requirement is unclear. The Final Permit eliminates this language and replaces it with a reference to the EPA Region 1 NPDES Permit Program Instructions for the DMRs for guidance on sampling below the minimum level. The current version of this guidance directs permittees to report values less than the minimum level specified in the permit as zero in the DMR.

SRWC supports monitoring for total cyanide at Outfall 027A and recommends that a limit be established in the permit. The Final Permit includes monitoring (without limits) at Outfall 001 and Outfall 027A (which receives dry weather flows from Outfall 001). According to GE, there are no sources of cyanide at the facility and the single "hit" from February 1998 was a false positive and should be rejected from the data set used by EPA to assess the need for limits and monitoring conditions in the permit. EPA responds that the 2012 wet weather monitoring data submitted in response to the information request dated October 19, 2011 also indicated elevated levels of cyanide at Outfall 001 on one of the three sampling dates. GE does not appear to be involved in industrial processes typically associated with the presence of cyanide in effluent, and it remains unclear what the source of cyanide at GE might be. Still, the limited available data suggests that monitoring for this parameter is warranted at Outfall 001 and Outfall 027A because it receives dry weather flow from Outfall 001. EPA believes that the use of activated carbon at the CDTS will enhance the removal of cyanide from the effluent and ensure that the water quality criterion is met. See Response to Comment 5.1.1.

The Draft Permit required, and the Final Permit retains, monitoring for metals both for wet weather discharges from the drainage system outfalls and for treated effluent from the CDTS. SRWC comments that additional language should be added to indicate how monitoring data will be used, particularly if water quality criteria are exceeded. The current permit has no monitoring requirements for metals at any of GE's outfalls, and monitoring data for metals in dry weather discharges representative of GE's wastewater following the installation and operation of the CDTS is limited to a single sample of dry weather flows taken from each of the drainage system outfalls in 2009. The exceedances of water quality criteria for metals at the drainage system outfalls described in the Fact Sheet (pp.42-44) and referenced in SRWC's comments were from data collected prior to the installation of the CDTS, additional site remediation projects, and pipe relining and may not be representative of the current wastewater. In the 2009 dry weather flow sample, only concentrations of copper were above metals water quality criteria. The monitoring requirements for the drainage system outfalls in the Final Permit are expected to be used during the next permit issuance to assess if the effluent from current operation of the drainage system outfalls has a reasonable potential to cause or contribute to an exceedence of water quality criteria and, if so, water-quality based limits for metals would be included in the new permit. EPA does not believe that additional permit language is needed to indicate how monitoring data will be used. EPA expects that the discharge of dry weather flows will be minimized through the technology-based requirements in the Final Permit, which EPA believes will also satisfy water quality standards. In the meantime, EPA has authority to modify a permit when new information is received that was not available at the time of permit issuance and would have justified the application of different permit conditions at the time of issuance. *See* 40 C.F.R. 122.62(a)(2).

In addition, SRWC recommends limits for heavy metals detected in groundwater at Outfall 027A. The current permit does not require monitoring for metals at Outfall 027D (now Outfall

027A, the CDTS) and no metals data exists for the discharges from the CDTS. The monitoring requirements for Outfall 027A in the Final Permit will be used during the next permit issuance to assess if the effluent from the CDTS has a reasonable potential to cause or contribute to an exceedence of water quality criteria and, if so, numeric water quality-based limits would be included in the new permit. In the meantime, the CDTS uses carbon adsorption to treat dry weather flows prior to discharge. Although the CDTS was installed primarily to treat contaminants related to the release of petroleum at the site, it also removes heavy metals from wastewater. According to the Remediation General Permit, carbon adsorption can routinely achieve water quality-based effluent limitations (including those set in the RGP) (RGP Fact Sheet, Attachment A p.35-36). The Final Permit requires monitoring for metals in treated effluent from Outfall 027D. EPA believes that the treatment of the effluent in the CDTS prior to discharge will achieve relatively low concentrations of metals regardless of the presence of numeric limits.

3) Non-stormwater Outfalls (014, 018, 020)

SRWC supports BMPs to inspect, reline, and rehabilitate drainage pipelines to reduce groundwater infiltration, and comments that GE should be held accountable to identify and address contaminated groundwater infiltration in its drainage system. The Draft Permit's BMPs to inspect and rehabilitate the pipeline specifically applied to Outfalls 014, 018, and 020 (Part I.B.10.(c)). In its comments, GE expressed concern that rehabilitating all of the drainage system pipes would prove very expensive and, in some cases, technically infeasible. Moreover, GE provided new information that indicates that the discharges from Outfalls 014, 018 and 020 are unlikely to receive contaminated groundwater infiltration (See Responses to Comments 3.3 and 7). First, GE demonstrated that the drainage pipes associated with these three outfalls *do not* pass through locations at the Lynn facility identified as having groundwater attenuation or Light Non-Aqueous Phase Liquids (LNAPL) plumes. More importantly, GE demonstrated that these outfalls have no groundwater infiltration. Outfall 014 was lined, internally sand blasted, and sealed in 2002. Outfall 018 is not impacted by groundwater due to the tidal effects on the structure and the high flow of cooling water discharged through the system. Finally, Outfall 020 is an above-ground concrete trough that returns the overflow water to the river and no integrity problems are visible. In addition, the reservoir that contains the unused river water discharged through Outfall 020 is drained, cleaned and inspected annually by licensed power plant operators and shows no signs of cracking or deterioration that would allow groundwater infiltration. Based on current information, EPA believes that GE has taken responsibility for these drainage pipes and EPA has removed BMPs requiring inspection and relining of the drainage pipes at Outfalls 014, 018, and 020 from the Final Permit.

Because GE established that these outfalls do not discharge groundwater infiltration in its comments on the Draft Permit, the Final Permit requirements for Outfalls 014, 018A, and 020 do not include monitoring or BMPs related to groundwater infiltration. In addition, in consideration of the fact that GE has provided information indicating that stormwater discharges do not occur at Outfall 018B, the Final Permit has eliminated Outfall 018B, including wet weather limits and conditions. The Draft Permit's authorization to discharge process flows (for Outfalls 014 and 018A) or unused river water (for Outfall 020) "commingled with minimal contaminated groundwater" for these three outfalls has been removed.

SRWC requests clarification on the draft permit limits for copper and selenium at Outfall 018A. The numeric effluent limitations for copper and selenium at Outfall 018A have been eliminated in the Final Permit. EPA has made this change in consideration of the fact that the information demonstrating that elevated levels of these metals were present in the discharge from Outfall 018A was derived from monitoring data gathered in 1998, while more recent sampling data submitted by GE in response to an EPA CWA Section 308 information request indicated that these metals were non-detect in the discharge. Limited monitoring for copper will be conducted and reported twice per year as part of the WET testing requirements. This data will enable EPA to determine the reasonable potential for the discharge to cause or contribute to an exceedence of water quality standards for these metals. See Response to Comment 7.3 for discussion of the copper and selenium limits.

SRWC recommends the addition of flow limits and an oil and grease limit of 15 mg/L for dry weather discharges from Outfall 018C. Outfall 018C is an internal outfall that includes intermittent and low volume discharges from the Power Plant and is monitored at a location representative of flows prior to mixing with other wastestreams at Outfall 018A. Ultimately the effluent from Outfall 018C discharges to the Saugus River commingled with other wastestreams through Outfall 018A. Both the Draft and Final Permit limits for this outfall, which are based on best professional judgment and informed by the technology-based national effluent limitations guidelines for low volume wastes from steam electric generating plants. The oil and grease limit of 15 mg/L applied at other outfalls in the Final Permit is a water quality-based limit designed to meet the narrative standard that the discharge from the facility will be free from oil, grease and petrochemicals that produce a visible film on the surface of the water, impart an oily taste to the water or an oily or other undesirable taste to the edible portions of aquatic life, coat the banks or bottom of the water course, or are deleterious or become toxic to aquatic life, consistent with the narrative water quality standard for Class SB waters at 314 CMR 4.05(4)(b)(7). The Final Permit includes a maximum daily oil and grease limit of 15 mg/L at Outfall 018A, which includes commingled discharges from Outfall 018C.

SRWC comments that although the proposed temperature limit of 90°F from Outfalls 014 and 018 is an improvement over the current permit, the receiving waters would be better protected if the permit implemented a requirement based on closed-cycle cooling as best available technology as described on page 76 of the Fact Sheet. In consideration of comments on the Draft Permit and review of the limited, available information, EPA determined that the potential for thermal impacts is likely limited to a relatively short period surrounding low slack tide during the hottest months of the year and at locations near the inshore habitat closest to the discharge, and that, outside of this period, lower ambient river temperatures and the tidally driven exchange of water are likely to minimize any potential for substantial thermal impacts. Moreover, even during low slack tide in the summer, conditions appear to be such that fish would likely be able to avoid elevated temperatures and seek cooler refuge. Because the potentially most serious impacts of the thermal plume can likely be avoided, EPA has determined that, based on available information, maximum temperature discharge limits of 95°F would reasonably assure the protection and propagation of the BIP. Therefore, whereas the Draft Permit included a year-round maximum daily temperature limit of 90°F, the Final Permit includes a maximum daily temperature limit of 95°F and an average monthly temperature limit of 90°F at Outfalls 014 and 018 consistent with the current permit. At the same time, the Final Permit adds protection for the

BIP by requiring a reduction in flow to minimize entrainment mortality of early life stages in the Saugus River. Finally, given that the temperature data available to characterize the extent of the thermal plume and its potential impacts is relatively limited, and because the ASA thermistor data analyzed by EPA and MassDEP in development of this permits limits suggest that, at times, river temperatures may rise as high as or higher than 95°F, the Final Permit requires continuous temperature monitoring at Outfalls 018 and 014. Continuous temperature monitoring will provide data more representative of the actual range of effluent temperatures than the weekly (at 018) or monthly (at 014) grab samples that were required in the Draft Permit. See Response to Comment 10.3.3 for discussion of the Final Permit's temperature limits.

SRWC supports the Draft Permit conditions to minimize impingement and entrainment at the CWISs and supports the addition of limits associated with fish migration periods. The Final Permit retains the requirements to minimize impingement and entrainment at the Power Plant CWIS. For the Test Cell CWIS, the Final Permit retains the requirement to improve the fish return trough and to reduce the average monthly flow compared to the current permit during the period of peak entrainment. After considering the low annual capacity and typically low through-screen velocity at this CWIS, EPA determined that, at this time, the additional costs to upgrade the traveling screen with fish-lifting buckets, low pressure spraywash, and to separate fish from debris may not be warranted by the marginal benefits they would provide above the required improvements to the fish return trough. During this permit cycle, impingement monitoring during Test Cell operation will provide data to determine if any additional improvements are necessary to protect fish from impingement mortality.

SRWC also supports the bioaccumulation survey included in the Draft Permit. The Final Permit's BMPs to treat dry weather flows in the CDTS and to minimize discharges of dry weather from the drainage system vaults during wet weather will likely minimize the discharge of the pollutants of concern that would have been assessed in the bioaccumulation study. At the same time, required monitoring and reporting of any discharges of PCBs, PAHs, and metals from these outfalls during wet weather events will enable EPA to determine if the effluent contains these contaminants of concern at concentrations that pose a threat to aquatic life. As a result, EPA decided that the bioaccumulation study could be left out of the Final Permit. If, however, monitoring of wet weather effluent discharges suggests that pollutants that bioaccumulate in aquatic organisms are present at levels presenting a concern to aquatic life or human health, EPA may require a bioaccumulation study in the future.

Attachment A to EPA's Response to Comment Document

Best Professional Judgment Determination of Technology-Based Effluent Limits for Discharges from GE's Drainage System Outfalls and CDTS

1. Introduction

The new final National Pollutant Discharge Elimination System (NPDES) permit for the General Electric Aviation (GE) facility in Lynn, MA (the Facility), addresses a number of different types of pollutant discharges from the Facility to the Saugus River. These include discharges from the Facility's drainage system.

The drainage system at GE collects and commingles process wastewater and contaminated groundwater infiltration. During wet weather, the system also collects stormwater. Not only does the process wastewater contain pollutants, but due to historical groundwater contamination at the site, the infiltrating groundwater may also be contaminated with a variety of pollutants. Indeed, as a result of this historical contamination, GE has been working for a number of years to remediate groundwater contamination at the site under an Administrative Consent Order that it entered with the Massachusetts Department of Environmental Protection (MassDEP). During wet weather, the drainage system also collects stormwater, which greatly increases the overall volume of water in the drainage system during wet weather.

The Facility's drainage system has a number of components. A network of pipes at the site collects and conveys wastewater and stormwater around the site. Drainage system "vaults" collect and hold wastewater for storage and simple treatment (*e.g.*, oil/water separation, skimming). The drainage system vaults have pumps for sending wastewater through drainage system pipes to the consolidated drains treatment system (CDTS) for more advanced treatment (*e.g.*, carbon adsorption) prior to discharge through the CDTS outfall (Outfall 027A). Finally, the drainage system vaults also have discharge outfalls (Outfalls 001, 007, 010, 019, 027B, 028, 030, and 031) from which effluent may be discharged directly to the Saugus River. During dry weather such effluent would consist of process wastewater and contaminated groundwater infiltration, whereas during wet weather the effluent would also include stormwater.

Pollutants in the drainage system effluent may include various types of toxic pollutants (*e.g.*, petroleum-based contaminants) as well as conventional pollutants (*e.g.*, total suspended solids). Thus, EPA's NPDES permit includes requirements designed to control the discharge of these pollutants from the drainage system consistent with terms of the Clean Water Act.

In 2011, EPA Region 1 published a new Draft NPDES Permit for GE which proposed a number of permit limits, conditions, and best management practices (BMPs) intended to eliminate the discharge of untreated dry weather effluent from the drainage system outfalls (*i.e.*, process wastewater and groundwater infiltration) to the Saugus River. The Draft Permit also contained provisions intended to reduce the amount of untreated contaminated effluent discharged commingled with stormwater from the drainage system outfalls during wet weather. In particular, the Draft Permit proposed to prohibit discharges from the drainage system outfalls during dry weather as well as during the first 30 minutes of wet weather. The Draft Permit called for these flows to be collected and conveyed to the CDTS for treatment prior to discharge through the CDTS outfall (Outfall 027A). *See* Draft Permit Part I.A.1, I.A.11, and I.A.15. In addition, the Draft Permit called for implementation of a suite of BMPs intended to minimize the discharge of untreated non-stormwater flow (*i.e.*, process wastewater and groundwater infiltration) from the drainage system outfalls by reducing the contribution of such flow to the drainage system by mandating that leaking drainage system pipes be upgraded replaced and/or re-lined. *See* Draft Permit Part I.B.10.

GE commented extensively on the Draft Permit's limits, conditions, and BMPs related to the drainage system outfalls. In particular, GE commented on the feasibility of lining or re-piping drainage pipes and the feasibility and cost of transferring the first 30 minutes of wet weather flow to the CDTS for treatment. The United States Environmental Protection Agency (EPA) has considered these comments and their supporting documentation. EPA has also reevaluated the conditions of the Draft Permit in light of these comments and other information.

In support of the new Final NPDES Permit that EPA is issuing to GE, this document provides EPA's revised determination of technology-based requirements to control pollutant discharges from the drainage system during both dry and wet weather.

2. Background

2.1 Effluent Standards under the CWA

Under the Clean Water Act (CWA), 33 U.S.C. §§ 1251, *et seq.*, discharges of pollutants to waters of the United States are generally prohibited unless authorized by an NPDES permit or a specific provision of the statute authorizing the discharge even in the absence of an NPDES permit. *See* 33 U.S.C. §§ 1311(a), 1342(a)(1) and (2). NPDES permit effluent limits must, at a minimum, satisfy applicable federal technology-based standards. *See* 33 U.S.C. § 1311(b); 40 C.F.R. §§ 122.43(a), 122.43(a) and (b), 125.3(a). They must also satisfy any more stringent requirements that may apply based on state water quality standards. *See* 33 U.S.C. § 1311(b)(1)(C); 40 C.F.R. §§ 122.4(d) and 122.44(d).

When EPA has established National Effluent Limitation Guidelines (NELGs) that specify technology-based effluent limitations for specific industrial categories or sub-categories, any technology-based limits in a permit issued to a facility in that category or sub-category are based on the NELGs. *See* 33 U.S.C. §§ 1342; 40 C.F.R. §§ 125.3(c)(1) and (3); 122.44(a)(1). In the absence of NELGs setting limits for a particular type of facility, particular aspects of a facility's operation, or particular pollutants discharged by the facility, technology-based permit limits are developed on a case-by-case, Best Professional Judgment (BPJ) basis. *See* 33 U.S.C. § 1342(a)(1)(B); 40 C.F.R. §§ 122.44(a)(1) and 125.3(c)(2) and (3). When establishing permit effluent limits on a case-by-case basis using BPJ, EPA considers the specific factors listed in 40 CFR §125.3(d). These factors track the factors specified in the statute for EPA's consideration in the development of NELGs. *See* 33 U.S.C. § 1314(b).

The CWA sets forth different technology standards based upon the type of pollutant and/or the type of discharger involved. Existing dischargers were first supposed to meet effluent limitations by July 1977 based on the "best practicable control technology currently available" (BPT). *See* 33 U.S.C. §§ 1311(b)(1)(A), 1314(b)(1)(B). *See also Environmental Protection Agency v. Nat'l Crushed Stone Ass'n*, 449 U.S. 64, 70 (1980). BPT is generally represented by "the average of the best existing performances by industrial plants of various sizes, ages, and unit processes within the point source category or subcategory." *BP Exploration & Oil, Inc. v. U.S. Environmental Protection Agency*, 66 F.3d 784, 789 (6th Cir. 1995). In determining the BPT for an industry, EPA is to consider several factors, including "the total cost of application of the technology in relation to the effluent reduction benefits to be achieved from such application." *Id.*

The CWA of 1972 further provided that by 1983, discharges of particular toxic, conventional and nonconventional pollutants were supposed to meet effluent limits based on the "best available technology economically achievable" (BAT).[1] *See* 66 F.3d at 790. *See also* 33 U.S.C. §§ 1311(b)(2)(A), (C), (D), (E) and (F), and 1314(b)(1)(B); 40 C.F.R. §§ 401.15, 401.16 (listed toxic and conventional pollutants); *Crushed Stone*, 449 U.S. at 70. Amendments to the CWA later pushed the BAT compliance deadline back to March 31, 1989. *See* 33 U.S.C. §§ 1311(2)(A), (C), (D) and (F); 40 C.F.R. §§ 125.3((a)(2)(ii), (iii) and (iv).

For existing dischargers (as opposed to "new sources" regulated under CWA § 306), the BAT standard is the CWA's most stringent technology standard. The BAT standard requires compliance with:

> effluent limitations . . . which . . . shall require application of the best available technology economically achievable . . ., which will result in reasonable further progress toward the national goal of eliminating the discharge of all pollutants, as determined in accordance with regulations issued by the [EPA] Administrator pursuant to section 1314(b)(2) of this title, which such effluent limitations shall require the elimination of discharges of all pollutants if the Administrator finds, on the basis of information available to him ... that such elimination is technologically and economically achievable . . . as determined in accordance with regulations issued by the [EPA] Administrator pursuant to section 1314(b)(2) of this title . . ..

33 U.S.C. § 1311(b)(2)(A). That is, EPA must require the most stringent possible limits that could be met by use of the most effective pollution control technologies that are technologically and economically achievable, and that will result in reasonable progress toward eliminating discharges of the pollutant(s) in question. As the courts have ruled, BAT represents, at a minimum, the best economically achievable performance in the industrial category or subcategory. *NRDC v. EPA*, 863 F.2d 1420, 1426 (9th Cir. 1988) (citing *Crushed Stone*, 449 U.S. at 74). "Congress intended these limitations to be based on the performance of the single best-performing plant in an industrial field." *Chemical Manufacturers Ass'n v. EPA*, 870 F.2d 177, 226 (5th Cir. 1989). *See also Kennecott v. EPA*, 780 F.2d 445, 448 (4th Cir. 1985) ("In setting BAT, EPA uses not the average plant, but the optimally operating plant, the pilot plant which acts as a beacon to show what is possible.").

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[1] Toxic pollutants regulated under the BAT standard are specified in CWA §§ 301(b)(2)(C) and (D). *See also* 40 C.F.R. § 401.15 (list of toxic pollutants). Conventional pollutants include biochemical oxygen demand (BOD), total suspended solids (TSS), pH, fecal coliform, and oil and grease *See* 33 U.S.C. § 1314(b)(4)(A); *see also* 40 C.F.R. § 401.16. Nonconventional pollutants include pollutants that are not specified as either toxic or conventional pollutants (*e.g.*, heat is a nonconventional pollutant).

With regard to conventional pollutants discharged by existing sources, the CWA Amendments of 1977 supplanted the BAT standard with the "best conventional pollutant control technology" standard (BCT). *See* 33 U.S.C. § 1311(b)(2)(E); 1314(b)(4). *See also Crushed Stone,* 449 U.S. at 70 n. 9; *BP Exploration*, 66 F.3d at 790 ("BCT is not an additional level of control, but replaces BAT for conventional pollutants."). Effluent limitations based on BCT may not be less stringent than the limitations based on BPT. Thus, NELGs based on BPT are a "floor" below which BCT limits cannot be established. At the same time, BCT limits more stringent than BPT limits may be set only if a two-part cost-reasonableness test is satisfied: (1) the "POTW cost-comparison test" comparing BCT cost to EPA's calculation of the cost of upgrading a POTW from secondary to advanced secondary treatment; and (2) the "industry cost-effectiveness test" comparing BCT cost to EPA's calculation of the cost per pound to upgrade a POTW from secondary treatment to advanced secondary treatment divided by the cost per pound to upgrade from no control to secondary treatment. *See* 51 Fed. Reg. 24,974, 24,976 (July 9, 1986). *See also BP Exploration*, 66 F.3d at 790. BCT limits are set equal to the BPT limits if limits more stringent than BPT would fail the two-part cost-reasonableness test.

For the Final NPDES Permit for GE's Lynn, MA facility, EPA has developed technology-based effluent limits and best management practices (BMPs) based on a BPJ, case-by-case application of the BAT standard for various toxic pollutants that are or may be discharged from GE's drainage system outfalls (Outfalls 001, 007, 010, 019, 027B, 028, 030, and 031) and the CDTS facility (Outfall 027A). The toxics in question include benzene, BTEX (benzene, toluene, ethylbenzene, and xylenes), polycyclic aromatic hydrocarbons (PAHs), and total petroleum hydrocarbons (TPH). In addition, EPA has evaluated technology-based effluent limits and BMPs based on a BPJ, case-by-case application of the BPT and BCT standards for conventional pollutants that are or may be discharged by GE's drainage system outfalls and the CDTS (specifically, oil and grease (O&G), pH, and total suspended solids (TSS)).

2.2 Factors to Be Considered in Setting BAT, BPT and BCT Requirements

Most of the factors to be considered in setting BPT, BAT and BCT limits are identical. The primary differences relate to cost considerations.

Thus, in determining BPT requirements, EPA considers the following factors:

(i) The age of equipment and facilities involved;

(ii) The process employed;

(iii) The engineering aspects of the application of various control techniques;

(iv) Process changes;

(v) Non-water quality environmental impacts (including energy requirements);

(vi) The total cost of application of technology in relation to effluent reduction benefits to be achieved from such application; and

(vii) Such other factors as the Administrator deems appropriate.

See 33 U.S.C. § 1314(b)(1)(B); 40 C.F.R. § 125.3(d)(1). In comparing the technology cost to the effluent reduction benefits under the BPT standard (item (vi), above), the costs of the BPT should not be wholly disproportionate to its benefits. *See, e.g., Crushed Stone,* 449 U.S. at 71 n. 10.

In determining BAT requirements, EPA considers the same factors listed above for setting BPT requirements, except that in place of BPT factor (vi) (*i.e.*, the comparison of costs to effluent reduction benefits), Congress directs only that EPA consider the "cost of achieving such effluent reduction." 33 U.S.C. § 1314(b)(2)(B); 40 C.F.R. § 125.3(d)(3). *See Crushed Stone,* 449 U.S. at 71, n. 10.

In determining BCT requirements, EPA considers the same factors that it considers when setting BPT and BAT requirements, except that in place of the cost-related factors for those standards, EPA considers the following cost criteria:

(i) The reasonableness of the relationship between the cost of attaining a reduction in effluent and the effluent reduction benefits derived; and
(ii) The comparison of the cost and level of reduction of such pollutants from the discharge from publicly owned treatment works to the cost and level of reduction of such pollutants from a class or category of industrial sources.

33 U.S.C. § 1314(b)(4)(B); 40 C.F.R. § 125.3(d)(2).

Thus, cost must be considered when setting BAT limits, but cost must be considered in relationship to other factors, such as effluent reduction benefits, when setting BPT and BCT limits. As explained above, EPA applies a wholly disproportionate cost test under the BPT standard, and a two-part cost reasonableness test under the BCT standard. Once again, however, neither the statute nor regulations dictate precisely how EPA is to conduct these evaluations or how they should be weighed in the evaluation with the other factors.

The CWA sets up only a loose framework for EPA's consideration of the various statutory factors in setting technology-based limits. While the Agency must consider each factor, it has considerable discretion to determine the details of that assessment and the weight to be accorded to each factor in reaching an ultimate BAT determination. *Texas Oil & Gas Ass'n v. U.S. Environmental Protection Agency*, 161 F.3d 923, 929 (5th Cir. 1998). "[I]n enacting the CWA, Congress did not mandate any particular structure or weight for the many consideration factors. Rather, it left EPA with discretion to decide how to account for the consideration factors, and how much weight to give each factor." *BP Exploration*, 66 F.3d at 796, *citing Weyerhauser v. Costle*, 590 F.2d 1011, 1045 (D.C. Cir. 1978). The CWA does not require comparison of all these factors, merely their consideration. *See Weyerhauser*, 590 F.2d at 1045. Ultimately, EPA's assessment is governed by a standard of reasonableness. *BP Exploration*, 66 F.3d at 796, *citing*

American Iron & Steel Institute v. Environmental Protection Agency, 526 F.2d 1027, 1051 (3d Cir. 1975), *mod. in other part*, 560 F.2d 589 (3d Cir. 1977), *cert. denied*, 435 U.S. 914 (1978). One court summarized the standard for judging EPA's consideration of the relevant factors in setting BAT effluent limits as follows: "[s]o long as the required technology reduces the discharge of pollutants, our inquiry will be limited to whether the Agency considered the cost of technology, along with other statutory factors, and whether its conclusion is reasonable." *Ass'n of Pacific Fisheries v. U.S. Environmental Protection Agency*, 615 F.2d 794, 819 (9th Cir. 1980)

This document sets forth EPA's revised BPJ analyses, based on the Agency's continued evaluation of the relevant factors and its consideration of comments received on the Draft Permit. Any technology-based limits for the drainage system in the Final Permit are based on these analyses. If, however, limits more stringent than the technology-based limits are necessary to comply with state water quality requirements and/or federal anti-backsliding requirements, then those more stringent limits are included in the Final Permit. *See* 33 U.S.C. §§ 1311(b)(1)(C) and 1342(o).

3. Best Performing Technology

As stated above, the starting point for setting BAT standards is the best performing facility in terms of pollutant removal from the same industrial category or sub-category. GE's facility is not, however, strictly a member of any industrial category or sub-category regulated under an NELG promulgated by EPA. Still, EPA may inform its BPJ determination of BAT standards by looking to existing permit limits or NELGs for similar types of facilities or industries.

At the same time, however, given that EPA is developing technology-based limits for the GE drainage system on a BPJ, case-by-case basis, the Agency has focused on the specific facts of the GE drainage system and facility. This is doubly appropriate because the nature of the wastewater discharge problem posed by the drainage system will necessarily be shaped by site-specific conditions that will determine, for example, the overall volume of wastewater to be handled, the extent of the contaminated groundwater problem and the difficulty of managing it, and the identity of the contaminants present in the wastewater.

GE's drainage system discharges primarily during wet weather and its effluent can include process wastewaters as well as potentially contaminated groundwater infiltration and stormwater. Data from the Facility shows that these commingled wastewaters can include a variety of pollutants, including toxic pollutants, such as petroleum-related compounds, volatile organic compounds, and metals, as well as various conventional pollutants commonly associated with stormwater. In determining permit requirements for the drainage system discharges, EPA has found relevant information in a variety of sources, including: (a) NPDES permit requirements for municipal combined sewer systems with combined sewer overflows (CSOs) and industrial facilities managing commingled process wastewater, stormwater and contaminated groundwater; (b) standards for publicly owned treatment works that handle conventional pollutants, (c) EPA's Remediation General Permit (RGP) for discharges from facilities that treat contaminated groundwater, and (d) EPA's NELGs for the Steam Electric Power Generating point source category. EPA looked to the latter source not because GE operates a Power Plant (although it does), but because GE uses and stores jet fuel at the facility. In developing effluent limits for Steam Electric Source Category, EPA identified potential pollutants associated with equipment containing fuel oil and/or the leakage associated with the storage of oil (USEPA, 1982) that may also be present at GE (*e.g.*, oil and grease and total suspended solids).

EPA has decided that the recently designed and installed collection, storage and treatment system at the Exxon/Mobil facility in Everett, MA (NPDES Permit No. MA0000833) is representative of the generally "best performing" technology for the treatment and discharge of process wastewater mixed with stormwater and contaminated groundwater infiltration. The Exxon/Mobil facility addresses the same general type of effluent discharged by GE's drainage system, which tends to include multiple contaminants of variable quantity and quality, including a number of petroleum- and gasoline-related constituents like benzene and "BTEX."

In its responses to comments on a proposed modification to the Exxon/Mobil permit, EPA stated the following:

> [t]he proposed permit modification established separate effluent limitations and monitoring requirements to address wet weather discharges (dominated by storm water) and dry weather discharges (comprised of infiltrated groundwater, some of which exhibit contamination from historic refinery and bulk petroleum operations). To implement this tiered permitting structure, ExxonMobil agreed to extensively redesign its effluent treatment system in order to improve effluent quality under all flow conditions, including through the use of a continuously operated advanced treatment system, and a flow equalization tank to store storm water volume during periods of peak storm water flow. The continuously operated treatment system will be capable of treating the dry weather flow from the site, as well as storm water flow.
>
> Under the modification, the new and modified facilities are required to address stormwater flows, infiltrating groundwater and other permitted discharges, under a variety of flow scenarios, which vary widely at the 110 acre site. This final permit modification requires a comprehensive system that provides treatment of effluent before discharge in all but the most extreme storm events exceeding the 10-year, 24 hour design storm event calculated at 13,600 gpm. The combined system provides continuous treatment of flows up to 280 gpm (over 12 million gallons per month) through sand filters and activated carbon. In order to meet the permit modification requirements, ExxonMobil has also modified its existing facilities to provide 2.1 million gallons of storage capacity to contain significant flows generated by most storm events. This will result in very infrequent discharges through Outfall 01B, known as bypass events. Indeed, since the storage modifications were completed in September 2010, there has not been a single discharge through Outfall 01B.

EPA Region 1 Response to Comments on Draft Modification of NPDES Permit No. MA0000833 EXXONMOBIL Oil Corporation-Everett Terminal (Oct. 2011), pp. 1, 3 (found at http://www.epa.gov/region1/npdes/permits/2011/finalma0000833permitmod.pdf).

Thus, Exxon/Mobil has constructed a system to collect contaminated groundwater and stormwater at the facility from storms up to and including the 10-year, 24-hour storm. The combined wastewater is then conveyed to a new treatment system for treatment prior to discharge. In addition, new storage facilities hold flows up to 2.1 million gallons, as needed, prior to sending them for treatment.

The new Exxon/Mobil treatment facility uses "liquid phase carbon adsorption preceded by oil water separation and filtration," which is similar to, or the same as, the technology installed at GE under an administrative consent order entered by GE and the Massachusetts Department of Environmental Protection (MassDEP) under state hazardous waste laws. EPA Region 1, Response to Comments Regarding the Resissuance of the Following NPDES Permit EXXONMOBIL Corporation MA0000833, p. 7 (Sept. 2008). Indeed, EPA pointed to the GE treatment plant technology, among other things, as support for requiring similar treatment technology at Exxon/Mobil.

The Exxon/Mobil technology (*i.e.*, collection, storage and treatment) is the best performing technology not only because it uses carbon adsorption, but also because it eliminates untreated discharges of commingled infiltrated groundwater and stormwater up to and including flows from a 10-year, 24-hour storm event. [2] Thus, dry weather flow, and dry weather flow commingled with wet weather flow from a storm up to that level, is sent to the treatment plant for the type of treatment described above (*i.e.,* oil/water separation, filtration, and carbon treatment) prior to discharge. There would be only a relatively small amount of untreated overflow from larger storms.

GE employs this same treatment technology (carbon adsorption) for treatment of infiltrated groundwater and process water, but for the most part does not currently collect, store, or treat stormwater. Instead, during wet weather, GE's drainage system outfalls stop pumping wastewater to the treatment system and discharge all wastewater directly to the Saugus River without treatment.

4. Existing Drainage System Outfalls and the Draft Permit's Conditions

At GE, groundwater containing waste oil and other chemical constituents infiltrates the facility's storm water collection system. Prior to the 1999 Administrative Consent Order between GE and MassDEP (File No. ACO-NE-99-1004) (the ACO), this effluent was discharged directly to the Saugus River without treatment. Under the ACO, GE agreed "to modify a portion of the existing storm water collection system to substantially eliminate the discharge of untreated dry weather

[2] With regard to facilities like GE that are dealing with combined dry and wet weather flows, EPA also considers combined municipal sewer systems that eliminate untreated dry weather discharges from their combined sewer overflow (CSO) discharges and send (or store and send) the wastewater to a facility for treatment prior to discharge to be representative of the best technology for a system. EPA discusses such combined systems in greater detail below.

flow, including infiltration, and reduce the discharge of untreated infiltration during wet weather flow by modification of the existing collection and treatment system." (ACO, Part II.7). The ACO also provides that, "[t]he collection and treatment system modifications will substantially eliminate untreated dry weather discharges and reduce the discharge of untreated infiltration during wet weather flows to the Saugus River." *Id.*

In its comments on the Draft Permit and supporting documentation, GE describes its existing technology for collecting and treating wastewater flows, including infiltrated groundwater, at the drainage system outfalls. The eight drainage system outfalls (001, 007, 010, 019, 027, 028, 030, and 031) that receive combined dry weather flows and wet weather flows were retrofitted with collection, treatment, and conveyance control technology. Commingled process wastewater and contaminated groundwater infiltration collects in the vaults during dry weather and is transferred to the consolidated drain treatment system (CDTS) for treatment prior to discharge through Outfall 027. The CDTS includes dissolved air flotation (DAF) and granulated activated carbon (GAC) treatment processes and is designed to treat dry weather flows up to 300 gallons per minute (gpm). It currently treats a maximum average of 250 gpm of dry weather flows. The system design allows maximum flexibility to operate either the DAF or the GAC units, or both, in order to meet treatment objectives and discharge limits. According to GE, however, the facility does not operate the DAF unit at this time (Technical Exhibit 17).

During dry weather, wastewater (including process water and infiltrated groundwater) collects in the drainage vault at each outfall and is transferred to the CDTS for treatment. The water level in each vault, and therefore the amount of dry weather flow transferred to the CDTS, is controlled by ultrasonic transducer sensors. At the "pump-off" setting, established "at an elevation above the bottom of the underflow baffle," the transfer pumps to the CDTS shut off and the remaining volume continues to be skimmed and treated in the vault's oil water separator. When the inflow of wastewater reaches the "pump-on" elevation, established at a level approximately 6 to 18 inches above the "pump off" elevation,[3] the transfer pumps to the CDTS turn on and a portion of the dry weather flow in the vault is conveyed to the CDTS for treatment. Once the transfer pumps reduce the vault volume to the "pump off" elevation, the pumps shut off again.

During wet weather, stormwater inflow comingles with the groundwater and process water flows, causing the water level in the vaults to rise. When the rate of inflow exceeds the capacity of a vault's transfer pumps, the pumps shut off and the vault fills until it reaches the "gate-open" elevation, causing the tide gate to open and discharge untreated commingled wastewater and stormwater from the vault directly to the Saugus River. The tide gate at each vault rises over a 5-minute period and remains open for one hour, at which time it closes until the "gate open" elevation is reached again. Under the worst-case conditions (dry weather flow at the "pump on" level), and depending on which of the drainage vaults is at issue, dry weather flow (including contaminated groundwater and process wastewater) comprises from about 45% to 66% of the total volume of commingled wastewater and stormwater released to the Saugus River when the tide gates are triggered. On average, dry weather flow constitutes about 54% (about 21,000

[3] This description is based on detailed drawings of each drainage outfall vault as revised by AECOM and submitted by GE on November 15, 2013, in response to a request for additional information communicated during the October 22, 2013, meeting between EPA and GE.

gallons) of the total volume of untreated flow discharged from the eight drainage vaults to the Saugus River when the tide gates are opened (*see* Technical Exhibit 15 p. 2).

EPA determined that the drainage system outfall vaults 1) may allow wastewater discharges during dry weather from occasional leakage at the gates, and 2) discharge untreated dry weather flows (including infiltrated contaminated groundwater and process wastewater) commingled with stormwater to the Saugus River during storm events that generate more than 0.1 inches of precipitation. GE's Draft Permit included a number of permit limits, conditions, and best management practices (BMPs) intended to ensure that dry weather discharges from the outfall vaults to the receiving water are "substantially eliminated" and that wet weather discharges of untreated dry weather flow commingled with stormwater are reduced, as per the 1999 ACO.

In particular, the Draft Permit proposed the prohibition of discharges from the drainage system outfalls during dry weather and during the first 30 minutes of wet weather. (Wet weather was defined as any time period that begins with an hour that received 0.1 inches or more of rainfall (or equivalent precipitation) and continues until two hours past the last hour that precipitation is recorded.) The Draft Permit called for this volume of commingled dry weather flow and stormwater to be collected and conveyed to the CDTS for treatment prior to discharge through Outfall 027A. *See* Draft Permit Part I.A.1, I.A.11, and I.A.15. In addition, Part I.B.10 of the Draft Permit included a number of BMPs designed to minimize or eliminate the discharge of untreated non-stormwater flows from the drainage system outfalls to the Saugus River, including re-piping certain non-stormwater flows directly to the CDTS, and upgrading, replacing and re-lining leaking drainage system pipes to reduce groundwater infiltration.

GE commented extensively on the Draft Permit's limits, conditions, and BMPs related to the drainage system outfalls (Outfalls 001, 007, 010, 019, 027B, 028, 030, and 031). In particular, GE commented on the feasibility of lining or re-piping drainage pipes and the feasibility and cost associated with transferring the first 30 minutes of wet weather flow to the CDTS for treatment. EPA has re-evaluated the feasibility of the Draft Permit requirements related to the drainage system in light of these comments and their supporting documentation. EPA's analysis in support of the Final Permit conditions for the drainage system outfalls is presented below.

5. Permit Conditions Subject to the BAT Standard

As explained above, discharges of toxic and nonconventional pollutants are subject to the BAT standard. As discussed in the record for the draft permit, and discussed further below and in the EPA's Responses to Comments, various toxic and nonconventional pollutants are or may be present in the dry weather flow (and the dry weather flow commingled with stormwater) that is collected in the drainage system.

EPA has focused on three ways to control and reduce the discharge of these pollutants from the drainage system: first, taking steps to reduce groundwater infiltration into the drainage system; second, minimizing dry weather discharges from the drainage system outfalls and maximizing flows receiving treatment by the CDTS during dry weather; and third, reducing drainage system outfall discharges of commingled process wastewater, groundwater infiltration and stormwater during wet weather conditions. In the absence of applicable national effluent limitation guidelines, EPA determined BAT requirements for GE's draft NPDES permit on a site-specific, BPJ basis. After considering GE's comments on the Draft Permit, EPA has re-examined its BPJ analysis and reconsidered the Draft Permit's requirements.

5.1 Minimizing Dry Weather Flows Entering the Drainage System

The Draft Permit proposed BMPs intended to minimize the infiltration of contaminated groundwater into GE's drainage system and, thereby, to reduce the volume of dry weather flow ultimately discharged from the vaults. These BMPs included re-piping dry weather flows directly to the CDTS and/or re-lining the drainage system pipes. In its comments, GE questioned the feasibility of many of these BMPs, and, in particular, urged that re-piping "non-allowable, non-stormwater flows" would be impracticable (See Comment 13.2.4).

The age of the GE facility and its equipment affects the contribution of contaminated wastewater to the drainage system. The lengthy history of industrial activity at GE has resulted in the contamination of local groundwater with a mixture of pollutants, including many toxic constituents. (GE has for a number of years been carrying out remedial measures for this contamination pursuant to the MassDEP ACO, as discussed above.) Over this long history, an extensive drainage system network has been installed at the site which is vulnerable to groundwater infiltration. Accordingly, drainage system effluent is now comprised of a mixture of infiltrated groundwater, process water and, during wet weather, stormwater.

The long history of industrial activity and the age of the facility also raises a number of difficulties for designing approaches for controlling drainage system discharges. For example, much of the area at the site is already in use and access to the drainage system is complicated by the existing network of steam pipes, fuel pipes, and other related infrastructure that overlays the drainage system. GE states that lining drainage system pipes to prevent infiltration would be extraordinarily difficult and expensive for a number of reasons, including the basic difficulty of locating and accessing much of the extensive network of drainage system pipes.

Despite these difficulties, GE points out that it has already lined 3.25 miles (26%) of its drainage pipes at a cost of $5.1 million (*see* Comment 3.2). GE's effort focused on pipes most susceptible to groundwater infiltration, including those below the groundwater table, those subject to tidal influence, and/or those located in areas where groundwater has been adversely impacted by historic operations. This includes pipes associated with many of the drainage system outfalls (001, 007, 010, 027, 028, and 031). In its comments on the Draft Permit and in Technical Exhibits accompanying its comments, GE estimated the cost for compliance with the BMPs in the Draft Permit to be approximately (a) $30 million to replace storm drains below the water table that have not been previously lined (accounting for about 70% of storm water drainage pipes at the site), (b) $750,000 to video the storm drainage system, and (c) approximately $70,000 for monitoring equipment.

Regarding re-piping all dry weather flows directly to the CDTS, GE comments that the drainage system is a centralized collection of flows and that locating the exact origin of some of these flows may not be feasible and some dry weather flows may be "overlooked" (see Comment 13.2.4). In addition, dry weather flows collected in the vaults are pre-treated with an oil water separator prior to being pumped to the CDTS. According to GE, bypassing this pre-treatment and sending the flows directly to the CDTS would cause the downstream granular activated carbon treatment system at the CDTS to be exhausted more frequently and operating costs would increase. Finally, GE estimates that re-piping flows in this manner would be very costly. More specifically, GE estimates the capital cost to collect and convey to the CDTS for treatment just the steam conduit drains, the power house boiler blowdown, and the boiler water treatment system backwash waters to be $6.8 million. This estimate does not include the capital costs associated with the isolation, collection, and conveyance of the remaining "non-allowable, non-stormwater" flows (*i.e.*, dry weather flows) (*see* Comment 13.2.4).

Based on a review of the Facility's extensive drainage system, and in consideration of GE's comments on the cost, engineering difficulty, and process changes related to the stress on the existing CDTS, EPA concludes that the BAT for controlling drainage system wastewater discharges does not at this time include requirements for GE to further line, replace, or re-pipe the drainage system pipes.

Therefore, the BMPs at Part I.B.10 of the Draft Permit that required GE to line, replace, or re-pipe drainage system pipes have been eliminated from the Final Permit.

5.2 Eliminating Dry Weather Discharges from the Drainage System Outfalls

The Draft Permit's proposal to prohibit dry weather discharges from the drainage system outfalls would potentially require modification to the vault gates. According to GE (*see* Comments 9.4 and 13.2.2), the drainage system vault gates cannot be sealed to preclude all possibility of some untreated dry weather discharges. GE argues that it is "technically impracticable" to perfectly seal the mechanized steel outfall gates, which operate on metal tracks, and characterizes the discharge of untreated dry weather flow as "a small amount of weeping around the bottom edges of the gates due to the hydrostatic pressure created by the water behind the gates" (Comment 13.2.2). GE has stated that this "weeping" is "per the design specification of the slide gates."[4]

EPA is not persuaded by these comments that it should authorize untreated dry weather pollutant discharges from the outfall vaults. The vault gates were installed with the stated purpose of "assist[ing] in isolating the vault and drain system from the river during dry periods" and, therefore, should not discharge during dry weather and certainly should not have been designed to do so.[5] EPA notes that the challenges posed by GE's drainage system, which handles commingled process wastewater, infiltrated groundwater, and stormwater, are analogous to the challenges posed by municipal combined sewer systems, which handle commingled sanitary wastewater, industrial wastewater, stormwater and, in some cases, infiltration from groundwater and illicit connections. Such municipal combined sewer systems are typically required to take steps to preclude dry weather discharges from their overflow discharge points (CSOs), despite the possibility that CSO discharges may in some cases be authorized when combined stormwater/wastewater flows in the system exceed a certain volume/rate due to large storms.

In its guidance for long-term CSO abatement planning, EPA explains that as a first, early step systems should implement "Nine Minimum Controls" for reducing CSO discharges even as they

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[4] NPDES Permit Renewal Application Revision May 2000.
[5] NPDES Permit Renewal Application Revision May 2000.

embark on their long-term planning process. *See Combined Sewer Overflows – Guidance for Long-Term Control Plan* (US EPA Office of Water, Pub. No. EPA 832-B-95-02, Sept. 1995), pp. 2-3 to 2-4. One of the Nine Minimum Controls is to *eliminate* dry weather overflows, and EPA identifies a variety of techniques for achieving that end. *See id.* at p. 2-5, Exhibit 2-1;[6] *Combined Sewer Overflows – Guidance for Nine Minimum Controls* (US EPA Office of Water, Pub. No. EPA 832-B-95-03, May, 1995), pp. 1-7, 6-1 to 6-5. *See also Guidance for Long-Term Control Plan,* at pp. 3-35 to 3-47; EPA website at http://cfpub1.epa.gov/npdes/cso/ninecontrols.cfm (*see* step no. 5) (last visited July 17, 2012). These techniques highlight the importance of routine inspections to ensure the proper operation and maintenance of overflow regulators.

EPA regards it to be technologically feasible to preclude virtually all dry weather discharges from the drainage system through proper facility design and routine inspections and maintenance activities. In fact, GE is already required to properly operate and maintain the vault gates during dry weather. GE's current NPDES Permit Part II.B.1 Standard Conditions, Proper Operation and Maintenance states that "[t]he permittee shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the permittee to achieve compliance with the conditions of this permit and with the requirements of storm water pollution prevention plans." Certainly, one step would be to ensure that all gates are properly shut during dry weather conditions. GE, in its permit application and again in its comments on the Draft Permit, acknowledges the feasibility of such a practice. For example, in the Table for Form 2C from the 1998 permit application, GE states that "once the CDTS is on-line, the only dry weather flow will be from Outfall 027. All other outfalls with dry weather flow will have gates closed and water pumped to the treatment system (with the exception of leakage around the gate seals and wet weather flow when the gates are opened)." Furthermore, in Comment 9.4, GE recommends "that EPA revise the prohibition in Part IA.1.a. to read: *"The gates for the Drainage System Outfalls (except outfalls 028, 030, and 031) shall remain closed during dry weather conditions."*).

After considering GE's comments and further evaluating the issue, EPA agrees that achieving a complete, 100 percent sealing of the vault gates at all times may pose an engineering challenge that GE is unable to meet or that may be excessively costly to achieve depending on the volume of any flow leaking from the gate during dry weather. At the same time, EPA concludes that, at a minimum, the discharge of untreated dry weather flows due to improper operation or maintenance of the vault gates should be prohibited. Therefore, EPA has revised the conditions that were in the Draft Permit so that Part I.B.1.a of the Final Permit requires that "the drainage system outfall gates shall remain closed without leaks, except for minor weeping around the bottom edge of the gate due to hydrostatic pressure, during all periods of dry weather." In light

[6] Indeed, it should also be noted that other steps included as part of the Nine Minimum Controls are similar or equivalent to aspects of the BAT requirements specified by EPA for the Final Permit. For example, the Nine Minimum Controls include the following steps: proper operations and maintenance (including inspections and repairs of regulators, tidegates and pumps); maximizing use of the collection system for storage (including repairing, maintaining and adjusting tidegates and regulators, adjusting and upgrading pumping capacity); and maximizing conveyance of flows to the treatment plant. *Id*. at p. 2-5, Ex. 2-1. It should be understood that EPA is not mandating these requirements because they are in the CSO abatement guidance. The CSO guidance in no way establishes legal requirements for GE's drainage system discharges. Rather, EPA merely looked to the guidance as a potential source of relevant information to help inform its BPJ in the development of site-specific requirements for GE's permit.

of GE's comments on the Draft Permit, EPA concludes that meeting this condition should be feasible and is consistent with the BAT for controlling these dry weather discharges at the GE Facility. Moreover, EPA believes that this permit condition is also consistent with GE's agreement to "substantially eliminate untreated dry weather discharges" in the 1999 ACO.

5.3 Treating Dry Weather Flows

Beyond considering permit conditions to minimize dry weather discharges from the drainage system outfalls by reducing groundwater infiltration and reducing or eliminating direct discharges from the drainage system outfalls, EPA has also focused on how the dry weather flow (*i.e.*, process wastewater and groundwater infiltration) that is discharged should be treated. In accordance with the 1999 ACO it entered with MassDEP, GE has installed a wastewater treatment plant (the CDTS) and pipes and pumps for collecting and transferring dry weather flows to the CDTS for treatment prior to discharge to the Saugus River. EPA has taken account of the fact that the CDTS and drainage system improvements are somewhat recent improvements and would not be expected yet to have yet reached the end of their useful life. In light of GE's investment in this treatment equipment, EPA has considered BAT options that incorporate the CDTS as part of the overall approach because utilizing this existing, relatively recently installed technology will likely be the most cost-effective option.

Moreover, EPA has determined that this approach is appropriate because the CDTS includes liquid phase carbon adsorption treatment, preceded by oil/water separation and potentially dissolved air flotation (DAF). This is the same combination of technologies employed by Exxon Mobil and is considered to be among the best performing technologies available for the treatment of petroleum-related contamination. For these reasons, EPA concludes that the BAT at GE for wastewater treatment of toxic and non-conventional pollutants prior to discharge from Outfall 027A is the existing CDTS and, specifically, the granulated active carbon (GAC) units.

Thus, the Final Permit's technology-based numeric effluent limits for discharges of toxic pollutants, including BTEX, benzene, TPH, and PAHs, from the CDTS (Outfall 027A) are based on the use of the existing CDTS GAC treatment technology. Discharges at Outfall 027A are expected to meet these effluent limits assuming proper operation and maintenance of the treatment system. In other words, EPA has concluded that the CDTS satisfies the BAT standard for treating dry weather flows at the facility and the Final Permit includes numeric, technology-based limits based on the use of this technology for various toxic and nonconventional pollutants that will potentially be discharged from Outfall 027A (see discussion of technology-based limits for toxics below). In its comments, GE agrees that "the CDTS continues to reflect the best available technology …," and indicates that this technology "… has proven to be effective at collecting and treating dry weather flows…" (*see* Comment 9.4).

5.3.1 Technology-based Limits for Toxics at Outfall 027A

The Final Permit applies numeric, technology-based effluent limits at Outfall 027A for BTEX, benzene, PAHs, and TPH. The effluent limits applicable at Outfall 027A are based on the granulated activated carbon (GAC) technology currently used in the CDTS. The RGP,[7] and its supporting analysis, were again considered in determining technology-based limits because GE's discharges of dry weather flow may contain contaminants of concern similar to those found in the groundwater at facilities surveyed in development of the RGP, and because the technology used at GE to treat dry weather flows is consistent with the technology evaluated in the RGP.

BTEX & Benzene: As stated in the Fact Sheet for the Draft Permit, the traditional approach for limiting effluents contaminated with gasoline or other light distillates, including from petroleum spills, is to place limits on the individual BTEX compounds and/or the sum of total BTEX compounds.

GE's discharges of pollutants through the CDTS (Outfall 027A), which include contaminated groundwater, are similar to the contaminated groundwater remediation situations analyzed in the development of the RGP. GE's discharge is also similar to the discharges of pollutants from the ExxonMobil facility discussed above. The RGP contains technology-based effluent limits of 100 ug/L for BTEX and 5.0 ug/L for benzene consistent with EPA's "Model NPDES Permit for Discharges Resulting from the Cleanup of Gasoline Released from Underground Storage Tanks" (July 1989). These technology-based limits reflect treatability using liquid phase carbon adsorption, a proven technology capable of removing benzene and other petroleum hydrocarbons from water to non-detectable levels. EPA has determined this technology to be the BAT for treating dry weather flows from GE's drainage system, and GE has this technology in place at the CDTS. As a result, EPA has established technology-based effluent limits at Outfall 027A for benzene of 5.0 ug/L and total BTEX of 100 μg/L, which are consistent with the limits in the RGP and the permit for ExxonMobil. These numeric limits are also consistent with GE's current permit limits at Outfall 027.

PAH: GE's discharges of pollutants through the CDTS (Outfall 027A), which include PAHs from contaminated groundwater infiltration, are similar to the contaminated groundwater remediation situations analyzed in the development of the RGP. The RGP contains a water-quality based limit for individual Group I PAH compounds of 0.0038 ug/L, with the compliance limit equal to the ML of the test method used. The RGP also sets technology-based limits of 10.0 ug/L for total Group I PAHs (sum of the individual isomers) and 100.0 ug/L for total Group II PAHs based on the use of carbon adsorption technology to remove these compounds to below detection levels.

Likewise, GE's Final Permit includes a monthly monitoring requirement for individual Group I PAHs at Outfall 027A, and technology-based maximum daily effluent limits of 10.0 ug/L for total Group I PAHs and 100.0 ug/L for total Group II PAHs consistent with the use of carbon adsorption technology.

TPH: GE's discharges of pollutants through the CDTS (Outfall 027A), which include total petroleum hydrocarbons (TPHs) in contaminated groundwater infiltration, are similar to the

[7] In writing the fact sheet, EPA referred to the 2005 RGP and fact sheet. The 2010 RGP, effective September 10, 2010, used the same basis in deriving limits for each of the parameters as the 2005 RGP (*see* Attachment A to the 2010 RGP Fact Sheet for the applicable 2005 RGP Fact Sheet Excerpts: http://www.epa.gov/region1/npdes/remediation/RGP2010_FactSheet_AttachmentA.pdf).

contaminated groundwater remediation situations analyzed in the development of the RGP. The RGP sets a technology-based daily maximum value of 5.0 mg/L for the discharge of TPH. This limit is based on a review of site remediation projects in Massachusetts and New Hampshire, which suggests that this limit is readily attainable with the standard treatment technology, including carbon adsorption, and that 1.0 mg/L is rarely exceeded in the effluents reported. Reported results are typically less than the laboratory reporting levels (0.2 to 0.5 mg/L). Accordingly, GE's Final Permit includes a technology-based, maximum daily effluent limit of 5.0 mg/L for TPH.

MtBE**:** The Draft Permit included a maximum daily limit of 100 μg/L for MtBE at Outfall 027A. No effluent limit or monitoring was required for MtBE at the drainage system outfalls, however, including Outfall 027B. According to the Draft Permit's Fact Sheet, the MtBE limit was continued from the current permit due to the anti-backsliding regulations at 40 C.F.R. § 122.44(l)(2)(i) and because monitoring for the contaminant would confirm whether it was present or absent in the effluent from Outfall 027A. In response to GE's comment questioning the appropriateness of this limit under existing conditions, EPA reevaluated the basis for the current limit and new information that has become available since the limit was first applied.

The Fact Sheet for GE's 1993 permit indicates that the numeric limit for MtBE at Outfall 027D was specified by EPA as an addendum to the previous permit, and that it was retained in the current permit. A letter from David W. Tordoff (EPA On-scene Coordinator) to David A. Roberts (GE) dated June 10, 1991, confirms that the numeric limit for MtBE was applied as a condition of an emergency authorization to allow intermittent discharges of non-contact cooling water and wastewater from a sump collection system in the vicinity of a recovery and treatment system operation in Building 64 to Outfall 027. Subsequently, a letter from David Johnston (GE) to George Harding (EPA) dated April 16, 1999, confirmed that the discharge line from the Building 64 treatment system to Outfall 027D was capped and the discharge re-piped to the Bennett Street Sewer, which discharges to the Lynn Water and Sewer Commission's Wastewater Treatment Facility. In addition, GE stated that analytical results for the treatment system effluent sampling would no longer be reported on discharge monitoring reports (DMRs) at Outfall 027D. The permittee was directed by Robin Neas (EPA) to use the no discharge code "C" on the DMRs for Outfall 027D.

In addition, EPA agrees with GE's assertion that MtBE is not a component of jet fuel –which GE stores and uses on-site – and that the only potential source of MtBE expected at the facility would be the two fuel tanks described in GE's comment. A review of historic groundwater monitoring data from 1998 through 2008 indicated nine instances of MtBE in groundwater at the site, of which all were below the current numeric limit of 100 μg/L. Eight of the samples were below the 2010 RGP technology-based numeric limit of 20 μg/L and the most recent samples (in 2007) were less than 2 μg/L.

EPA concludes that because effluent discharges from the Building 64 treatment system, on which the current numeric limit for MtBE was originally based, have been eliminated and there is no other likely source of MtBE from the manufacturing facility, the MtBE limit should be eliminated from the limits for Outfall 027A in the Final Permit. Eliminating this permit limit is appropriate under an exception to the CWA's anti-backsliding requirements because the re-routing of the effluent from the treatment system in 1999 is a material alteration to the permitted facility that occurred after issuance of the existing permit. *See* 40 C.F.R. § 122.44(l)(1).

EPA notes that the other parameters associated with the batch discharge of effluent from the Building 64 treatment system (benzene and BTEX) are associated with jet fuel, and have at times been detected in the groundwater at the site at levels substantially above numeric limits. For these and other reasons discussed in response to GE's comments, EPA has retained the numeric limits at Outfall 027A for these constituents and applied monitoring requirements at the drainage system outfalls for these parameters.

Table 1. Summary of numeric effluent limits (µg/L) for treated, dry weather discharges from the CDTS at Outfall 027A.

Parameter	Type	Draft Permit	Final Permit	Basis
BTEX	Maximum Daily	100	100	Technology
Benzene	Maximum Daily	5	5	Technology
PAH	Maximum Daily	Group I Total 10 Group II Total 100	Group I Total 10 Group II Total 100	Technology
TPH	Maximum Daily	100	100	Technology

5.4 Treating Wet Weather Flows

Beyond the permit conditions discussed above, which are designed to limit drainage system pollutant discharges during dry weather, EPA also considered permit conditions to limit discharges during wet weather. During wet weather, GE's drainage system collects and discharges stormwater commingled with the polluted dry weather flow.

The Draft Permit proposed prohibiting discharges of the "first flush" of wet weather flows (defined as the first 30 minutes of stormwater flow) from the drainage system outfalls and requiring this portion of the flow during wet weather to be transferred to the CDTS for treatment. In proposing this requirement, EPA noted that the first flush during wet weather was likely to entrain or subsume the dry weather flow already in the drainage system vaults. In the Draft Permit, EPA acknowledged, however, that the Facility's existing technology might require improvements in order to collect and treat this first flush of wet weather flow (*see* Part I.B.10.b.ii of the Draft Permit ("if the permittee determines that this is presently infeasible due to capacity limitations of the system, then the permittee must evaluate what steps would be needed to make it feasible, including increasing pumping capacity, storage capacity, and/or the treatment capacity of the CDTS, or reducing sources of infiltration to the system to free up existing capacity")).

In its comments, and in the Technical Exhibits supporting its comments, GE evaluated whether the existing drainage system and treatment technology were capable of treating the first 30 minutes of wet weather flow and identified improvements that could potentially be required to meet this condition of the Draft Permit. In response to GE's comments and analysis, EPA reevaluated the feasibility of treating the first 30 minutes of wet weather flow as the BAT for controlling the GE drainage system's discharge of pollutants during wet weather.

5.4.1 Age of Equipment and Facilities Involved

EPA agrees with GE's conclusion that the existing capacity of the drainage system vaults, conveyance system and CDTS is not sufficient to treat the first 30 minutes of wet weather flow from all storms, as the Draft Permit's conditions would require. Instead, significant improvements and/or upgrades to these facilities would be needed. This would be the case even if EPA were to apply the permit condition only to smaller storms (*e.g.*, "minor" or "average" events).

EPA considered the age of the equipment and the facilities involved when considering the need for upgraded technology to satisfy the BAT standard for GE's Final Permit. If GE was constructing an entirely new drainage system, EPA would likely have specified that it should be designed to handle some amount of stormwater along with the dry weather flow. Faced with similar issues, that is the approach that Exxon/Mobil took. It designed a system to handle stormwater combined with contaminated groundwater at its facility. Exxon/Mobil's system is similar to the existing system at GE in that flows are collected and conveyed to a centralized treatment system providing filtration treatment and oil/water separation prior to carbon treatment and discharge. Exxon/Mobil's system also provides significant storage capacity so that excess flows can be stored, up to a point, and then conveyed to the treatment plant when capacity becomes available. Exxon/Mobil sized its system to accommodate all the flows from a storm up to and including the 10-year, 24-hour storm, which required a 2.1 million gallon storage facility and a treatment plant capable of handling up to 280 gallons per minute (gpm) of wastewater.

In contrast, GE indicates that its existing drainage system was not designed to capture, convey, or treat stormwater flows under wet weather conditions. As a result, it would likely need to be retrofitted with additional pumping, storage, and treatment capacity in order to accommodate wet weather flows. GE's existing system, however, was installed only a relatively short time ago (around 1999) and would not be expected yet to have reached the end of its useful life. Moreover, the existing treatment technology (activated carbon) is the best performing technology in the industry (as described above) for handling the type of wastewater at issue here. In light of these considerations, EPA determined that it would make sense for GE to use or improve the existing system rather than design an entirely new system.

5.4.2 Engineering Aspects of the Application of Various Control Techniques

In Technical Exhibit 17, GE evaluates the feasibility of collecting, conveying, and treating the first flush of three identifiable wet weather scenarios: a "minor" event based a 10-year, 24-hour precipitation event; an "average" event based on a 2-year, 6-hour precipitation event; and a "major" event based on a 1-year, 1-hour precipitation event. GE estimated stormwater flows using the rational method (Q = CiA, where C is the runoff coefficient, i is the rainfall intensity, and A is the drainage area), and added these stormwater flows to the estimated dry weather flows to calculate the total wet weather flows in the drainage system for each event. GE estimated that the total wet weather flow for the first 30 minutes would be 3,757 gallons per minute (gpm) or 112,699 gallons for a minor event, 6,562 gpm or 196,858 gallons for an average event, and 80,201 gpm or 2,406,031 gallons for a major event.

Existing treatment capacity

In its comments on the Draft Permit in Technical Exhibit 17, GE estimates the rate of dry weather flow to the vaults at 250 gpm (360,000 gallons per day). The design flow of the existing CDTS system is 300 gpm. Therefore, the existing CDTS has an additional 50 gpm to treat wet weather flows in addition to the existing dry weather flow. Yet, the total wet weather flow for a minor event exceeds 3,700 gpm. As a result, GE concludes that the current capacity of the CDTS is insufficient to manage the volume of combined stormwater/wastewater produced by the first 30 minutes of stormwater flows for any of the evaluated storm events. Based on this information provided by GE, EPA concurs with the company's conclusion.

Existing storage capacity

While the current treatment capacity of the CDTS cannot accommodate the full volume of combined stormwater and dry weather flow during the first 30 minutes of precipitation, GE could potentially store wet weather flows prior to pumping them to the CDTS for treatment. First, GE evaluated the possibility of storing wet weather flow at each vault and then pumping this flow to the CDTS. In Technical Exhibit 17, GE estimated that the footprint for storage of the wet weather flow generated during the first 30 minutes of a storm at each of the vaults would range from 26-547 ft^2 for a minor precipitation event, to 566-11,612 ft^2 for a major event (assuming a ten-foot retention basin depth). According to GE, there is "very little space at each of the vaults to construct the required storage necessary to capture the volume of the major event, [and] therefore storage at the individual drainage system vaults is not feasible" (Technical Exhibit 17, p. 5). After considering this information, EPA is persuaded that adequate space is not available to construct storage facilities at the vaults for the volume of precipitation associated with a major storm event.

GE also evaluated the potential to store wet weather flow in the CDTS equalization tanks prior to treatment. The equalization tanks currently in place at the CDTS could store a certain amount of wet weather flow at a cost that would likely be substantially less than upgrading the CDTS to enable instantaneous treatment of additional wet weather flow at flow rates as high as 3,757 gpm (for a minor storm) to 80,201 gpm (for a major storm). Using the tanks in this manner would be similar to ExxonMobil's use of the 2.1 million gallon storage tank that it constructed in conjunction with its treatment system, as described above. According to GE, to use the two equalization tanks in this manner, they would need to be drained relatively quickly so as to accommodate the possibility of multiple wet weather events occurring in quick succession. Otherwise, GE would not be prepared to accommodate the first flush of a later storm event. This affects the capacity needed for both storage tanks and treatment equipment.

The design flow of the existing CDTS system is 300 gpm, and the CDTS is currently treating an estimated maximum average of up to 250 gpm of dry weather flow. GE estimates that if both equalization tanks were full and dry weather flow continued to enter the tanks at an average rate of 250 gpm, then it would take almost 13 days to completely empty the tanks at the hydraulic design capacity of the CDTS, notwithstanding additional rainfall (Technical Exhibit 17, p. 2). EPA agrees that the 926,000 gallon capacity of the existing equalization tanks would be inadequate if GE was required to store and treat the first 30 minutes of flow from a major (1-year, 1-hour) storm (estimated at about 2.4 million gallons). On the other hand, the first 30 minutes of an average storm (about 197,000 gallons) or a minor storm (about 113,000 gallons) generate much less precipitation. Assuming that the CDTS operates at design capacity (300 gpm) and dry weather flow continues to enter the tanks at 250 gm, the existing system would potentially be able to drain the tanks of the flow from the first 30 minutes of a minor event in about 1.6 days and from the first 30 minutes of an average event in about 2.7 days. These storm events would require from about 12% (for a minor event) to 21% (for a major event) of the total storage capacity of the tanks, which could potentially leave sufficient storage for additional rainfall.

Existing pump and conveyance system capacity

According to GE (NPDES Permit Renewal Application Revision May 2000), the transfer pumps:

> … are designed to handle dry weather flow and a portion of "first flush" wet weather flow only. Two pumps have been installed in each vault. One pump is designed to handle the entire dry weather flow in the drain system. The second pump is designed to handle flow fluctuations of up to 125 percent (particularly, the "first flush"). Design maximum pumping capacity for each vault range from 65 to 90 gallons per minute.

In its comments on the Draft Permit, GE states that the existing system was not designed to handle wet weather flow and that to provide that capability, "improvements (i.e., capacity increases) will be needed to the submersible transfer pumps in each vault, the pump discharge headers, and the combined header."

Table 2 provides estimates of the dry weather flow, wet weather flow (based on the first 30 minutes of a 10-year, 24-hour storm), and the existing transfer pumping capacity at each drainage system outfall. It is clear that while the existing pumping capacity is capable of keeping up with dry weather inflows, it is quickly overwhelmed during the first 30 minutes of even a minor precipitation event. EPA cannot see how the existing pumps can handle flow fluctuations of up to 125 percent. Because the combined stormwater and dry weather inflow quickly exceeds the pumping capacity in each outfall, the tide gates are triggered to open within 5 to 18 minutes of the beginning of a storm event. EPA concludes that the existing transfer pumps at the drainage system outfalls are not adequate to convey the first 30 minutes of wet weather to the CDTS for treatment.

Table 2. GE's estimated dry weather and minor wet weather event flow rates, existing transfer pump capacity, and approximate time to tide gate triggered during a minor precipitation event at each drainage system outfall.

Outfall	Estimated Dry Weather Flow (gpm)	Wet Weather Flow for "Minor" Event (gpm)	CDTS Transfer Pump Rate (gpm)	Minutes to Tide Gate Open
001	4	66	50	15.84
007	48	768	50	4.25
010	28	437	100	6.51
019	9	147	50	17.81
027	99	1365	100	1.98
028	28	447	50	5.79
030	17	275	100	7.55
031	16	251	140	15.59

Improving Existing Technology

Based on the analysis of the existing system provided by GE in its comments on the Draft Permit, the existing pumping capacity from the vaults to the CDTS is substantially undersized to handle wet weather flows for even minor precipitation events (see Table 2, above). EPA is also persuaded that storage capacity in the equalization tanks at the CDTS and the individual drainage vaults would be inadequate to store the first 30 minutes of a major precipitation event (defined by GE based on a 1-year, 1-hour storm). Therefore, the existing drainage system cannot be used to treat the first 30 minutes of wet weather without significant improvements in technology.

According to GE, retrofitting the existing system to improve pump, conveyance, storage, and treatment capacity to treat the inflow of stormwater during the first 30 minutes of a major storm (1-day, 1-hour event) would pose tremendous logistical challenges at the site (as discussed farther above). It is not clear that these challenges could be overcome. Furthermore, attempting to do so would entail very large costs. In order to transfer the additional flow from the first 30 minutes of wet weather during a major storm to the CDTS (Outfall 027A), GE would need to upgrade both the pumps at the individual drainage system outfall vaults and the network of piping for conveying wastewater from the vaults to the CDTS. GE would also need to upgrade the existing DAF unit at the CDTS and/or install an additional DAF unit and add approximately 500,000 gallons in additional storage volume as well an additional 9,150 gpm of treatment capacity to the existing CDTS. The building to house the additional treatment would require a footprint of approximately 12,000 square feet (approximately twice as large as the existing building). GE estimates that improvements to treat the first 30 minutes of wet weather from a major storm would result in capital costs of $37.9 million, which is more than 12 times the initial installation costs for the CDTS system in 1999. Annual operational costs would be $800,000 in addition to the current operation costs of $360,000 per year. In light of these difficulties and uncertainties, EPA concludes that treating the first flush of wet weather as defined in the Draft Permit, which includes the first 30 minutes of a *major* precipitation event as defined by GE in Technical Exhibit 17, may not be feasible and is not the BAT at this time.

EPA also considered whether constructing new storage at the vaults to accommodate the first 30 minutes of a smaller storm event (a minor or average storm) would be feasible, and whether the existing equalization tanks could accommodate the first 30 minutes of flow from a smaller storm event if the tanks are assumed to be empty. EPA's evaluation focused first on a minor storm event (defined by GE as a 10-year, 24-hour storm). Other facilities operate wastewater conveyance and treatment systems to address wastewater combining contaminated groundwater, stormwater and process wastewater up to a specific storm size. For example, as discussed above, to comply with its new NPDES Permit (NPDES Permit No. 0000833), the ExxonMobil facility designed its system to provide a continuously operated advanced treatment system and a flow equalization tank to store wet weather flow from storms up to and including a 10-year, 24-hour storm. The Conoco Phillips (NPDES Permit No. MA0004006) facility also collects and provides a similar level of treatment for wastewaters including contaminated groundwater and stormwater.

From an engineering perspective, it appears likely to be feasible for GE to upgrade its existing technology to provide storage and treatment of the first 30 minutes of a minor storm event. For a storm event of this magnitude, needed improvements to the existing system would be more limited and less costly than the improvements to handle a major storm. GE proposes that storing and treating the first 30 minutes of a minor event would necessitate "substantial" maintenance or upgrade for the existing CDTS, including the addition of a second 300 gpm treatment process as well as additional DAF (or alternative process) capacity to reduce turbidity and protect the GAC units. GE estimates that the building to house the additional treatment would require a footprint of 6,000 square feet, which is similar in size to the current structure and would, therefore, double the treatment facility's footprint. Furthermore, the capacity of the drainage system vault pumps, conveyance piping and transfer headers would need to be increased. GE estimated capital costs for these improvements at $5.7 million, with annual operational costs of $530,000. Thus, while it is likely feasible to improve the existing drainage and treatment system to accommodate the first 30 minutes of wet weather from a minor storm, the cost of the necessary improvements would not be insignificant. Moreover, the logistical challenges of upgrading the various aspects of the existing drainage system would not be insignificant. As discussed above, undertaking significant construction activity on the GE site is not a simple matter.

Finally, as an alternative to focusing on treating additional wet weather flows in the CDTS, EPA also considered refining the BMPs proposed in the Draft Permit to further reduce the volume of dry weather flows that would be discharged with the first flush of stormwater. In other words, rather than requiring increased conveyance, storage and treatment to handle greater flow, this option seeks to reduce the amount of flow requiring treatment. Specifically, Part I.B.10.b.iii of the Draft Permit proposes that GE "manually operate the transfer pumps in all eight vaults during the days leading up to a significant storm event to reduce the dry weather flows to a low level in the vaults and, as a result, to help eliminate, to the maximum extent practicable, the amount of non-allowable non-stormwater flows that are commingled with stormwater flows in the Drainage System vaults and discharged to the Saugus River from the Drainage System Outfalls." Minimizing dry weather volume in the vault prior to storm events likely to trigger the tide gates would not require any process changes or improvements and would maximize the use of the existing technology to minimize the discharge of dry weather flows without new capital costs for the permittee.

For this analysis, EPA proposes that the permittee be required to pump dry weather flows to the "low alarm" elevation prior to the start of a precipitation event forecasted to generate more than

0.1-inches of precipitation (which GE submits will trigger the tide gates to open and discharge commingled dry weather flowand stormwater from the drainage system outfalls). This BMP would replace the requirement proposed in the Draft Permit to treat the first flush of stormwater. Table 3 compares the total volume of dry weather flow (in gallons) that could be present in the vaults at the start of a storm event under worst-case ("pump on elevation") and average conditions with the volume that would be present if the permittee were to pump the vaults to the low alarm elevation prior to the start of precipitation. Under the worst-case scenario (dry weather flow up to "pump on" elevation), dry weather flow comprises from 45% to almost 66%, depending on which of the drainage vaults is at issue, of the total volume of commingled wastewater and stormwater that would be released to the Saugus River. If the volume of dry weather flow is maintained at the low alarm elevation prior to a storm event, dry weather flow would comprise only from 5% to 35% (depending on the outfall) of the total volume of commingled wastewater and stormwater released to the Saugus River. In other words, at little to no cost to the permittee, pumping to the low alarm level could reduce the direct discharge of dry weather flow by 12,859 gallons (57%) compared to the worst-case condition, and by 9,981 gallons (51%) as compared to average conditions.

Table 3. Gallons of wastewater in the drainage system vaults when the tide gate opens, at the pump on elevation, at the average operating volume (halfway between pump on and pump off elevations), at the low alarm elevation, and generated during the first 30 minutes of a 10-year, 24-hour storm event. Volumes calculated based on elevations provided in the figures submitted with the November 2013 correspondence between GE and EPA.

Outfall	Tide Gate Volume (gal)	"Pump On" Volume (gal)	Average Operating Volume (gal)	Low Alarm Elevation Volume (gal)	Percent DWF Released at Pump On Elevation	Percent DWF Released at Low Alarm Elevation
001	1,823	844	778	573	46.3%	31.4%
007	6,800	3,821	3,538	2,350	56.2%	34.6%
010	5,319	2,836	2,476	1,323	53.3%	24.9%
019	5,035	2,940	2,416	253	58.4%	5.0%
027	6,164	4,035	3,464	2,134	65.5%	34.6%
028	4,228	1,904	1,639	709	45.0%	16.8%
030	4,229	2,433	2,153	1,289	57.5%	30.5%
031	7,110	3,726	3,197	1,050	52.4%	14.8%
Total	40,707	22,539	19,661	9,680		

Requiring the permittee to minimize the direct discharge of dry weather flow commingled with stormwater, rather than treating the stormwater in the CDTS, would be feasible and would likely substantially reduce the potential volume of dry weather flow released when the tide gates open. Although GE did not evaluate the cost of this BMP to the facility, EPA assumes it could be achieved at little to no expense to the permittee since compliance would require no new or improved equipment. While GE could shoulder certain operating expenses while complying with such a BMP, GE has reported that its standard operating procedures already involve steps similar to those laid out for this BMP (*see* footnote 10 below). Therefore, any marginal increase in operating expense associated with complying with this BMP would not be expected to be significant.

5.4.3 Process Employed & Process Changes

In developing the conditions for GE's permit, EPA must take into account the manner in which the drainage system, its associated outfalls, and the CDTS operate. This includes consideration of the ways that stormwater and dry weather flow, including contaminated groundwater, enter the drainage system, as well as the ways that these flows are currently managed and treated.

The Draft Permit called for drainage system flows from the first 30 minutes of a wet weather event – which would include dry weather flow already in the system commingled with stormwater – to be conveyed to the CDTS for treatment, rather than being discharged directly from the drainage system outfalls to the Saugus River. To meet such a requirement, the existing system would need to be modified to increase the pump, conveyance, storage, and treatment capacity. Such improvements would increase the capacity of the existing system, and would result in certain flows being treated in the CDTS instead of being discharged without treatment, but these changes would not fundamentally alter the existing process of treating drainage system flows at GE. (Similarly, a BMP to minimize the discharge of dry weather flow released when the tide gates open also would not result in process changes at GE.)

5.4.4 Non-water Quality Environmental Impacts (including energy requirements)

EPA considered the non-water quality environmental impacts (*e.g.*, air emissions) and energy requirements (*e.g.*, energy consumption) associated with the options under consideration and has determined that such non-water quality environmental impacts and energy requirements would likely be negligible. No significant non-water quality environmental effects or energy requirements will arise due to addressing the outfall gates or any pumping, storage or treatment capacity increases needed to manage and treat wet weather flows. Although energy requirements would increase if additional pumping and DAF capacity is added, any such increases are not expected to be particularly significant. A BMP to minimize dry weather flow commingled with stormwater during wet weather would be unlikely to have any significant non-water quality environmental impacts or energy effects.

5.4.5 Cost Considerations

As discussed above, EPA considers the cost of technological alternatives when determining the BAT and associated NPDES permit requirements. Where the BAT standard applies, CWA §§ 301(b)(2) and 304(b)(2) require "EPA to set discharge limits that reflect the amount of pollutant that would be discharged by a point source employing the best available technology that the EPA determines to be economically feasible ...." *Texas Oil*, 161 F.3d at 928. To be an "available" technology, the option in question must be "economically achievable." *See Chemical Manufacturers*, 870 F.2d at 250 (*citing* 33 U.S.C. § 1311(b)(2)(A)). The United States Supreme Court has interpreted the CWA to mean that the BAT should "represent 'a commitment of the maximum resources economically possible to the ultimate goal of eliminating all polluting discharges." *Nat'l Crushed Stone*, 449 U.S. at 74.

Neither the CWA nor EPA regulations dictate precisely how the Agency should go about considering costs in its technology standards determinations, but the courts have made clear that only a reasonable consideration of cost is necessary and precise cost estimates are not required. *See BP Exploration*, 66 F.3d at 803; *NRDC v. EPA*, 863 F.2d 1420, 1426 (9th Cir. 1988) (EPA need "develop no more than a rough idea of the costs the industry would incur"). Moreover, the BAT standard does not call for consideration of a comparison of costs to benefits. *See, e.g., Crushed Stone*, 449 U.S. at 74; *Texas Oil*, 161 F.3d at 936.

As part of its comments on the Draft Permit, GE estimated $38 million in capital costs to comply with a requirement to treat drainage system flow from the first 30 minutes of a major storm event (a 1-year, 1-hour storm). In the discussion above, EPA concluded that treating the first 30 minutes of *major* storm events is not the BAT for GE at this time. GE states that the improvements necessary to treat the first 30 minutes of wet weather flow from a *minor* (10-year, 24-hour) storm event would include maintenance and upgrades for the existing DAF unit and would have capital costs of $5.7 million. EPA has discussed the necessary upgrades above. GE estimates the operational costs of providing such additional treatment capacity would include the cost of power to run associated equipment, additional DAF chemicals to treat additional flow, more frequent GAC media replacement, and increased regular maintenance, parts replacement and staffing. GE estimates that operational costs to treat the first 30 minutes of a minor storm would be about $530,000 per year.

In contrast, implementing a BMP to minimize the amount of dry weather flow in the drainage system vaults prior to the start of a storm event would not require GE to upgrade any existing equipment. Such a BMP, therefore, would have no capital costs. Furthermore, any additional operational costs are expected to be minimal. In its comments on the Draft Permit, GE did not question the feasibility of using the existing technology to pump the vaults to the lowest elevation possible prior to a forecasted storm. Indeed, according to GE, this BMP is consistent with the standard operating protocol for the CDTS Operator.[8] EPA sees no reason why this BMP would not be feasible using existing technology.

The estimated $5.7 million to upgrade the existing system to treat the first 30 minutes of a minor storm would treat both dry weather flow and stormwater at the CDTS. Requiring the permittee to treat the first 30 minutes of a minor (10-year, 24-hour) storm would likely result in the transfer of about 27,161 gallons of dry weather flow to the CDTS for treatment, in addition to about 112,699 gallons of stormwater.[9] Compared to the current permit, this option would decrease the volume of dry weather flow released by a relatively limited amount (about 27,000 gallons) at a substantial cost to the permittee. The majority of flow that would be transferred during the first

[8] In its July 10, 2009 Response to Request for Information, GE states "Actually, the standard operating protocol calls for the CDTS Operator to manually run the transfer pumps in all eight vaults during the days leading up to a significant storm event. The operator typically reduces the level of DWF to the "low-low" elevations in these cases. This reduces the mean elevation of the vaults to an even lower elevation" (p. 16).

[9] The total volume of 27,161 gallons is the sum of 7,500 gallons (based on GE's estimate of 250 gpm of dry weather flow in Technical Exhibit 17) and 19,661 gallons (the total volume of dry weather flow in all drainage vaults at the "average operating level" halfway between the pump on and pump off elevations according to the detailed figures of each outfall prepared by AECOM and submitted in November 2013).

30 minutes would be stormwater, which is unlikely to include the toxic constituents that EPA is concerned about in the dry weather flow (*e.g.*, benzene, PAHs, VOCs). As demonstrated farther above, the BMP to pump down the vaults to the low alarm elevation prior to the storm would likely transfer about 10,000 gallons of dry weather flow to the CDTS for treatment prior to a storm, thus avoiding the release directly to the Saugus River at potentially little or no cost.[10] Stated differently, the BMP option would still allow the release of about 17,180 gallons of untreated dry weather flow directly to the Saugus River during the first 30 minutes of wet weather.[11]

Thus, the option of upgrading the existing system to treat the first 30 minutes of wet weather in the CDTS would treat roughly an additional 17,000 gallons of dry weather flow at a capital cost of $5.7 million (or about $335 per additional gallon, not including O&M costs). Under the facts of this case, EPA regards the two options to achieve roughly comparable results, while the BMP option is more cost-effective. Under both options, any additional dry weather flow generated after the first 30 minutes would discharge directly to the Saugus River while the tide gates are opened.

5.4.6 Conclusion

Considering all the BAT factors on a case-by-case, BPJ basis, EPA concludes that BMP measures discussed above constitute the BAT for controlling the discharge of toxic and nonconventional pollutants from GE's drainage system during wet weather. Through this BMP, EPA anticipates that the majority of dry weather flows will be transferred to the CDTS for treatment or storage and treatment. Although this option will result in somewhat less dry weather flow being treated at the CDTS than the option involving transfer to the CDTS of the first flush from a minor storm, the BMP option is more cost-effective. In addition, it will avoid the logistical difficulties of upgrading the drainage system pumps, conveyance system and treatment facilities. Although EPA regards such upgrades to be feasible, the Agency factored their difficulty into its overall BAT determination.

Thus, the Final Permit requires the permittee to continue to collect, convey, and treat dry weather flows at the CDTS, and to minimize the discharge of dry weather flows during wet weather by pumping down the level of wastewater in the drainage vaults to the "low alarm" elevation prior to the start of a precipitation event forecasted to generate more than 0.1 inches of precipitation. The National Weather Service's Precipitation Forecast for the Boston area should be used to determine when to operate the vaults at the "low alarm" level. Two sources of this precipitation forecast are http://graphical.weather.gov/sectors/box.php and http://www.hpc.ncep.noaa.gov/qpf/qpf_12hr.shtml. Discharges from the drainage system

[10] EPA recognizes that GE has indicated that it already takes steps much like the proposed BMP so that one could argue that the BMP does not make an improvement over the existing case. Yet, EPA regards a permit requirement to implement the BMP to be an improvement over current conditions because the existing permit contains no such requirement. Thus, under the existing permit, GE has no obligation to take these steps. Moreover, it is not entirely clear to EPA that GE consistently takes the precise steps that would be spelled out in a BMP permit requirement.

[11] Estimated volume based on the "low alarm" elevation in the detailed figures of each outfall prepared by AECOM and submitted in November 2013.

vaults will be authorized during wet weather, but monitoring requirements timed to capture the first flush will enable EPA to determine whether the limited discharges of dry weather flow commingled with stormwater meet water quality standards. EPA expects that they will. Effluent limits will apply for discharges from the CDTS (Outfall 027A) and the BMP steps will control wet weather discharges of toxic pollutants from GE's drainage system outfalls (Outfalls 001, 007, 010, 019, 027B, 028, 030, and 031).[12] The Final Permit sets BAT limits at Outfall 027A (the CDTS) for discharges of BTEX (daily maximum), benzene (daily maximum), TPH (daily maximum), and PAH Groups I and II (daily maximum). Discharges from the drainage system outfalls during wet weather will be authorized subject to compliance with the applicable BMPs and, as discussed in more detail below, BCT-based effluent limits on pH, O&G and TSS, as well as various monitoring requirements.

6. Determining Effluent Limitations for Conventional Pollutants

As explained earlier in this document, NPDES permit effluent limits must, at a minimum, satisfy applicable federal technology-based standards. *See* 33 U.S.C. § 1311(b); 40 C.F.R. §§ 122.43(a), 122.43(a) and (b); 125.3(a). They must also satisfy any more stringent requirements that may apply based on state water quality standards. *See* 33 U.S.C. § 1311(b)(1)(C); 40 C.F.R. §§ 122.4(d) and 122.44(d). Finally, Section 402(o) of the CWA, 33 U.S.C. § 1342(o), and 40 C.F.R. § 122.44(l)(1) and (2) preclude a facility's NPDES permit from including effluent limits less stringent than the corresponding limits in the prior permit, unless certain exceptions apply. This is referred to as the CWA's anti-backsliding requirement.

The BPT standard sets the floor for technology-based effluent limits for conventional pollutants (pH, TSS, and oil and grease). Effluent limitations based on BCT may not be less stringent than the limitations based on BPT.

While the starting point for setting BAT limits is "performance of the single best-performing plant [in terms of pollutant removals] in an industrial field," *Chemical Manufacturers*, 870 F.2d at 226, BPT is generally based on "the average of the best performing facilities" in the same industrial category or subcategory. As discussed in more detail farther above, the factors considered by EPA for BCT and BPT are largely the same as the factors for BAT, but with a few important differences. In setting both BAT and BPT standards, EPA considers the age of the equipment and facilities involved, the process employed, the engineering aspects of the application of various control techniques, process changes, non-water quality environmental impacts (including energy requirements), and other factors the Agency deems appropriate. When setting BAT standards, however, EPA considers "the cost of achieving such effluent

[12] The CWA authorizes EPA to set BMPs and non-numeric effluent limitations to meet technology-based requirements such as the BAT, BCT and BPT standards. *See* 33 U.S.C. § 1362(11) (definition of "effluent limitation"); 40 C.F.R. § 122.44(k). *See also Waterkeeper Alliance, Inc. v. U.S. EPA,* 399 F.3d 486, 496–97, 502 (2d Cir. 2005) (EPA use of non-numerical effluent limitations in the form of best management practices are effluent limitations under the CWA); *Natural Res. Def. Council, Inc. v. EPA*, 673 F.2d 400, 403 (D.C. Cir. 1982) (''section 502(11) [of the CWA] defines 'effluent limitation' as 'any restriction' on the amounts of pollutants discharged, not just a numerical restriction.'').

reduction," while it considers "the total cost of application of technology in relation to effluent reduction benefits to be achieved from such application" when setting BPT requirements. In evaluating the appropriateness of the relationship between cost and effluent reduction benefits for the BPT standard, EPA applies a "wholly disproportionate" test.

At the same time, BCT limits more stringent than BPT limits may be set only if they satisfy a two-part cost-reasonableness test: (1) the "POTW cost-comparison test" comparing BCT to EPA's calculation of the cost of upgrading a POTW from secondary to advanced secondary treatment, and (2) the "industry cost-effectiveness test" comparing BCT to EPA's calculation of the cost per pound to upgrade a POTW from secondary treatment to advanced secondary treatment divided by the cost per pound to upgrade from no control to secondary treatment. See 51 Fed. Reg. 24,974, 24,976 (July 9, 1986). *See also BP Exploration*, 66 F.3d at 790.

6.1 Effluent Limitations for Dry Weather Discharges of Conventional Pollutants from Outfall 027A (CDTS)

In setting effluent limitations for conventional pollutants for treated dry weather flows from the CDTS based on the BPT and BCT standards, EPA looked to a number of sources to determine the average of the best performing facilities – in terms of their control of conventional pollutants – that deal with the same type of wastewater as GE. As discussed earlier in this document, EPA determined that the BAT for the treatment of dry weather flows from the drainage system, including contaminated groundwater, is the existing CDTS. The CDTS includes liquid phase carbon adsorption preceded by oil water separation and filtration, which is also employed by, among others, Exxon Mobil and is considered to be among the best performing technologies available for the treatment of petroleum-related contamination. Therefore, similar to the technology-based limitations for toxic pollutants under BAT, technology-based effluent limitations for conventional pollutants for dry weather flows are based on the use of GE's existing carbon adsorption and oil/water separation technology.

As explained in the Draft Permit Fact Sheet, *see, e.g.,* pp. 33-34, EPA also looked to the Steam Electric Power Generating Point Source Category (Steam Electric NELGs), *see* 40 C.F.R. Part 423, as a relevant source of information for the Agency's BPJ analysis, while recognizing that these NELGs do not strictly apply to the GE facility. EPA considers the Steam Electric NELGs to be an appropriate source of information in this case because, like GE, steam electric generating facilities store fuel oil on their premises. In developing effluent limits for the Steam Electric Source Category, EPA identified potential pollutants from drainage associated with equipment containing fuel oil and/or from leakage associated with the storage of oil (USEPA, 1982). EPA then considered the level of treatment that could be technologically achieved for those pollutants using an oil/water separator and set corresponding limits in the guidelines (*See* 40 C.F.R. Part 423, "low volume waste sources"). Given the similarities between the storage of jet fuel at GE and the storage of fuel oil at steam electric facilities, and given the use of an oil water separator as the primary technology for treating the conventional pollutants Oil & Grease (O&G), EPA looked to the established effluent limitations for steam electric facilities to inform the technology-based effluent limits at GE.

6.1.1 pH

In developing effluent limits for the pH of discharges from GE's drainage system, EPA reviewed the RGP, as well as NPDES permits issued to ExxonMobil Final Permit (as modified) (NPDES Permit No. MA0000833) and Conoco Phillips (NPDES Permit No. MA000406), Global Petroleum (NPDES Permit No. MA0003425), and Distrigas (NPDES Permit No. MA0020010). All of these permits set pH limits of 6.5 to 8.5 SU for discharges to Massachusetts Class SB waters based on the state water quality standard. The Massachusetts Water Quality Standards for Class SB waters at 4.05(4)(b)(3) state that the pH:

> … shall be in the range of 6.5 through 8.5 standard units and not more than 0.2 units outside of the natural background range. There shall be no change from natural background conditions that would impair any use assigned to this Class.

The Steam Electric NELGs set BPT limits of 6.0-9.0 SU for pH of all facility discharges, except once-through cooling water. Thus, the pH range in the state's water quality standards is more stringent than the technology-based values. Therefore, in the Final Permit for GE, EPA includes a pH range of 6.5 to 8.5 SU based on the Massachusetts water quality standard for Class SB waters. This limit is also consistent with antibacksliding requirements, as discussed in the Fact Sheet for the Draft Permit, *see* p. 51, and presented in Table 3 below.

6.1.2 Oil and Grease (O&G)

In EPA's experience, in most cases involving commingled contaminated groundwater, stormwater and process water discharged from an industrial site, O&G will be one of the pollutants at issue. Limiting O&G is often a relatively straightforward matter of using well-established oil/water separator technology. Of course, O&G removal could be more difficult on a site-specific basis depending on the nature and extent of the contamination at hand.

Again, EPA looked to the Steam Electric NELGs, which set BPT limits of 20 mg/L (daily maximum) and 15 mg/L (30-day average) for O&G in low volume wastes. *See* 40 C.F.R. § 423.12(b)(3). *See also* GE Draft Permit Fact Sheet, p. 36. EPA also again considered ExxonMobil's Permit (as modified) (NPDES Permit No. MA0000833), which sets daily maximum technology-based limits for O&G of either 15 mg/L or 5 mg/L, depending on the waste stream, treatment technology and outfall involved. In connection with ExxonMobil's permit, EPA explained that no O&G constituents were expected in the discharge except for petroleum hydrocarbons, while noting that a maximum daily value of 15 mg/l would be a typical effluent limit for storm water at a petroleum bulk storage facility and would reflect the capabilities of an oil/water separator to remove product in the event of an equipment leak or a spill of petroleum (ExxonMobil Permit, EPA Responses to Comments, p. 13).

EPA also considered the permit for Conoco Phillips (NPDES Permit No. MA000406), which includes a daily maximum O&G limit of 15 mg/L. Performance data from terminals in Massachusetts and Maine support that this effluent limit can be achieved through the proper operation of a correctly-sized oil/water separator and implementation of best management practices. EPA made a BPJ determination based upon the technology-based and performance information to carry forward the average monthly O&G limit of 10 mg/L from the previous permit consistent with antibacksliding regulations. The Fact Sheet further proposes that a maximum daily effluent limit for O&G of 15 mg/L should ensure that the discharge from the facility will meet the narrative water quality standard that discharges are free from oil, grease, and petrochemicals that might produce a visible film on the surface of the water.

Thus, for facilities dealing with the general type of wastewater present at GE, EPA regards the average of the best performing facilities for O&G control to be approximately 15 mg/L (30-day average) based on the use of oil water separator technology. Meeting this level is generally straightforward when using this technology and GE has typically been able to do so in this manner. *See* GE Draft Permit Fact Sheet, pp. 6, 8, 11, 36. Furthermore, GE removes O&G at the CDTS in the phase separation step that occurs in the storage/equalization tanks, as well as in the DAF and carbon adsorption phases of the treatment process. *See id.* at pp. 48-49. Using these technologies, GE has been able to meet a daily maximum of 15 mg/L, as well as a 30-day average of 10 mg/L, at the CDTS. *See id.* at pp. 36, 51.

The Final Permit retains the existing limits of 10 mg/L (monthly average) and 15 mg/L (daily maximum) for O&G discharges from the CDTS based on technology and water quality standards and consistent with antibacksliding, as discussed in the Fact Sheet for the Draft Permit, *see* p. 51, and presented in Table 4 below.

6.1.3 Total Suspended Solids (TSS)

Total suspended solids (TSS) is one of the pollutants addressed in most cases involving discharges of commingled contaminated groundwater, stormwater and process water being discharged from an industrial site. Initial TSS concentrations will be determined by the nature of the wastewater at the site. If necessary, TSS concentrations may be limited by using one or another well-established solids removal technology. Such technologies include applying chemicals (*e.g.*, polymers or flocculants) to promote or facilitate solids removal in some type of sedimentation basin, and using of some type of filtration, dissolved air flotation, or other solids removal technology. *See, e.g.,* GE Draft Permit Fact Sheet, p. 37. Of course, TSS removal could be more difficult on a site-specific basis depending on the precise nature and extent of the contamination in the wastewater at issue.

In developing effluent limits for the Steam Electric Source Category, EPA identified TSS as a potential pollutant due to the drainage associated with equipment containing fuel oil and/or the leakage associated with the storage of oil (USEPA, 1982). EPA then considered the level of treatment that could be achieved for TSS using an oil water separator and set corresponding limits in the guidelines (See 40 CFR Part 423 "low volume waste sources"). Given the similarities between the technology for removal of petroleum contamination at GE and at steam electric facilities, EPA used the same TSS limits established for steam electric facilities (BPT limits of 100 mg/L (daily maximum) and 30 mg/L (30-day average)) for GE in the Draft Permit. See GE Draft Permit Fact Sheet, p. 37. EPA also considered the RGP, and a number of different general permits and NELGs that were considered in development of the RGP, all of which support a technology standard of 30 mg/L (30-day average) for TSS. *Id.* EPA also looked to the NPDES permit issued to Conoco Phillips (NPDES Permit No. MA000406), which also sets BPJ, technology-based limits of 100 mg/L (daily maximum) and 30 mg/L (30-day average) for TSS based on consideration of the Steam Electric NELGs.

Thus, EPA regards the average of the best performing facilities' TSS control to be approximately 100 mg/L (daily maximum) and 30 mg/L (30-day average) based on the GE's use of an oil water separator prior to transferring dry weather flows to the CDTS. As indicated in the Fact Sheet for the Draft Permit, *see* pp. 51-52, and in Table 3 below, the Final Permit sets technology-based effluent limits of 30 mg/L (monthly average) and 100 mg/L (daily maximum) for TSS discharges from the CDTS.

6.2 Effluent Limitations for Conventional Pollutants in Wet Weather Flows Discharged from the Drainage System Outfalls

In this section, EPA addresses effluent limitations for conventional pollutants in wet weather discharges from the drainage system outfalls (001, 007, 010, 019, 027B, 028, 030, and 031). As discussed earlier in this document, EPA's General Permit for Storm Water Discharge Associated with Industrial Activity specifies that the minimum BAT/BCT requirement for storm water discharges associated with industrial activity is a Storm Water Pollution Prevention Plan (SWPPP) [57 Fed. Reg. 44438]. The Draft Permit included a number of BMPs to address the potential for discharge of commingled stormwater and dry weather flows during storm events. In addition, the Draft Permit proposed prohibiting the discharge of the "first flush" of wet weather flows (defined as the first 30 minutes of stormwater flow) and called for this flow to be transferred to the CDTS for treatment. EPA has addressed GE's concerns regarding the feasibility of the BMPs and treating the "first flush" of wet weather earlier in this document and in EPA's responses to GE's comments. After reviewing the comments and supporting information and following additional analysis, EPA has concluded that the BAT to minimize the discharge of dry weather flow during wet weather is a BMP requiring GE to pump down the drainage vaults to the "low alarm" elevation prior to the start of a precipitation event forecasted to generate more than 0.1 inches of precipitation. This BMP is included as part of the SWPPP consistent with the BAT/BCT requirements for stormwater discharges.

In setting effluent limitations for wet weather flows from the drainage system outfalls, EPA considered the current permit limits, water quality standards, and BPT and BCT standards based on a number of sources to determine the average of the best performing facilities – in terms of their control of conventional pollutants – that deal with the wet weather flows. As explained above, this is the starting point for setting BPT limits, which, in turn, set the floor for BCT limits.

At GE, each drainage system outfall vault is equipped with an oil water separator that continually skims wastewater in the vault when the tide gate is closed and the volume of wastewater is below the elevation that would trigger the pumps to transfer flows to the CDTS. However, under the Final Permit, GE would pump the level of wastewater in the vault to the "low alarm" level in order to minimize the volume of dry weather flow in the vault prior to the start of a forecasted storm. The "low alarm" level is below the minimum level needed for the skimmers to transfer water to the oil water separator. Moreover, once the tide gate is tripped, the oil water separator at the vaults is bypassed. Therefore, any technology-based limits at the drainage system outfalls for wet weather conditions must be based on BMPs to control stormwater and minimize dry weather flows, rather than on the use of an oil water separator.

6.2.1 pH

EPA reviewed the Final RGP, which sets pH limits of 6.5 to 8.5 SU for discharges to Massachusetts Class SB waters based on a state certification requirement. Final RGP, p. 14. *See also* Proposed RGP, Fact Sheet, p. 52. In addition, EPA considered NPDES permits issued to ExxonMobil Final Permit (as modified) (NPDES Permit No. MA0000833), Conoco Phillips (NPDES Permit No. MA000406), Global Petroleum (NPDES Permit No. MA0003425), and Distrigas (NPDES Permit No. MA0020010), all of which have water quality-based pH limits of 6.5 to 8.5 SU. As indicated in the Fact Sheet for the Draft Permit, *see* pp. 35-36, and in Table 4, below, the Final Permit sets a limit of 6.5-8.5 SU for the pH of discharges from the drainage system outfalls based on anti-backsliding and water quality requirements.

6.2.2 O&G

The current permit requires a monthly average O&G limit of 10 mg/L for drainage system outfalls based on water quality standards, according to the Fact Sheet for the Current Permit. As discussed above for dry weather discharges, for facilities dealing with commingled groundwater, process water, and stormwater, EPA regards the average of the best performing facilities for O&G control to be approximately 15 mg/L (30-day average) based on the use of oil/ water separator technology. The BAT for GE does not, however, require this technology for wet weather flows at this time. Nevertheless, EPA considers that an effluent limit for O&G of 15 mg/L will ensure that the discharge from the facility will be free from oil, grease and petrochemicals that produce a visible film on the surface of the water, impart an oily taste to the water or an oily or other undesirable taste to the edible portions of aquatic life, coat the banks or bottom of the water course, or are deleterious or become toxic to aquatic life, consistent with the narrative water quality standard for Class SB waters at 4.05(4)(b)(7). In addition, BMPs being implemented by the facility, which include development of a SWPPP, ensure that there is a program in place at the facility to limit the amount of pollutants being discharged with storm water runoff. BMPs are fully enforceable permit conditions that serve to prevent pollution, rather than simply treat it.

The Final Permit sets limits of 10 mg/L (monthly average) and 15 mg/L (daily maximum) for O&G discharges from the drainage system outfalls based on water quality standards and consistent with antibacksliding. Considering the information discussed above, EPA has determined that BPT and BCT limits would not be any more stringent than the limits in the Final Permit. GE has demonstrated its ability to meet the O&G permit condition in the Current Permit.

6.2.3 TSS

As discussed above for dry weather discharges, for facilities dealing with commingled groundwater, process water, and stormwater, EPA regards the average of the best performing facilities for TSS control to be approximately 100 mg/L (daily maximum) and 30 mg/L (30-day average) based on the use of an oil water separator. The BAT for GE does not require this technology for wet weather flows at this time. However, BMPs being implemented by the facility, which includes a SWPPP, ensures that there is a program in place at the facility to limit the pollutants being discharged with storm water runoff. These BMPs include a prohibition on the discharge of drainage system cleaning water through the drainage outfalls and require proper off-site disposal of solid waste from drainage system cleaning and minimization of solids left behind in the drain lines (*see* GE Draft Permit Fact Sheet p. 37). BMPs are fully enforceable permit conditions that serve to prevent pollution, rather than simply treat it. The Final Permit includes requirements to monitor for TSS from the drainage system outfalls to ensure the effectiveness of BMPs designed to minimize the discharge of solids.

6.3 Summary

GE will be able to meet the BPT/BCT limits for controlling pH, O&G and TSS for dry weather flows using the existing CDTS, which EPA has determined is the BAT for controlling discharges of toxic and nonconventional pollutants from the drainage system. Further, operation of the CDTS treatment equipment would be necessary regardless of the technology-based limits for conventional pollutants. For example, solids removal is necessary to ensure proper operation of the CDTS and both pH and O&G must be controlled to meet water quality-based effluent limitations. Any additional O&M expenses associated with treating TSS at the drainage system outfalls and the CDTS (*e.g.*, using oil/water separators) to meet BPT/BCT limits for dry weather flows would be expected to be quite small. Meanwhile, the effluent reduction benefits of such removals should be significant.

Meeting effluent limits in the Final Permit will reduce loadings of O&G and TSS to the Saugus River and the Rumney Marshes ACEC and prevent discharges that could alter the natural pH of the receiving water. All of this should contribute to maintaining or improving water quality within the ACEC in light of the fact that O&G and TSS may contain toxic contaminants and can have a variety of adverse effects on aquatic organisms and habitat. GE is not expected to incur any significant costs that are attributable to compliance with the BPT/BCT limits. EPA concludes that the benefits of reducing conventional pollutant discharges to the level of the BPT/BCT standards easily warrant the costs, if any, of doing so. For the Final Permit, EPA has not set any BCT limits more stringent than the applicable BPT limit.

Table 4. Summary of Effluent Limitations for Conventional Pollutants.

Parameter	Type	Draft Permit	Final Permit	Basis
Outfall 027A: Dry Weather Flows from CDTS				
pH (s.u.)	Range	6.5-8.5	6.5-8.5	Water Quality
O&G (mg/l)	Monthly Average	10	10	Antibacksliding
	Maximum Daily	15	15	Technology
TSS (mg/l)	Monthly Average	30	30	Technology
	Maximum Daily	100	100	Technology
Drainage System Outfalls (001, 007, 010, 019, 027B, 028, 030, 031): Wet Weather Flows				
pH (s.u.)	Range	6.5-8.5	6.5-8.5	Water Quality
O&G (mg/l)	Monthly Average	10	10	Antibacksliding
	Maximum Daily	15	15	Water Quality
TSS	Monthly Average	Report	Report	
	Maximum Daily	Report	Report	