AUTHORIZATION TO DISCHARGE UNDER THE NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES)

In compliance with the provisions of the Federal Clean Water Act, as amended, (33 U.S.C. §§1251 et seq.; the "CWA"),

Granite Shore Power Schiller LLC

is authorized to discharge from the facility located at

Schiller Station
400 Gosling Road
Portsmouth, NH 03801

to receiving waters named: **Piscataqua River**
(USGS Hydrologic Basin Code 01060003)

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 sixty (60) days after the date of signature.

This permit supersedes the permit issued on September 11, 1990.

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 consists of: 19 pages in Part I, which includes effluent limitations, monitoring and reporting requirements and conditions; as well as 25 pages in Part II, which includes General Conditions and Definitions.

Signed this 6th day of April, 2018

/S/SIGNATURE ON FILE
Ken Moraff, Director
Office of Ecosystem Protection
U.S. Environmental Protection Agency
Region I - New England
Boston, Massachusetts

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 from outfall number **001: non-contact cooling water** to the Piscataqua River. Such discharges shall be limited and monitored by the permittee as specified below.

Effluent Characteristic	Discharge Limitations		Monitoring Requirements	
	Average Monthly	Maximum Daily	Frequency[5]	Sample Type
Flow (million gallons/day [MGD])	40	40	Quarterly[6]	Recorder
Total Residual Oxidant (mg/L)[1]	--	0.2[2]	Daily – when in use	Grab
Oil & Grease (mg/L)	15	20	Quarterly[6]	Grab
Temperature (°F)	Report	95[3]	Hourly – when in use	Grab
Temperature Rise (°F)	Report	25[4]	Hourly – when in use	Calculate[7]

Samples taken in compliance with the monitoring requirements specified above shall be taken at a representative point prior to discharge into the receiving water.

1 Total residual oxidant (TRO) may not be discharged for more than two hours in any one day unless the facility can demonstrate to the Regional Administrator that the unit in this particular location cannot operate at or below this level of oxidation. The term "Regional Administrator" means the Regional Administrator of Region 1 of the U.S. Environmental Protection Agency.

2 This TRO limit shall not be exceeded at any time (instantaneous maximum); not a maximum daily limit.

3 The 95°F temperature limit shall not be exceeded at any time (instantaneous maximum). At no time shall the discharge cause the receiving water to exceed a maximum temperature of 84°F at a distance of 200 feet in any direction from the point of discharge.

4 The temperature rise limitation is increased from 25°F to 30°F for a three-hour period each day during condenser maintenance.

5 The permittee shall make note on monthly Discharge Monitoring Reports (DMRs) when monitoring is performed during periods other than “dry weather.” Dry weather is defined as at least seventy-two (72) hours following a storm event that results in an actual discharge of stormwater from the outfall (“measurable storm event”). If no sampling is required for a particular parameter and monitoring period, the permittee should enter the appropriate No Data Indicator Code (NODI) in the monthly DMR.

6 This parameter shall be monitored during each calendar quarter (January-March, April-June, July-September, and October-December) and reported on the monthly DMR following the end of each calendar quarter (i.e., April, July, October, and January).

7 Temperature rise is defined as the difference between the influent (ambient) temperature and the effluent (discharge) temperature.

2. During the period beginning on the effective date and lasting through the expiration date, the permittee is authorized to discharge from outfall numbers **002 (Unit #4), 003 (Unit # 5) and 004 (Unit #6): non-contact cooling water and condenser hotwell drains**. Such discharges shall be limited and monitored by the permittee as specified below.

Effluent Characteristic	Discharge Limitations		Monitoring Requirements	
	Average Monthly	**Maximum Daily**	**Frequency[5]**	**Sample Type**
Outfall 002 Flow (MGD)	43.5	52.2	Continuous	Recorder
Outfall 003 Flow (MGD)	50.2	50.2	Continuous	Recorder
Outfall 004 Flow (MGD)	50.2	50.2	Continuous	Recorder
Total Residual Oxidants (mg/L)[1]	--	0.2[2]	Daily – when in use	Grab
Temperature (°F)	Report	95[3]	Hourly – when in use	Grab
Temperature Rise (°F)	Report	25[4]	Hourly – when in use	Calculate[6]

Samples taken in compliance with the monitoring requirements specified above shall be taken at a representative point prior to discharge into the receiving water.

[1] Total residual oxidants (TRO) may not be discharged for more than two hours in any one day from any one unit unless the facility can demonstrate to the Regional Administrator that the unit in this particular location cannot operate at or below this level of oxidation. The term "Regional Administrator" means the Regional Administrator of Region 1 of the U.S. Environmental Protection Agency.

[2] This TRO limit shall not be exceeded at any time (instantaneous maximum); not a maximum daily limit.

[3] The 95°F temperature limit shall not to be exceeded at any time (instantaneous maximum). At no time shall the discharge cause the receiving water to exceed a maximum temperature of 84°F at a distance of 200 feet in any direction from the point of discharge.

[4] The temperature rise limitation is increased from 25°F to 30°F for a three-hour period each day during condenser maintenance.

[5] If no sampling is required for a particular parameter and monitoring period, the permittee should enter the appropriate No Data Indicator Code (NODI) in the monthly Discharge Monitoring Report (DMR).

[6] Temperature rise is defined as the difference between the influent (ambient) temperature and the effluent (discharge) temperature.

3. During the period beginning on the effective date and lasting through the expiration date, the permittee is authorized to discharge from outfall number **006: emergency boiler blowdowns, boiler condensate and deaerator overflows**. The outfall consists of 6 pipes; 2 for each of Units 4, 5, and 6. Such discharges shall be limited and monitored by the permittee as specified below.

Effluent Characteristic	**Discharge Limitations**				**Monitoring Requirements**	
	Average Monthly	**Maximum Daily**	**Min**	**Max**	**Frequency[3]**	**Sample Type**
Flow[1] (Gallons)	--	Report	--	--	When in use	Estimate
pH[2] (S.U.)	--	--	6.5	8.0	When in use	Grab
Total Suspended Solids (mg/L)	30	100	--	--	When in use	Grab
Oil & Grease (mg/L)	15	20	--	--	When in use	Grab

Samples taken in compliance with the monitoring requirements specified above shall be taken at a representative point prior to discharge into the receiving water. The boiler blowdown sampling station shall be at a representative point.

[1] The discharge consists only of boiler blowdowns during an emergency condition or when a boiler experiences a severe disruption. The duration and amount of flow shall be estimated when a discharge occurs. The amount (gallons) shall be reported in the monthly DMR and the duration (hours) shall be submitted as an attachment. The flow estimate shall not include the steam portion of the discharge.

[2] The permittee shall evaluate pH control methods for the emergency blowdowns to ensure permit compliance.

[3] The permittee shall make note on monthly DMRs when monitoring is performed during periods other than "dry weather." Dry weather is defined as at least seventy-two (72) hours following a storm event that results in an actual discharge of stormwater from the outfall ("measurable storm event"). If no sampling is required for a particular parameter and monitoring period, the permittee should enter the appropriate No Data Indicator Code (NODI) in the monthly DMR.

4. During the period beginning on the effective date and lasting through the expiration date, the permittee is authorized to discharge from outfall number **011: heater condensate drips**. The effluent from 3 individual pipes combine to create the culverted outfall. Such discharges shall be limited and monitored by the permittee as specified below.

Effluent Characteristic	Discharge Limitations				Monitoring Requirements	
	Average Monthly	Maximum Daily	Min	Max	Frequency[2]	Sample Type
Flow (GPD)	Report	Report	--	--	Quarterly[3,4]	Estimate
Total Suspended Solids (mg/L)	30	100	--	--	Quarterly[3,4]	Grab
Oil & Grease (mg/L)	15	20	--	--	Quarterly[3,4]	Grab
pH[1] (S.U.)	--	--	6.5	8.0	Quarterly[3,4]	Grab

Samples taken in compliance with the monitoring requirements specified above shall be taken at a representative point prior to discharge into the receiving water. A representative sample must include the combined discharge of all discharging pipes.

[1] The pH shall not be less than 6.5 standard units (S.U.) nor greater than 8.0 S.U., unless due to naturally occurring conditions.

[2] If no sampling is required for a particular parameter and monitoring period, the permittee should enter the appropriate No Data Indicator Code (NODI) in the monthly Discharge Monitoring Report (DMR).

[3] This parameter shall be monitored during each calendar quarter (January-March, April-June, July-September, and October-December) and reported on the monthly DMR following the end of each calendar quarter (i.e., April, July, October, and January).

[4] All sampling shall be performed during dry weather. “Dry weather” is defined as at least seventy-two (72) hours following a storm event that results in an actual discharge of stormwater from the outfall (“measurable storm event”).

5. During the period beginning on the effective date and lasting through the expiration date, the permittee is authorized to discharge from outfall number **015: treated effluent from WWTP #1**. This discharge will only be used during essential maintenance of WWTP #2; i.e., sludge removal from the fireside basin. Only treated plant demineralization reagent wastes, chemical lab drains, oil separator wastes, and other routine wastes from day-to-day operation may be discharged. WWTP #1 is not allowed to treat coal pile runoff. Such discharges shall be limited and monitored by the permittee as specified below.

Effluent Characteristic	**Discharge Limitations**				**Monitoring Requirements**	
	Average Monthly	**Maximum Daily**	**Min**	**Max**	**Frequency**[1]	**Sample Type**
Flow (GPD)	61,800	85,300	--	--	Continuous	Recorder
Total Suspended Solids (mg/L)	30	100	--	--	Daily when in use	Grab
Oil & Grease (mg/L)	15	20	--	--	Daily when in use	Grab
pH (S.U.)	--	--	6.5	8.0	Daily when in use	Grab

Samples taken in compliance with the monitoring requirements specified above shall be taken at a representative point prior to discharge into the receiving water.

[1] If no sampling is required for a particular parameter and monitoring period, the permittee should enter the appropriate No Data Indicator Code (NODI) in the monthly Discharge Monitoring Report (DMR).

6. During the period beginning on the effective date and lasting through the expiration date, the permittee is authorized to discharge from internal outfall number **016: treated effluent from WWTP #2**. This discharge may not include chemical metal cleaning waste; treated chemical metal cleaning waste is subject to requirements in section I.A.7 below. Such discharges shall be limited and monitored by the permittee as specified below.

Effluent Characteristic	Discharge Limitations				Monitoring Requirements	
	Average Monthly	Maximum Daily	Min	Max	Frequency[1]	Sample Type
Flow (GPD)	216,000	360,000	--	--	Continuous	Recorder
Total Suspended Solids (mg/L)	30	100	--	--	Monthly	Grab
Oil & Grease (mg/L)	15	20	--	--	Monthly	Grab
pH (S.U.)	--	--	6.0	9.0	Continuous	Recorder
Total Copper (mg/L)	1.0	1.0	--	--	Monthly[3]	Grab
Total Iron (mg/L)	1.0	1.0	--	--	Monthly[3]	Grab
Total Nitrogen (mg/L)	--	Report	--	--	Quarterly[2]	Grab

Samples taken in compliance with the monitoring requirements specified above shall be taken at a representative point prior to mixing with discharges from any other outfall.

1 If no sampling is required for a particular parameter and monitoring period, the permittee should enter the appropriate No Data Indicator Code (NODI) in the monthly Discharge Monitoring Report (DMR).

2 This parameter shall be monitored during each calendar quarter (January-March, April-June, July-September, and October-December) and reported on the monthly DMR following the end of each calendar quarter (i.e., April, July, October, and January).

3 Copper and iron limits apply only when non-chemical metal cleaning waste (NCMCW) is present in the discharge. If non-chemical metal cleaning waste (NCMCW) is discharged from this outfall in a given month (i.e., NCMCW is not segregated and discharged via Outfall 017), the permittee shall collect the effluent sample when NCMCW is present in the discharge. If NCMCW is the only type of waste stream present in the discharge, the copper and iron limits will apply directly to the effluent data. If NCMCW is comingled with other dissimilar waste streams, the measured effluent data must be multiplied by a dilution factor based on an up-to-date combined waste stream formula (CWF) to demonstrate compliance with the 1.0 mg/L limits on the NCMCW only. In this case, the detailed calculations of the CWF (describing each parameter and assumption), as well as any future updates to the CWF, shall be submitted to EPA as a NetDMR attachment (See Section I.B.2 below) prior to implementation. If NCMCW is not present in the discharge, the Permittee may use NODI code “9” (i.e., conditional limit not required) for copper and iron reporting requirements during that monitoring period.

7. During the period beginning on the effective date and lasting through the expiration date, the permittee is authorized to discharge from internal outfall number **017: treated metal cleaning waste (chemical and/or non-chemical) from WWTP #2 or an alternate holding/treatment tank prior to comingling with any other waste streams**. Such discharges shall be limited and monitored by the permittee as specified below.

Effluent Characteristic	Discharge Limitations				Monitoring Requirements	
	Average Monthly	Maximum Daily	Min	Max	Frequency[1]	Sample Type
Flow (GPD)	Report	360,000	--	--	Continuous, when in use	Recorder
Total Suspended Solids (mg/L)	30	100	--	--	Daily, when in use	Grab
Oil & Grease (mg/L)	15	20	--	--	Daily, when in use	Grab
Total Copper (mg/L)	1.0	1.0	--	--	Daily, when in use	Grab
Total Iron (mg/L)	1.0	1.0	--	--	Daily, when in use	Grab
pH (S.U.)	--	--	6.0	9.0	Continuous, when in use	Recorder
Total Nitrogen (mg/L)	--	Report	--	--	Quarterly, when in use[2]	Grab

Samples taken in compliance with the monitoring requirements specified above shall be taken at a representative point prior to mixing with discharges from any other outfall.

[1] If no sampling is required for a particular parameter and monitoring period, the permittee should enter the appropriate No Data Indicator Code (NODI) in the monthly Discharge Monitoring Report (DMR).

[2] This parameter shall be monitored during each calendar quarter (January-March, April-June, July-September, and October-December) and reported on the monthly DMR following the end of each calendar quarter (i.e., April, July, October, and January).

8. During the period beginning on the effective date and lasting through the expiration date, the permittee is authorized to discharge from outfall number **018: heater condensate drips**. Such discharges shall be limited and monitored by the permittee as specified below.

Effluent Characteristic	Discharge Limitations				Monitoring Requirements	
	Average Monthly	Maximum Daily	Min	Max	Frequency[2]	Sample Type
Flow (GPD)	Report	Report	--	--	Quarterly[3,4]	Estimate
Total Suspended Solids (mg/L)	30	100	--	--	Quarterly[3,4]	Grab
Oil & Grease (mg/L)	15	20	--	--	Quarterly[3,4]	Grab
pH[1] (S.U.)	--	--	6.5	8.0	Quarterly[3,4]	Grab

Samples taken in compliance with the monitoring requirements specified above shall be taken at a representative point prior to discharge into the receiving water. A representative sample must include the combined discharge of all discharging pipes.

1 The pH shall not be less than 6.5 standard units (S.U.) nor greater than 8.0 S.U., unless due to naturally occurring conditions. The pH sampling may be reduced to a single grab sample from any of the 3 pipes.

2 If no sampling is required for a particular parameter and monitoring period, the permittee should enter the appropriate No Data Indicator Code (NODI) in the monthly Discharge Monitoring Report (DMR).

3 This parameter shall be monitored during each calendar quarter (January-March, April-June, July-September, and October-December) and reported on the monthly DMR following the end of each calendar quarter (i.e., April, July, October, and January).

4 All sampling shall be done during dry weather. "Dry weather" is defined as at least seventy-two (72) hours following a storm event that results in an actual discharge of stormwater from the outfall ("measurable storm event").

9. During the period beginning on the effective date and lasting through the expiration date, the permittee is authorized to discharge from outfall numbers **020 and 021: intake screen wash (Outfall 020 serves intake for Unit 4; Outfall 021 serves intake for Units 5 and 6)**. Such discharges shall be limited and monitored by the permittee as specified below.

Effluent Characteristic[1,2]	**Discharge Limitations**		**Monitoring Requirements**	
	Average Monthly	**Maximum Daily**	**Frequency**	**Sample Type**
Outfall 020 Flow (GPD)	--	108,000	Monthly	Estimate
Outfall 021 Flow (GPD)	--	108,000	Monthly	Estimate

Samples taken in compliance with the monitoring requirements specified above shall be taken at a representative point prior to discharge into the receiving water.

1 The temperature of the discharge shall at no time exceed the temperature of the intake water used for this discharge.

2 All live fish, shellfish and other organisms collected or trapped on the intake screens should be returned to their habitat, sufficiently distant from the intake structures to prevent re-impingement. All other material, except natural debris (e.g., leaves), shall, to the extent practicable, not be returned to the receiving waters and, in any event, shall be disposed of in accordance with all existing federal, state, and/or local laws and regulations that apply to waste disposal.

10. Water Quality Requirements

a. Discharges and water withdrawals shall not cause a violation of the water quality standards or jeopardize any Class B use of the Piscataqua River.

b. The thermal plumes from the station shall: (a) not block zones of fish passage, (b) not interfere with spawning of indigenous populations, (c) not change the balanced indigenous population of the receiving water, and (d) have minimal contact with surrounding shorelines.

c. The effluent shall not contain metals and/or materials in concentrations or in combinations which are hazardous or toxic to aquatic life or which would impair the uses designated by the classification of the receiving water.

d. Discharges to the Piscataqua River shall be adequately treated to ensure that the surface water remains free from pollutants in concentrations or combinations that settle to form harmful deposits, float as foam, debris, scum or other visible pollutants. They shall be adequately treated to ensure that the surface waters remain free from pollutants which produce odor, color, taste, or turbidity in the receiving water which is not naturally occurring and would render it unsuitable for its designated uses.

e. Pollutants which are not limited by the permit, but have been specifically disclosed in the last permit application, may be discharged at the frequency and level disclosed in the application, provided that such discharge does not violate sections 307 and 311 of the Act or applicable water quality standards.

11. Cooling Water Intake Structure Requirements to Minimize Adverse Impacts from Impingement and Entrainment

a. Best Technology Available. The design, location, construction, and capacity of the permittee's cooling water intake structures (CWISs) shall reflect the best technology available (BTA) for minimizing adverse environmental impacts from the impingement and entrainment of various life stages of fish (*e.g.*, eggs, larvae, juveniles, adults) by the CWISs. ***Nothing in this permit authorizes take for the purposes of a facility's compliance with the Endangered Species Act.*** The following requirements have been determined by the EPA to represent the BTA for minimizing impingement and entrainment impacts at this facility:

1. To minimize entrainment, the permittee shall install and operate a fine mesh wedgewire screen intake system for the CWIS's of Units 4, 5, and 6, with a pressurized air system to clear debris from the screens. For this permit, the screen must have a slot or mesh size no greater than 0.8 mm, unless the permittee can demonstrate through a site-specific study that a larger slot size is equally or more effective for reducing entrainment mortality as a 0.8 mm slot or mesh size. The site-specific study must evaluate 0.8 mm slots concurrently with any larger slot sizes. Screens must be constructed from material or incorporate a coating designed to

reduce fouling. The wedgewire screen units must be positioned as close to the west bank of the Piscataqua River and the CWIS as possible, while 1) meeting all operational specifications required by this permit; 2) meeting the conditions of any other permits for the equipment; and 3) assuring that the equipment performs as designed.

2. To minimize impingement mortality, the permittee shall maintain a through-screen velocity at the wedgewire screens no greater than 0.5 fps. The permittee shall continuously monitor the through-screen velocity daily and report the average monthly and daily maximum through-screen intake velocity at the screens in the discharge monitoring report.

3. The permittee shall institute a best management practice (BMP) of shutting down the intake pumps associated with a particular generating unit to the extent practicable when that generating unit is not operating and water is not needed for fire prevention or other emergency conditions.

4. The permittee shall at all times properly operate and maintain the wedgewire screen intake system in compliance with conditions (1) and (2) of this section except when operation of the wedgewire screens would result in unavoidable loss of human life, personal injury, or severe property damage. Severe property damage means substantial physical damage to property or damage to cooling water intake-related equipment that causes it to become inoperable. When operation of the wedgewire screen intake system would cause loss of human life, injury, or severe property damage, the permittee may cease use of the wedgewire screens and operate an emergency intake. The permittee shall minimize the use of the emergency intake system to the greatest extent possible. Within twenty-four (24) hours of the start of each use of the emergency intake system, the permittee must notify EPA and NHDES of the reason for operation of the emergency intake and identify all steps taken or to be taken to address the cause and minimize the use of the emergency intake. The permittee shall notify EPA and NHDES within twenty-four hours of the resumption of full operation of the wedgewire screens.

5. No change in the location, design or capacity of the present structure, unless specified by this permit, can be made without prior approval by EPA.

b. Compliance Schedule. In order to comply with Part I.A.11.a 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 Part I.A.11.a of the permit. Specifically, steps for the installation and operation of equipment required to comply with Part I.A.11.a 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 in writing of compliance or non-compliance with the requirements for each milestone no later than fourteen (14) days following each specified deadline.

1. Design

   i. The permittee shall finalize the pilot testing design and obtain and install all equipment required for pilot testing within six (6) months from the effective date of the permit.

   ii. The permittee shall complete pilot testing of wedgewire screens no later than eighteen (18) months from the effective date of this permit.

   iii. A demonstration report documenting the results of the pilot testing shall be submitted to EPA and NHDES by July 30, 2020. The demonstration report shall include a preliminary design of the wedgewire screens at Schiller Station and include justifications for 1) the proposed screen slot size based on observation of each slot size's ability to reduce entrainment mortality relative to baseline entrainment, as measured concurrently at the existing traveling screens, avoid screen clogging, fouling or other maintenance issues, and any other relevant considerations; 2) the proposed material alloy choice for the equipment in order to reduce bio-fouling; and 3) the proposed optimal screen orientation in the river (i.e., parallel or perpendicular to the flow) in order to reduce entrainment and impingement mortality. The screen slot size and orientation selected will be based upon the results of the pilot testing and demonstration report and subject to EPA review and comment within sixty (60) days from submission.

   iv. Data collection, including but not limited to topographic and bathymetric surveys, geotechnical exploration, and other design and marine construction variables that need to be evaluated shall be completed by August 29, 2020.

   v. The permittee shall submit a final design for the wedgewire screens at Schiller Station by December 30, 2020 and in accordance with EPA's review of and comments on the preliminary design.

2. Permitting

   i. Within eight (8) months from the submission of the final design, the permittee shall complete submission of all permit applications and notices necessary to install wedgewire screens at the Units 4, 5, and 6 CWISs, including those required by U.S. Army Corps of Engineers (ACOE), National Marine Fisheries Service (NMFS), NHDES, New Hampshire Division of Coastal Zone Management, local conservation commissions, and others as necessary.

NHDES, New Hampshire Division of Coastal Zone Management, local conservation commissions, and others as necessary.

ii. In the event that more than twelve (12) months elapses between submitting all necessary permit application and notices and the completion of the permitting process, the permittee shall submit an annual report demonstrating progress towards obtaining all necessary permit approvals. Until all necessary permits and approvals are obtained, this report shall be submitted every twelve (12) months from the deadline for completing submission of necessary applications described in (i), above.

3. Construction

i. Within three (3) months of obtaining all necessary permits and approvals, the permittee shall enter into an Engineering, Procurement and Construction agreement with the permittee's contractor or report to EPA that the permittee has made other appropriate arrangements to commence construction.

ii. No later than twelve (12) months after obtaining all permits and approvals, the permittee shall complete site preparation for the installation of wedgewire screens for the Units 4, 5 and 6 CWISs. The permittee shall minimize environmental and navigational impacts during construction and installation. In addition, EPA will work with representatives of Schiller Station and, as appropriate, the ISO to schedule any necessary downtime of the power plant that will minimize or eliminate any effects on the adequacy of the region's supply of electricity.

iii. Within twenty (20) months from obtaining all permits and approvals, the permittee shall complete installation, operational modifications, test, startup and commissioning of the wedgewire screens for the CWIS's of Units 4, 5 and 6.

12. Water Treatment Chemicals

a. The Regional Administrator or the Director shall be notified in advance of any addition and/or change of chemicals containing pollutants not approved for water discharge and may require additional feasibility studies.

b. The permittee may add and/or change maintenance chemicals containing pollutants not currently approved for water discharge only if the permittee can demonstrate through testing that each of the 126 priority pollutants in 40 CFR Part 423.15(j)(1) is not detectable in the final discharge.

13. Maintenance, Diagnostic and Repair Materials

The use of Rhodamine WT dye and fine wood sawdust is allowed when the need arises, provided that the permittee: 1) notify EPA and NHDES at least thirty (30) days prior to the addition of these materials to any water stream that will ultimately be discharged to the Piscataqua River and 2) meets the requirements in Part I.A.1 of this permit. The initial notification shall include the following projections:

Rhodamine WT Dye

a. The expected maximum concentration of Rhodamine WT dye that will be discharged to the receiving water before dilution and the projected duration of the maximum concentration;

b. The total volume of Rhodamine WT dye to be introduced and the resulting average concentration expected at the outfall before dilution; and

c. The beginning time and duration the material is expected to be discharged to the receiving water at detectable levels, before dilution.

Fine Wood Sawdust

d. The total amount in pounds of sawdust introduced and the expected maximum total suspended solids (TSS) concentration of the effluent before dilution and the projected duration of the maximum concentration; and

e. The beginning time and duration the material is expected to be discharged to the receiving water at detectable levels, before dilution.

14. Thermal Mixing Zone Requirements

a. The thermal mixing zone is defined as 200 feet upstream (flood tide) and 200 feet downstream (ebb tide) of the discharge from outfalls 001, 002, 003 and 004, with a width of 200 feet from the shoreline.

b. The mixing zone criteria for the thermal plume are such that at no time shall the temperature of the receiving water outside the mixing zone exceed a maximum temperature of 84°F at any point beyond a distance of 200 feet in any direction from the point of discharge. Brief excursions are allowed only during tidal reversal periods (i.e., the period lasting 15 minutes before and 15 minutes after slack tide).

c. Outside the thermal mixing zone, the natural seasonal temperature cycle of the receiving water shall remain unchanged by the discharge, the annual spring and fall temperature and salinity changes shall be gradual, and large day to day temperature and salinity fluctuations shall be avoided.

15. Other Requirements

a. There shall be no discharge of polychlorinated biphenyl (PCB) compounds such as those commonly used for transformer fluid. The permittee shall dispose of all known PCB equipment, articles, and wastes in accordance with 40 CFR 761.

b. Water drawn from fuel oil tanks shall not be discharged into the Piscataqua River.

c. Chlorine only may be used as a biocide. No other biocide shall be used without explicit approval from EPA.

d. The permittee shall comply with all existing federal, state, and local laws and regulations that apply to the reuse or disposal of solids, such as those which may be removed from water and waste treatment operations and equipment cleaning. At no time shall these solids be discharged to the Piscataqua River.

e. All existing manufacturing, commercial, mining, and silvicultural dischargers must notify the Regional Administrator as soon as they know or have reason to believe (40 CFR §122.42):

1. That any activity has occurred or will occur which would result in the discharge, on a routine or frequent 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 ug/l);

ii. Two hundred micrograms per liter (200 ug/L) for acrolein and acrylonitrile; five hundred micrograms per liter (500 ug/L) for 2,4-dinitrophenol and for 2-methyl-4,6-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 CFR §122.21(g)(7); or

iv. Any other notification level established by the Regional Administrator in accordance with 40 CFR §122.44(f).

2. 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 ug/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 CFR §122.21(g)(7); or

iv. Any other notification level established by the Regional Administrator in accordance with 40 CFR §122.44(f).

3. 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.

B. MONITORING AND REPORTING

The monitoring program in the permit specifies sampling and analysis, which will provide continuous information on compliance and the reliability and effectiveness of the installed pollution abatement equipment. The approved analytical procedures found in 40 CFR Part 136 are required unless other procedures are explicitly required in the permit. The permittee is obligated to monitor and report sampling results to EPA and the NHDES within the time specified within the permit.

In accordance with 40 C.F.R. § 122.44(i)(1)(iv), the Permittee shall use sufficiently sensitive test procedures (i.e., methods) approved under 40 C.F.R. § 136 or required under 40 C.F.R. Chapter I, Subchapter N or O, for the analysis of pollutants or pollutant parameters limited in this permit (except WET). A method is considered "sufficiently sensitive" when either 1) The method minimum level is at or below the level of the applicable water quality criterion or permit effluent limitation for the measured pollutant or pollutant parameter; or 2) The method has the lowest minimum level of the analytical methods approved under 40 C.F.R. § 136 or required under 40 C.F.R. Chapter I, Subchapter N or O for the measured pollutant or pollutant parameter. The "minimum level" is the lowest level at which the test equipment produces a recognizable signal and acceptable calibration point for a pollutant or pollutant parameter, representative of the lowest concentration at which a pollutant or pollutant parameter can be measured with a known level of confidence.

Unless otherwise specified in this permit, the permittee shall submit reports, requests, and information and provide notices in the manner described in this section.

1. Submittal of DMRs and the Use of NetDMR

The permittee shall continue to submit its monthly monitoring data in discharge monitoring reports (DMRs) to EPA and the State no later than the 15th day of the month electronically using NetDMR. When the Permittee submits DMRs using NetDMR, it is not required to submit hard copies of DMRs to EPA or the State. NetDMR is accessed from the internet at https://netdmr.zendesk.com/hc/en-us.

2. Submittal of Reports as NetDMR Attachments

Unless otherwise specified in this permit, the Permittee shall electronically submit all reports to EPA as NetDMR attachments rather than as hard copies. See Part I.B.5. for more information on State reporting. Because the due dates for reports described in this permit may not coincide with the due date for submitting DMRs (which is no later than the 15th day of the month), a report submitted electronically as a NetDMR attachment shall be considered timely if it is electronically submitted to EPA using NetDMR with the next DMR due following the particular report due date specified in this permit.

3. Submittal of Requests and Reports to EPA/OEP

The following requests, reports, and information described in this permit shall be submitted to the EPA/OEP NPDES Applications Coordinator in the EPA Office Ecosystem Protection (OEP).

A. Transfer of permit notice
B. Request for changes in sampling location
C. Request for reduction in monitoring frequency
D. Change in location, design or capacity of cooling water intake structures
E. Wedgewire screen pilot testing demonstration report
F. Final design plans for the wedgewire screen installation

These reports, information, and requests shall be submitted to EPA/OEP electronically at R1NPDES.Notices.OEP@epa.gov or by hard copy mail to the following address:

U.S. Environmental Protection Agency
Office of Ecosystem Protection
EPA/OEP NPDES Applications Coordinator
5 Post Office Square - Suite 100 (OEP06-03)
Boston, MA 02109-3912

4. Submittal of Reports in Hard Copy Form

The following notifications and reports shall be submitted as hard copy with a cover letter describing the submission. These reports shall be signed and dated originals submitted to EPA.

A. Written notifications required under Part II
B. 316(b) compliance schedule milestone reports

This information shall be submitted to EPA/OES at the following address:

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

5. State Reporting

Unless otherwise specified in this permit, duplicate signed copies of all reports, information, requests or notifications described in this permit, including the reports, information, requests or notifications described in Parts I.B.3 and I.B.4 also shall be submitted to the State electronically via email to the Permittee's assigned NPDES inspector, permit engineer and compliance supervisor at NHDES-WD or in hard copy to the following address:

Attn: Compliance Supervisor
New Hampshire Department of Environmental Services
Water Division
Wastewater Engineering Bureau
P.O. Box 95
Concord, New Hampshire 03302-0095

An annual report on the impinged lobsters and other biota detected from any screen wash sampling in July and August is to be sent to the NH Fish and Game Department's Marine Fisheries Division Chief at the following address:

NH Fish and Game Department
Marine Division
225 Main Street
Durham, NH 03824

6. Verbal Reports and Verbal Notifications

Any verbal reports or verbal notifications, if required in Parts I and/or II of this permit, shall be made to both EPA and to NHDES. This includes verbal reports and notifications which require reporting within 24 hours. (As examples, see Part II.B.4.c.(2), Part II.B.5.c.(3), and Part II.D.1.e.) Verbal reports and verbal notifications shall be made to EPA's Office of Environmental Stewardship at:

617-918-1510

Verbal reports and verbal notifications shall also be made to the permittee's assigned NPDES inspector at NHDES –WD.

C. STATE PERMIT CONDITIONS

This NPDES discharge permit is issued by the U.S. Environmental Protection Agency under Federal and State law. Upon final issuance by the EPA, the NHDES-WD may adopt this permit, including all terms and conditions, as a State permit pursuant to RSA 485-A:13.

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 the permit as issued by the other Agency, unless and until each Agency has concurred in writing with such modification, suspension or revocation.

A relaxation of the pH limits is allowed if the permittee performs an in-stream dilution study that demonstrates that the in-stream standards for pH would be protected. If NHDES approves results from a pH demonstration study, this permit's pH limit range may be relaxed for some or all relevant outfalls. Note that with so many outfalls it would be difficult to show how one outfall either did or did not affect the downstream pH so an aggregate pH demonstration for all of outfalls may be required. Since it may be quite difficult to do such a study during worst case tidal conditions, the permittee should coordinate closely with NHDES in the development of any such study. The notification of the relaxation must be made by certified letter to the permittee from EPA-Region 1. The pH limit range cannot, however, be made less restrictive than the 6.0 - 9.0 S.U. limitations included in the applicable Steam Electric ELGs for the facility.

NPDES PART II STANDARD CONDITIONS
(January, 2007)

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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. <u>Definitions for NPDES Permit Sludge Use and Disposal Requirements</u>.

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.

RESPONSE TO COMMENTS
DRAFT NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM PERMIT NO. NH0001473
SCHILLER STATION, PORTSMOUTH, NEW HAMPSHIRE

April 2018

In accordance with the provisions of 40 C.F.R. § 124.17, this document presents the United States Environmental Protection Agency's ("EPA" or "Region 1" or "the Region") responses to comments received on Draft NPDES Permit NH0001473 for Schiller Station (or "the Facility") located in Portsmouth, NH. The responses to comments explain and support the EPA determinations that form the basis of the Final Permit. The Final Permit authorizes discharges of pollutants and withdrawal of cooling water by the Facility. The public comment period on the Draft Permit began on September 30, 2015, and ended on January 27, 2016. This time period included one extension of the comment period.

Schiller Station was long owned and operated by Public Service Company of New Hampshire ("PSNH" or "the Permittee"). In recent years, PSNH also did business under the name of its parent company, Eversource. Even more recently, New Hampshire law, *see* RSA 369-B:3-a (2015), mandated that PSNH divest itself of its electrical generating facilities, including Schiller Station. After a lengthy auction process, PSNH sold Schiller Station and its other generating facilities to Granite Shore Power LLC (GSP). The sale closed on January 10, 2018. Each individual facility is now owned by a separate, wholly-owned subsidiary of GSP. Thus, Schiller Station is now owned by GSP Schiller LLC (GSP-Schiller or the Permittee).

Under the terms of purchase and sale agreement between PSNH and GSP, GSP-Schiller now owns and operates Schiller Station and is responsible for compliance with the Facility's NPDES permit. In essence, GSP-Schiller has stepped into the shoes of PSNH with regard to both ongoing NPDES permit compliance and participation in the current NPDES permit development proceeding for Schiller Station. As such, PSNH's comments on the Draft Permit for Schiller Station have been adopted by, and are now attributable to, GSP-Schiller. As requested by PSNH and GSP, EPA issued a minor modification to the existing permit to change the named permittee to GSP-Schiller because it now owns and operates the Facility. This change in the named permittee became effective on January 10, 2018.

In these responses to comments, EPA will at times refer to PSNH because it previously owned and operated Schiller Station and submitted comments on the Draft Permit. EPA will also at times refer to GSP-Schiller given that it currently owns and operates the power plant, is now the named permittee on the existing permit, as modified, and is responsible for permit compliance going forward. Finally, EPA will also sometimes use the generic terms, "Permittee" or "Company" to refer to either PSNH or GSP-Schiller, whichever is appropriate in context.

During the public comment period, the following parties commented on the Draft Permit:

- **Public Service Company of New Hampshire**
- **Super Law Group LLC Sierra Club**

- **Conservation Law Foundation**

All comments presented in this document have been reproduced verbatim from each comment letter and have not been paraphrased. The footnotes from the comments are included verbatim at the end of the corresponding comment. EPA has inserted its responses to each comment throughout the document. Footnotes included in EPA's responses follow the conventional format at the bottom of the corresponding page.

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

1. For Outfalls 001, 002, 003 and 004, the temperature rise limit had a temporary (two-hour) increase from 25°F to 30°F during condenser maintenance. This temporary provision has been modified to a three-hour period per day. See PSNH Comment and EPA Response V.D.1.
2. For Outfall 006, the monitoring requirement for total nitrogen has been removed. Additionally, the language requiring the effluent to be routed to the on-site WWTP for pH neutralization if the discharge is not within 6.5 to 8.0 standard units has been removed. See PSNH Comment and EPA Response V.D.2.
3. For Outfall 011, the pH monitoring frequency has been changed from monthly to quarterly, the sampling location has been clarified, the flow limits have been replaced with reporting only requirements, and the PAH and total nitrogen monitoring requirements have been removed. See PSNH Comment and EPA Response V.D.3.
4. Outfall 013 has been removed from the Final Permit. See PSNH Comment and EPA Response V.D.7.
5. For Outfall 016, conditional limits for copper and iron have been added with a footnote describing the optional use of a combined waste stream formula for compliance. See PSNH Comments and EPA Responses V.C.3.d and V.C.3.e.
6. For Outfall 018, the sampling location has been clarified, the flow limits have been replaced with reporting only requirements, and the PAH and total nitrogen monitoring requirements have been removed. See PSNH Comment and EPA Response V.D.4.
7. For Outfalls 020 and 021, language has been added to the footnote indicating that all solid material from the screens shall be disposed of via land disposal "to the extent practicable." See PSNH Comment and EPA Response V.D.5.
8. Outfall 023 has been removed from the Final Permit. See PSNH Comments and EPA Responses V.D.6 and V.D.7.
9. The authorizations to discharge stormwater from Outfalls 001, 006, 011, 013, 018 and 023 have been removed. See PSNH Comment and EPA Response V.D.7.

10. The requirement to monitor and report rainfall pH in Parts I.A.4 (footnote 1) and I.A.8 (footnote 1) have been removed. See PSNH Comment and EPA Response VII.A.21.
11. The cooling water intake structure requirements for entrainment in Part I.A.11.a.1 (Part I.A.13 in Draft Permit) have been clarified, a condition requiring an antifouling coating or alloy has been added, and recommendations for periodic cleaning and deflecting structures have been removed. See PSNH Comment and EPA Response V.B.7.
12. The cooling water intake structure requirements for impingement in Part I.A.11.a.2 have been clarified and a requirement to monitor the through-screen velocity has been added. See Sierra Club Comment and EPA Response IV.B.4.
13. The cooling water intake structure requirement at Part I.A.11.a.4 requiring the Unit 5 outage to be scheduled in June has been eliminated. See PSNH Comment and EPA Response V.B.6.
14. The cooling water intake structure requirement at Part I.A.11.a.4 authorizing limited use of an emergency intake system has been added. See PSNH Comment and EPA Response V.B.7.
15. The compliance schedule for the cooling water intake structure requirements at Part I.A.11.b has been extended from 48 months to 54 months with additional time allotted for design and analysis of the pilot study and other interim compliance steps clarified. See PSNH Comment and EPA Response V.B.8.
16. Part I.A.16.d of the Draft Permit, prohibiting thermal backwash of the intake, has been removed.
17. Parts I.A.18.a and I.A.18.b of the permit have been removed to conform to EPA regulations. See 40 C.F.R. § 122.62(a)(7). Part I.A.18.c of the permit has been moved to Part I.C State Permit Conditions.
18. Part I.B and I.C regarding stormwater management have been removed based on the Permittee's coverage under the MSGP. See PSNH Comment and EPA Response V.D.7.
19. Part I.B (Part I.D in the Draft Permit) requiring the Permittee to begin using NetDMR has been updated to require the Permittee to continue to use NetDMR because the Permittee began using NetDMR prior to final issuance of the permit. Additionally, requirements of the sufficiently Sensitive Test Method Rule promulgated in 2014 and found at 40 C.F.R. § 122.44(i)(1)(iv) have been included, which is now common to all Region I NPDES permits.
20. The reference to NHDES Monthly Operating Reports (MORs) has been removed from Part I.B.2 (Part I.D.2 in the Draft Permit) as MORs are only required to be submitted by Publicly Owned Treatment Works.
21. In Part I.B.5 (Part I.D.5 in the Draft Permit), the NHDES permit engineer and compliance supervisor have been included as recipients of electronic or hard copies of reports and information required in Parts I.B.3 and I.B.4 of the Final Permit.

Electronic copies of the Final Permit and these responses to public comments are available at EPA Region 1's website at https://www.epa.gov/npdes-permits/new-hampshire-final-individual-npdes-permits.

PUBLIC SERVICE COMPANY OF NEW HAMPSHIRE

PSNH Executive Summary

The draft National Pollutant Discharge Elimination System ("NPDES") permit for Public Service Company of New Hampshire's (d/b/a Eversource Energy) (variously referred to herein as "PSNH," the "Company," or the "Permittee") Schiller Station, Permit No. NH0001473 ("Draft Permit"), issued by Region 1 of the Environmental Protection Agency ("Region 1"), cannot be issued as proposed.

Although the agency correctly determined that PSNH is entitled to a continuation of its Clean Water Act ("CWA") § 316(a) variance based on PSNH's demonstration that Schiller Station's thermal discharges have not caused any appreciable harm to the balanced indigenous population ("BIP") of the Piscataqua River, many of the agency's other determinations in the Draft Permit are unsupported, unfounded, and must be revised. As detailed in the comments that follow, Region 1 was arbitrary and capricious in establishing certain proposed permit limits and requirements for Schiller Station. The Draft Permit as issued fails to comply with the applicable law and regulations. Any final NPDES permit for Schiller Station must address the issues raised in these comments. Specifically:

- Although Region 1 correctly determined that PSNH's existing § 316(a) variance for its thermal discharges at Schiller Station should be continued, the agency should grant PSNH's request to increase the effluent temperature limit to 100ºF and "Delta-T" limit from 25ºF to 30ºF.
- Region 1's determination that the installation of fine-mesh cylindrical wedgewire ("CWW") screens for the cooling water intake structures ("CWISs") at Schiller Station is necessary under CWA § 316(b) has no factual basis, lacks legal support, and is thus arbitrary and capricious.
- Region 1's proposed technologies to address entrainment are arbitrary and capricious and must be revised before the agency issues the permit as final. These technologies are not necessary at Schiller Station for several reasons:

  (1) Region 1 has not determined, and in fact cannot determine, that the CWISs at Schiller Station cause an adverse environmental impact ("AEI") to the aquatic ecosystems of the Piscataqua River.

  (2) The average actual intake flow ("AIF") of the CWISs is 72.4 million gallons per day ("MGD"), which is well below the 125 MGD AIF compliance threshold U.S. Environmental Protection Agency ("EPA") established less than two years ago in the final § 316(b) rule. This policy threshold was established by the agency to allow permitting authorities to focus primarily on larger facilities whose water withdrawals are more likely to pose a significant risk of AEI due to entrainment. The final § 316(b) rule presupposes that a facility withdrawing less than 125 MGD AIF presents little or no potential adverse impact to aquatic organisms. Schiller Station is no exception.

(3) In fact, entrainment at the facility is de minimis. Average water withdrawals from the facility amount to only 0.0018 percent of the peak Piscataqua River withdrawal zone flow during each tidal cycle. It is therefore not possible for the CWIS operations at Schiller Station to be causing any environmental impact that is adverse to the aquatic ecosystem within the Piscataqua River.

- Given the determination that controls for entrainment are not warranted, the Best Technology Available ("BTA") for the CWISs at Schiller Station is dictated by considerations of impingement mortality. Modified traveling water screens with an upgraded fish return system constitute BTA for the CWISs at Schiller Station. These technologies have a proven track record of success in reducing impingement mortality, will be comparatively easy to install, and will permit the facility to comply with the final § 316(b) rule within a shorter time period. Plus, they are one of seven "pre-approved" control technologies from which a facility may choose to satisfy the BTA impingement mortality standard.

- If Region 1 erroneously rejects PSNH's well-reasoned conclusions that technologies for entrainment are not necessary at Schiller Station to satisfy the BTA standard, the agency must allow the company to submit additional analyses that will provide Region 1 at least the minimum amount of information the agency would need to make a reasoned and legally defensible BTA entrainment determination. The final § 316(b) rule requires facilities above the aforementioned 125 MGD AIF compliance threshold to complete analyses of the sort PSNH would seek to submit to Region 1 if the agency rejects the company's position on the application of entrainment at Schiller Station. If Region 1 continues to require fine-mesh CWW screens at Schiller Station, the agency must allow the company to test the biological effectiveness of CWW screens with slot-widths of 2.0 mm, 3.0 mm, and larger in light of the better understanding of the efficacy of these screens developed in recent years due to quantification of the hydraulic bypass and larval avoidance phenomena. In addition, Region 1's detailed schedule for the design, permitting, and construction requirements for the installation of the fine-mesh CWW screens at Schiller Station must be significantly revised because it cannot be implemented as proposed.

- A June outage requirement for Unit 5 at Schiller Station is not a regulatory option and in any case not necessary to satisfy the § 316(b) BTA standard. PSNH notified Region 1 of this fact in 2008, which the agency acknowledged in its Fact Sheet to the Draft Permit, but ultimately ignored without explanation. Even if it were possible, it is not economically prudent due to the fact that it would have significant costs for PSNH's customers due to incremental energy costs, among other reasons.

- Region 1's best available technology ("BAT") effluent limitations established pursuant to the agency's best professional judgment ("BPJ") authority for nonchemical metal cleaning wastes ("NCMCWs") generated at Schiller Station are arbitrary and capricious.

- NCMCWs should continue to be classified as a low volume waste in the new final permit for Schiller Station in accordance with industry guidance commonly referred to as the Jordan Memorandum. Region 1 failed to even consider how NCMCWs have been historically addressed at Schiller Station, which is specifically required by EPA's new final steam effluent guidelines before a permitting authority may establish BPJ-based effluent limitations for the waste stream.

- Region 1's BAT analysis is arbitrary and capricious, as well. The agency does not possess essential data regarding the makeup of NCMCW discharges at Schiller Station. Furthermore, Region 1 failed to adequately consider the changes in current processes employed at Schiller Station, as well as the costs necessary to achieve these changes, that would be required to comply with new effluent limitations. Without these foundational facts, the agency has no way of knowing whether its proposed effluent limitations are operationally feasible and/or cost-effective. In fact, they are not. NCMCWs should continue to be treated as low volume wastes in the new final permit issued for Schiller Station. Any other determination, without these critical considerations, is arbitrary and capricious.

- Various other requirements within the Draft Permit are arbitrary and capricious and require revision. The entirety of Parts I.B. and I.C. of the Draft Permit should be deleted because Schiller Station already maintains a stormwater pollution prevention plan ("SWPPP") and has obtained coverage under Multi-Sector General Permit ("MSGP") NHR053208 to manage all stormwater discharges related to the facility. Many new effluent limitations and monitoring requirements (including frequency of monitoring) inserted in the Draft Permit also warrant revision because they create an unnecessary administrative burden on PSNH and result in the expenditure of needless dollars with no ultimate improvement to the environment.

Region 1 must consider these comments and amend the proposed permit accordingly. Failure to do so will result in a permit that is arbitrary and capricious and that has no support in the record or basis in law.

EPA Response to PSNH Executive Summary

As part of its careful consideration of PSNH's comment, Region 1 has reviewed and considered the Executive Summary to those comments. The Region notes here that PSNH agrees with Region 1's decision to renew Schiller Station's CWA § 316(a) thermal discharge variance, but that the Company disagrees with many other aspects of the Draft Permit for Schiller Station, including the thermal discharge limits and monitoring requirements, cooling water intake structure requirements under CWA § 316(b), effluent discharge limits for non-chemical metal cleaning wastes (referred to as "NCMCWs"), and requirements for stormwater discharges. In a number of instances, PSNH refers to data or information that it believes Region 1 should have been considered but did not. PSNH does not, however, present or provide specific references for that information in the Executive Summary.

In its more detailed comments, PSNH further discusses the issues identified in its Executive Summary. Region 1 responds to all of this material below in its responses to PSNH's more detailed comments.

PSNH Comment I. Introduction

PSNH submits these comments on the Draft Permit for Schiller Station issued by Region 1.[1] Region 1 correctly determined that the existing § 316(a) variance for the facility should be continued in the new final permit and PSNH commends the agency on this well-reasoned conclusion. Many of the other limits and requirements in the Draft Permit lack factual support in the record or basis in law, however, and must be revised in the final permit issued by the agency. Specifically, Region 1's § 316(b) BTA determination is arbitrary, capricious, and not in accordance with law inasmuch as it requires the installation of CWW screens with a slot-width of no greater than 0.8 mm and a June annual outage for Unit 5. Neither determination is supported by the existing administrative record, nor are the requirements necessary at Schiller Station to satisfy the § 316(b) legal standard.

Fine-mesh CWW screens were chosen as BTA for the CWISs at Schiller Station due to purported entrainment concerns. These concerns are unfounded. Entrainment at Schiller Station is *de minimis* and is not causing any environmental impact within the Piscataqua River that is adverse to the aquatic ecosystem. In fact, Region 1 expressly stated in its Fact Sheet to the Draft Permit that it has found "no evidence" that the CWISs at Schiller Station are impacting the waterbody. Technologies to address entrainment at Schiller Station are also unnecessary because the average 72.4 MGD AIF at the facility is one of the lowest within the industry and is far below the 125 MGD AIF entrainment policy threshold EPA established less than two years ago to allow the agency to focus on facilities that withdraw larger quantities of water and, thus, have the highest likelihood of causing adverse impacts. Instead, modified traveling water screens with an upgraded fish return system constitute BTA for the CWISs at Schiller Station.

Should Region 1 erroneously reject this well-founded BTA determination, PSNH must be permitted to submit additional entrainment data and analyses before the agency renders its BTA determination. The additional data and analyses would be substantially similar to the information facilities with an average withdrawal volume in excess of 125 MGD AIF are required to submit to their respective permit writers, in accordance with the final § 316(b) rule, to ensure the permit writer can make an informed BTA determination. This additional information would show entrainment controls are not necessary at Schiller Station. And, even if it does not, PSNH should be allowed to test larger slot-width CWW screens than the maximum 0.8 mm slot-width Region 1 has currently prescribed due to additional discoveries in recent years that demonstrate larger slot-width CWW screens are as effective at reducing entrainment as smaller ones in certain ecological environments. Moreover, if PSNH is ultimately required to install CWW screens at Schiller Station, the proposed timeline for the design, permitting, and construction of them must be altered because the current timeframe is unreasonable.

The June outage requirement for Unit 5 must be removed from the final permit because a June outage is not possible and, even if it were, does not make economic sense for PSNH and its customers. If PSNH is ultimately required to install CWW screens at Schiller Station, no accompanying operational measure is warranted to satisfy the § 316(b) BTA standard.

Region 1's proposed regulation of NCMCWs at Schiller Station is arbitrary and capricious, as well. NCMCWs generated by each unit at Schiller Station have historically been, and continue to be, treated as a low volume waste exempted from any iron and copper effluent limitations in accordance with the Jordan Memorandum. EPA (with assistance from Region 1) recently confirmed this fact as part of the promulgation of the new NELGs. Furthermore, an evaluation of how NCMCWs have previously been addressed at the facility is mandated by this recent rulemaking. Region 1 failed to consider the historical permitting record at Schiller Station before establishing BPJ-based BAT limits for the waste stream, which renders the agency's proposed analysis and corresponding effluent limitations incomplete, arbitrary, capricious, and not in accordance with law.

Region 1's BAT analysis for establishing BPJ-based effluent limitations for NCMCWs at Schiller Station is likewise arbitrary and capricious. The agency has no data of isolated NCMCWs generated at Schiller Station, an analysis of which is fundamental to any legally defensible BAT determination. Region 1's BAT determination is also insufficient because it grossly underestimates the significant costs and/or logistical problems that regulation of NCMCWs in this manner would present at Schiller Station. Section 304(b)(2)(B) of the CWA and EPA's regulations require Region 1 to take these and other factors into consideration when adopting site-specific effluent limitations. A thorough BAT analysis, coupled with a review of the historical permitting record, should lead Region 1 to conclude that the NCMCW waste stream must continue to be classified as a low volume waste in the new final permit for Schiller Station.

Region 1's final NPDES permit for Schiller Station must take into consideration the issues raised in these comments and contain reasonable limits and requirements established through a lawful and proper process based upon substantive facts.

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[1] PSNH supports and adopts the January 2016 PSNH Schiller Station Draft NPDES Permit Comments jointly prepared by Enercon Services, Inc. ("Enercon"), and Normandeau Associates, Inc. ("Normandeau"), attached hereto as Exhibit 1. Hereinafter these comments are referred to as the "2016 Enercon-Normandeau Comments."

EPA Response to PSNH Comment I. Introduction:

In the Introduction to its comments, PSNH again briefly touches on the same issues addressed in the Executive Summary. PSNH opines that Region 1 was "correct" to renew Schiller's thermal discharge variance under CWA § 316(a), and the Company commends the Region's "well-reasoned analysis."

Conversely, PSNH disagrees with Region 1's BTA determination under CWA § 316(b). The Company states that the Draft Permit's requirements based on wedgewire screens with a 0.8 mm slot-width and a Unit 5 June outage are unsupported in fact or law. PSNH also states that Schiller's entrainment impacts are de minimis and do not qualify as "adverse environmental impact" (AEI) under the CWA. Furthermore, the Company suggests that the applicable regulations recognize that a facility with as low an intake flow as Schiller's would not have AEI under the statute. PSNH urges once more that the BTA for Schiller would be modified traveling screens and an improved fish return.

In addition, PSNH states that if Region 1 doesn't agree with the company's proposed BTA, then the Region must allow PSNH to submit new data to demonstrate the absence of AEI. PSNH further asserts that if the Region still concludes that AEI exists and wedgewire screens are needed, then Region 1 must allow PSNH to test screens with larger mesh sizes given that recent information suggests the efficacy of such screens. PSNH also states that if the Region still concludes that wedgewire screens are needed, then the Draft Permit's timeline is unreasonable and must be lengthened. Finally, PSNH also comments that a June outage for Unit 5 is neither possible nor economically sensible for the company or its customers, and that if wedgewire screens are required, then no outage or other operational requirement would be warranted.

Turning to NCMCW discharges, PSNH comments that in its view, the Draft Permit's BAT limits for NCMCWs are inconsistent with applicable law. The Company states that in the past such wastes have been treated as low volume wastes at Schiller under guidance from "the Jordan Memorandum" and that under the new ELGs, they should continue to be treated this way. As a result, according to the Company, no iron or copper limits should be imposed for NCMCWs. In addition, PSNH urges that Region 1's BPJ determination for the NCMCWs is inconsistent with the law because the Region has no data for individual NCMCWs to support its assessment. Furthermore, the Company states that the Region underestimates the difficulty and cost of addressing the proposed BAT limits at Schiller.

Again, Region 1 has carefully considered these comments and notes that PSNH repeats and elaborates upon them in its more detailed comments. Therefore, rather than respond here to the substance of the comments in the Introduction, Region 1 responds to them further below within its responses to PSNH's more detailed comments.

PSNH Comment II. General Background

PSNH Comment II.A. Public Service Company of New Hampshire

PSNH is a public utility headquartered in Manchester, New Hampshire, and is the largest power company in the State of New Hampshire, with more than 498,000 retail distribution customers served throughout the state in a 5,630-square-mile area that encompasses more than 200 New Hampshire communities. PSNH generates approximately 1,200 megawatts ("MW") of electricity from three fossil-fueled power plants, nine hydroelectric power plants, and a biomass facility. PSNH's generation fleet also includes five fossil-fueled combustion turbine "peaking units," each with nominal 20 MW nameplate generating capacity that contribute to regional reliability and operate only in times of high demand or high prices. [2] Cumulatively, PSNH has invested in excess of $80 million in environmental initiatives at Schiller Station since 2006, significantly reducing the Station's environmental footprint. Schiller Station currently meets all state and federal clean air requirements. PSNH has received numerous awards from the EPA and other agencies and organizations for its environmental and public service initiatives.[3]

[2] Additionally, PSNH has contracts to purchase renewable power from various privately owned biomass and hydroelectric facilities, as well as New Hampshire's first commercial-scale wind farm in Lempster, New Hampshire.

[3] For instance, PSNH has received the following: EPA "Environmental Merit Award," 1996 (recognizing PSNH's demonstrated commitment and significant contributions to the environment); "New Hampshire Governor's Award for Pollution Prevention," 1996 (awarded for installing the SCR at Merrimack Station); U.S. EPA "Certificate of Appreciation," 1999 (recognizing Merrimack's NOx emissions reduction project); "Lung Champion Award," 2003 (awarded by the American Lung Association of New Hampshire); "Secretary of Defense Employer Support Freedom Award," 2002 (awarded by the U.S. Department of Defense); U.S. Department of Energy Grant For Mercury Reduction Research, 2007; "Breathe New Hampshire Award," 2008 (recognizing exceptional commitment and support of Breathe New Hampshire); "Edison Electric Institute Common Goals Special Distinction-Environmental Partnerships Award," (recognizing efforts to collaborate with government agencies and environmental groups to develop an ozone reduction strategy); Northern New England Concrete Promotion Assn.'s "Excellence in Concrete Award," 2009; "Old Republic Insurance Safety Excellence During Construction," 2011; "URS Presidents Award" for 1.2M Safe Man-hours Worked, 2011; Power Magazine's "Top Plants - Six Innovative Coal Fired Plants," 2012 (pertaining to Merrimack Station); The EBC "Outstanding Environmental – Energy Technology Application Achievement Award," 2013; "The International Green Apple Award for Outstanding Environmental Achievement," 2013; ASCE-NH 2014 "Civil Engineering Achievement Award," 2015.

PSNH Comment II.B. PSNH's Schiller Station

Schiller Station, located in Portsmouth, New Hampshire, has a total electrical output of approximately 163 MW. It produces enough energy to supply tens of thousands of New Hampshire households. Schiller Station consists of three steam-electric generating units—Units 4, 5, and 6—along with one smaller, light fuel oil-fired peaking combustion turbine. Units 4, 5, and 6 each have a nameplate generating capacity of 48 MW. Units 4 and 6 are equipped with dual fuel boilers capable of firing either pulverized bituminous coal or #6 fuel oil. Unit 4 began operating in 1952. Unit 6 was placed in operation in 1957. Unit 5 began operating in 1955. In 2006, Unit 5 was repowered to burn clean wood chips for its primary fuel and is commonly referred to as the "Northern Wood Power Project." The conversion has added more than $380 million to the regional and local economies within the past nine years, as the facility has received greater than 150,000 deliveries of wood chips (weighing approximately 4.6 tons) from local foresters and has sustained 150-200 forestry-related jobs. The project has also earned state, regional, national, and international awards for its innovation and positive impacts to the environment. [4] It is touted as one of the cleanest boilers in New England and to date has generated more than 2.8 billion kilowatt hours of renewable energy to Eversource customers and the regional energy market.

Schiller Station is located on the southwestern bank of the Piscataqua River. The facility withdraws water from the waterbody to cool and condense steam produced in the facility's power production process. Schiller Station utilizes two once-through CWISs with a total design intake flow ("DIF") of 125.8 MGD.[5] One CWIS draws water from an intake tunnel that extends approximately 30 feet offshore from the north bulkhead ("Screen House #1) and provides cooling water to Unit 4. The other CWIS is located within the south bulkhead ("Screen House #2) and provides cooling water to Units 5 and 6.

Screen House #1 withdraws water from a 6.5-foot diameter tunnel located approximately two feet above the river bottom. [6] The river bottom is periodically maintained to preserve the two-foot elevation between the river bottom and the floor of the intake structure. The inlet is a concrete manifold equipped with a coarse bar rack designed to prevent large, submerged debris from entering the intake tunnel. Another fixed screen designed to prevent lobsters from entering the intake has been installed on the offshore intake, as well. To minimize environmental impact, water supplied to the two circulating water pumps that serve Unit 4 is equipped with one traveling water screen—a REX (Chain Belt Company) screen with 3/8-inch square copper wire mesh panels (basket segments). The screen is 5.5-feet wide and 28-feet high, and has 34 basket segments. It is rotated at least twice each day and often more frequently when there is significant debris in the Piscataqua River. A screenwash system consisting of pumps and associated piping and spray nozzles is used to keep the screen clean. The screenwash system uses five overlapping spray nozzles with 40 psi spray pressure to remove any aquatic organisms from the traveling water screen into the fish return trough that runs along the CWIS. The trough then funnels through a 14-inch diameter chute to discharge all aquatic organisms back to the Piscataqua River at an elevation of 4 feet above mean sea level ("MSL").

Screen House #2 has a total of four circulating water pumps and four traveling water screens. The two pumps located on the north side of Screen House #2 supply cooling water to Unit 5, while the two pumps located on the south side of Screen House #2 supply cooling water to Unit 6. Each set of pumps withdraws water through forebays that are separated by a partition wall and protected by a set of bar racks with 43/8-inch by 4-inch grating. The floor of Screen House #2 is at an elevation of 18 feet below MSL, and the deck is at an elevation of 10 feet above MSL. The river bottom elevation is 20 feet below MSL in the vicinity of the intake. Thus, the river bottom grade is approximately 2 feet below the floor of the intake, which provides a vertical barrier to the movement of bottom-oriented fish and shellfish into the CWIS. The river bottom in front of Screen House #2 is covered with rip rap to maintain the floor of the Screen House #2 CWIS at an elevation of 2 feet above the river bottom. The four traveling water screens designed to minimize impingement and entrainment for Screen House #2 are also REX (Chain Belt Company) screens with 3/8-inch square copper wire mesh panels (basket segments). Each screen is 5.5-feet wide and 29-feet high and is equipped with a screenwash system that is substantially similar to the one that services the screen for Screen House #1. The screens are rotated at least twice each day and often more frequently when there is significant debris in the Piscataqua River. The fish and debris return trough runs along the length of Screen House #2 and discharges to the river at an elevation of 8 feet above MSL.

PSNH's existing NPDES permit for Schiller Station allows it to discharge a maximum of 52.2 MGD of non-contact cooling water for Unit 4 into the Piscataqua River, not to exceed a monthly average of 43.5 MGD. Maximum and monthly average flows for non-contact cooling water utilized for Units 5 and 6 are each capped at 50.2 MGD. PSNH's current temperature permit limits are based on Region 1's previous determination that a § 316(a) variance was warranted. As discussed more fully below, Region 1 correctly determined in this permit renewal proceeding that PSNH has more than adequately demonstrated that continuation of its § 316(a) variance is warranted because no appreciable harm has resulted from past thermal discharges from Schiller Station.

[4] Specifically, the facility has won EPA's Clean Air Excellence Award, the N.H. Governor's Award for Pollution Prevention, the Green International Green Apple Award, the New Hampshire Timberland Owners Association's N.H. Outstanding Forest Industry Award, the Environmental Business Council of New England's Outstanding New Environmental/Energy Technology award, and the National Pollution Prevention Roundtable's Most Valuable Pollution Prevention Award.

[5] The average AIF is considerably less.

[6] There are two additional 6.5-foot diameter tunnels connected to Screen House #1 designed to provide cooling water to Unit 3, which is now retired. These two tunnels are not currently utilized by the facility.

EPA Response to PSNH Comment II.A and II.B

In Sections II.A and II.B of the General Background section of its comments, PSNH provides factual information about various aspects Schiller Station's operation, with particular focus on the facility's cooling water intake structures. PSNH notes that the traveling screens are typically rotated twice per day, but can be rotated more frequently when necessary due to high debris loadings from the river. In addition, the Company notes that it maintains a two-foot difference in the elevation of the river bottom and the intake so as to create a "vertical barrier" to benthic organisms entering the intake structure. PSNH also again expresses agreement with Region 1's proposed decision to renew Schiller's existing thermal discharge variance under CWA § 316(a).

PSNH Comment II.C. Piscataqua River

The Piscataqua River is a 13-mile-long tidal estuary formed by the confluence of the Salmon Falls and Cocheco Rivers. It flows southeastward, determining part of the boundary between the states of New Hampshire and Maine, and empties into the Portsmouth Harbor and the Atlantic Ocean. The drainage basin of the river is approximately 1,495 square miles, encompassing the additional watersheds of the Great Works River and five rivers flowing into Great Bay: the Bellamy, Oyster, Lamprey, Squamscott, and Winnicut.

Channel depths within the Piscataqua River range from 42 to 75 feet in the vicinity of Schiller Station. The width at the narrowest point of the River in this same vicinity is approximately 850 feet. The tide in the Piscataqua River is semi-diurnal, with an average period of 12.4 hours. Tidal flushing requires six to 12 tidal cycles (i.e., 3 to 6 days) and tidal mixing forces cause the water column to be vertically well mixed. Flow velocities in the vicinity of Schiller Station range from approximately 4.9 fps during ebb tide and 4.4 fps during flood tide. The peak tidal flows are approximately 117,000 cubic feet per second ("cfs") and the average freshwater discharge rate is approximately 1570 cfs.

The Piscataqua River is classified as both a water of the United States and as a water of the State of New Hampshire. The New Hampshire Department of Environmental Services ("NHDES") has designated the Piscataqua River as a Class B water in accordance with New Hampshire water quality standards, which require all surface waters to provide for the protection and propagation of fish, shellfish and wildlife, and for recreation in and on the surface waters, when feasible. [7] New Hampshire law identifies the designated uses of Class B waters as "[o]f the second highest quality," and further provides that such waters "shall be considered as being acceptable for fishing, swimming and other recreational purposes and, after adequate treatment, for use as water supplies." [8]

[7] *See* N.H. Code Admin. R. Ann. Env-Wq 1703.01.
[8] N.H. Rev. Stat. Ann. § 485-A:8(II) (1998).

EPA Response to PSNH Comment II.C

In Section II.C of the General Background section of its comments, PSNH provides factual information about the physical characteristics of the Piscataqua River and its watershed, as well as its water quality classification by the State of New Hampshire.

PSNH Comment III. Current NPDES Permit

Region 1 issued Schiller Station's current NPDES permit on September 11, 1990. This permit included a variance for Schiller Station's thermal discharges because PSNH adequately demonstrated that its thermal discharges have not caused appreciable harm to the BIP of the Piscataqua River. To minimize impingement and entrainment, the 1990 permit established Schiller Station's existing traveling screens and fish return system as BTA. The 1990 permit, for the most part, also set reasonable limits, including monitoring and reporting requirements, for each of the then-existing outfalls at Schiller Station. In 1995, PSNH timely submitted a complete application for renewal of the 1990 NPDES permit for Schiller Station. [9] The company submitted an updated renewal application in 2010 in response to a CWA Section 308 information request issued by Region 1.[10] The 1990 permit has been administratively continued and remains in effect today.

[9] *See* Document AR-044 of Region 1's compiled administrative record for this Draft Permit, available here: http://www3.epa.gov/region1/npdes/schillerstation/index.html. Hereinafter, references to the agency's administrative record will be cited as "AR-XXX."
[10] *See* AR-139.

EPA Response to PSNH Comment III. Current NPDES Permit

In these comments, PSNH outlines a chronology of events related to Schiller's 1990 NPDES Permit and the company's 1995 application for permit renewal, as well as its 2010 update to the renewal application. In addition, PSNH notes that the 1990 Permit's thermal discharge limits were based on a variance under CWA § 316(a), and its cooling water intake structure requirements were based on a determination that the Schiller's existing traveling screens and fish return system constituted the BTA under CWA 316(b) for the facility. More detailed comments about the present determinations under CWA §§ 316(a) and 316(b) are discussed and responded to below.

PSNH Comment IV. Legal Issues and Standards of Review

Region 1 correctly determined that both the final regulations promulgated in 2014 setting categorical technology-based requirements under CWA § 316(b) for CWISs at existing facilities and the 2015 effluent limitations guidelines and standards for the steam electric power generating point source category are applicable to, and will be applied in, this permit renewal proceeding. [11] As to the new final § 316(b) rule, Region 1 unequivocally and aptly stated that "[t]hese standards apply to Schiller Station." [12] The NELGs had not yet been finalized at the time Region 1 issued the Draft Permit on September 30, 2015. Accordingly, Region 1 provided in its Fact Sheet for the Draft Permit that "EPA will apply the [NELGs] to the extent appropriate" "if the [NELGs are] in effect at the time that a new Final Permit is issued to Schiller Station." [13] The NELGs were promulgated on November 3, 2015, and became effective on January 4, 2016.[14] Region 1 is therefore obligated to apply these uniform, technology-based standards applicable to the steam electric power generating industry. This is true even if Region 1 were in the position to issue the Draft Permit as final one day after the effective date of NELGs because Region 1 may not create alternative, case-by-case effluent and/or technological limitations based on its BPJ when guidelines are in the place that apply to a particular point source. BPJ-based limits are permissible only when no standardized effluent limitations exist. Once categorical limitations are established, the agency's authority to establish BPJ-based standards ceases to exist. [15] Region 1 acknowledged this reality in its Fact Sheet to the Draft Permit, [16] and PSNH concurs with Region 1's conclusion on this topic.

Region 1's Draft Permit for Schiller Station contains certain key flaws that are not supported by the factual record and have no basis in law. As discussed more extensively below, components of Region 1's Draft Permit are based on the agency's erroneous application of and determinations under the CWA. Specifically, § 316(b) requires EPA to ensure that CWISs are located, designed, and constructed in a way that minimizes impingement and entrainment of biological organisms in the body of water from which cooling water is withdrawn. Additionally, CWA § 304 authorizes EPA to establish case-by-case BAT effluent limitations pursuant to its BPJ only after completing a thorough analysis of a number of specific factors.

In the Draft Permit, Region 1 failed to establish a rational or reasonable basis for its proposed § 316(b) and § 304 permit requirements. Region 1 must consider these and other comments regarding the inadequacy of its Draft Permit and address these inadequacies in the final permit. Region 1's final permit cannot stand if it is found to be "arbitrary, capricious, an abuse of discretion, or otherwise not in accordance with the law." [17] As is made clear by these comments, Region 1's current Draft Permit contains limits and requirements that are arbitrary and capricious, not in accordance with law, and that are not supported by the record. Region 1 simply has not "fully [explained] its course of inquiry, its analysis, and its reasoning." [18]

A court will review Region 1's factual permit determinations under the Administrative Procedure Act's ("APA") arbitrary and capricious standard. [19] The APA requires the reviewing court to "hold unlawful and set aside agency action, findings, and conclusions found to be . . . arbitrary, capricious, an abuse of discretion, or otherwise not in accordance with the law." [20] An agency decision is arbitrary and capricious if "the agency has relied on factors which Congress has not intended it to consider, entirely failed to consider an important aspect of the problem, offered an explanation of its decision that runs counter to the evidence before the agency, or is so implausible that it could not be ascribed to a difference in view or the product of agency expertise." [21] Questions of law will be determined by a two-step process established by the U.S. Supreme Court. [22]

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[11] See Fact Sheet at 9-10; see also 79 Fed. Reg. 48,300 (Aug. 15, 2014) (National Pollutant Discharge Elimination System—Final Regulations To Establish Requirements for Cooling Water Intake Structures at Existing Facilities and Amend Requirements at Phase I Facilities; Final Rule) ("final § 316(b) rule"); 80 Fed. Reg. 67,838 (Nov. 3, 2015) (Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category) ("NELGs").

[12] Fact Sheet at 10.

[13] *Id*. at 10 n.1.

[14] *See* 80 Fed. Reg. at 67,838.

[15] *See* NRDC v. EPA, 822 F.2d 104, 111 (D.C. Cir. 1987) (noting that a state or permit writer may set BPJ based limits only when there is no national standard that has been promulgated for a point-source category); Citizens Coal Council v. EPA, 447 F.3d 879, 881 n.11 (6th Cir. 2006) (noting that BPJ applies only when "EPA has not promulgated an applicable guideline"); see also Riverkeeper v. U.S. E.P.A., 358 F.3d 174, 203 (2d Cir. 2004) ("It is, of course, true that once the EPA promulgates applicable standards, regulation of those facilities subject to those standards on a best professional judgment basis must cease"); Letter from Jim Hanlon, Director, Office of Wastewater Management, to Water Division Directors Regions 1-10 (June 7, 2010) (commonly referred to as the "Hanlon Memorandum") (acknowledging that BPJ-based limits are only to be included in permits "until such time [as the NELGs are] promulgated.") (emphasis added).

[16] *See* Fact Sheet at 10.

[17] 5 U.S.C. § 706(2)(A).

[18] *See* Reynolds Metals Co. v. EPA, 760 F.2d 549, 559 (4th Cir. 1985), (quoting Tanner's Council of Am.,

Inc. v. Train, 540 F.2d 1188, 1191 (4th Cir. 1976)).

[19] Pamlico-Tar River Found v. U.S. Army Corps of Eng'rs, 329 F. Supp. 2d 600, 612 (E.D.N.C. 2004) ("agency action under the CWA is reviewed under the arbitrary and capricious standard"); c.f., Conservation Law Found v. Fed. Highway Admin., 827 F. Supp. 871, 885 (D.R.I. 1993) aff'd, 24 F.3d 1465 (1st Cir. 1994) ("under the APA standard, courts reviewing permit Section 404 decisions must determine whether the Corps' action was 'arbitrary, capricious, an abuse of discretion, or otherwise not in accordance with law.'" (citing 5 U.S.C. § 706(2)(A); Hough v. Marsh, 557 F. Supp. 74, 81 (D.Mass.1982)).

[20] Alliance to Save the Mattaponi v. U.S. Army Corps of Eng'rs, 606 F. Supp. 2d 121, 127 (D.D.C. 2009) (citing 5 U.S.C. § 706(2)(A)).

[21] *Id*. (citing Motor Vehicle Mfrs. Ass'n v. State Farm Mut. Auto. Ins. Co., 463 U.S. 29, 43, 103 S. Ct. 2856, 77 L.Ed.2d 443 (1983)).

[22] *See* Defenders of Wildlife v. Browner, 191 F.3d 1159, 1162 (9th Cir. 1999) opinion amended on denial of reh'g, 197 F.3d 1035 (9th Cir. 1999)

> [T]he Supreme Court devised a two-step process for reviewing an administrative agency's interpretation of a statute that it administers…Under the first step, we employ 'traditional tools of statutory construction' to determine whether Congress has expressed its intent unambiguously on the question before the court…If the intent of Congress is clear, that is the end of the matter; for the court, as well as the agency, must give effect to the unambiguously expressed intent of Congress. If instead Congress has left a gap for the administrative agency to fill, we proceed to step two. At step two, we must uphold the administrative regulation unless it is arbitrary, capricious, or manifestly contrary to statute.

(internal quotations omitted) (citing Chevron U.S.A. Inc. v. Natural Resources Defense Council, Inc., 467 U.S. 837, 842-44 (1984)).

EPA Response to PSNH Comment IV. Legal Issues and Standards of Review

When issuing the Draft Permit to Schiller in 2015, Region 1 explained that the EPA's 2014 Final CWA § 316(b) Regulations for Cooling Water Intake Structures at Existing Facilities (the 2014 Final Rule or Final Rule) had come into effect and applied to the permit. PSNH comments that it agrees. While litigation challenging the 2014 CWA § 316(b) Regulations is ongoing, the court has not yet ruled on the merits of the challenges and the regulations remain in effect and applicable to the Schiller permit.

In issuing the Draft Permit, EPA also discussed its then forthcoming Steam-Electric ELGs and indicated that the new regulations would apply to the Final Permit if they were in effect at the time of permit issuance. *See* 40 C.F.R. §§ 122.43(b)(1) and 125.94(a). *See also* Fact Sheet at 9-10 and 81-84. Since the final Steam-Electric ELGs became effective on January 4, 2016, *see* 80 Fed. Reg. 67838 (Nov. 3, 2015) (Final Rule), they became applicable to the Final Permit. In this regard, PSNH comments that it agrees with Region 1 about the applicability of these regulations to Schiller's NPDES permit. Since January 2016, the status of the 2015 Steam-Electric ELGs has become more complicated, but the bottom-line with respect to their application to Schiller Station's NPDES permit has not changed.

In early 2017, EPA received multiple administrative petitions asking it to reconsider various aspects of the 2015 Steam-Electric ELGs. After considering the petitions, EPA agreed that it should reconsider certain of the standards in the ELGs. Specifically, EPA decided that it is appropriate and in the public interest to conduct a rulemaking to potentially revise the BAT limitations and Pretreatment Standards for Existing Sources (PSES) established by the 2015 Rule for flue gas desulfurization (FGD) wastewater and bottom ash transport water. EPA then issued a new Final Rule, *see* 82 Fed. Reg. 43494 (Sept. 18, 2017) (*Postponement of Certain Compliance Dates for the Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category)*, postponing for two years the earliest compliance dates for the new, more stringent, BAT effluent limitations and PSES for bottom ash transport water and FGD wastewater that were included in the 2015 Steam-Electric ELGs. EPA explained that during this time it would be able to reconsider these particular standards and decide whether to modify them. 82 Fed. Reg. at 43494. The 2017 Final Rule does not revise any other requirements of the 2015 Steam-Electric ELGs. As a result, the 2017 Final Rule does not affect the Schiller Station permit because the facility does not discharge FGD wastewater or bottom ash transport water. Schiller Station *does* discharge non-chemical metal cleaning wastes (NCMCWs), and the development of effluent limits for this type of waste is discussed in the preamble to the 2015 Steam-Electric ELGs, but the 2017 Final Rule does not postpone or alter the 2015 Rule's approach to these wastes. Therefore, the analysis and approach to regulating NCMCWs language included in the 2015 preamble, as mentioned above and as discussed at length throughout EPA's responses to comments, remains applicable and is not subject to postponement or amendment.

Several legal challenges to the 2015 Steam-Electric ELGs were filed and that litigation is still ongoing, but the part of the case dealing with FGD wastewater and bottom ash transport wastewater has been stayed pending EPA's new rulemaking effort.

PSNH states the view that Region 1's determinations for the Draft Permit that set BTA requirements under CWA § 316(b) and BAT requirements under CWA §§ 301 and 304 lack a rational basis and are unsupported by fact or law. Citing *Reynolds Metals Co. v. EPA*, 760 F.2d 549, 559 (4th Cir. 1985), (quoting *Tanner's Council of Am., Inc. v. Train*, 540 F.2d 1188, 1191 (4th Cir. 1976)), the company asserts that Region 1 has not adequately explained the analysis supporting its conclusions and that those conclusions are arbitrary and capricious. Region 1 disagrees with these comments, as will be discussed in detail below in response to PSNH's more detailed comments. The citation to *Reynolds* in no way establishes any infirmity in the Region's support for the permit.

In addition, PSNH briefly explains that the "arbitrary and capricious standard" is derived from the APA and quotes from certain court cases to illustrate how that standard has been applied. PSNH further points out that questions regarding EPA's interpretation of the Clean Water Act will be governed by the judicial "two-step" analysis set forth in *Chevron U.S.A. Inc. v. Natural Resources Defense Council, Inc.*, 467 U.S. 837, 842-44 (1984)). A footnote in PSNH's comment quotes from a court decision explaining the two-step analytical construct under *Chevron*. Region 1 agrees with these general comments regarding the arbitrary and capricious standard under the APA and the two-step *Chevron* test that defines the contours of judicial deference to administrative agency interpretations of federal statutes. Region 1 maintains, however, that its Draft and Final Permits satisfy the requirements of the Clean Water Act as well as the APA's arbitrary and capricious standard. Moreover, in EPA’s view, its interpretations of the Clean Water Act would be upheld under an application of the Chevron analysis. EPA also notes that a final permit decision by Region 1 would be reviewed in the first instance by EPA’s Environmental Appeals Board (EAB) and only after EAB review could the permit be challenged in court. *See* 40 C.F.R. §§ 124.19(a) and (l).

PSNH Comment V. PSNH’S Comments on the Draft Permit

PSNH strongly urges Region 1 to reconsider and revise key portions of its Draft Permit for Schiller Station. Region 1 correctly determined the existing § 316(a) variance should be continued in the new final permit for Schiller Station. However, the agency’s § 316(b) BTA determination, as well as its decision to establish BPJ-based BAT effluent limits for NCMCWs, are flawed and unsupported by the existing record, rendering them arbitrary and capricious. Modified traveling water screens with an upgraded fish return system are BTA for the CWISs at Schiller Station. Region 1’s conclusion that fine-mesh CWW screens are necessary to address entrainment is erroneous, as is the proposed June outage for Unit 5 at the facility. There is no evidence that operation of the CWISs at Schiller Station is having any detrimental or adverse impact on the BIP—a fact with which Region 1 expressly agreed in its Fact Sheet. In fact, entrainment at Schiller Station is de minimis based on the relatively small amount of cooling water withdrawn at the facility compared to the rest of the industry and because Schiller Station’s cooling water withdrawals constitute a mere 0.0018 percent of the peak Piscataqua River withdrawal zone flow during each tidal cycle.

If Region 1 does not agree with PSNH’s proffered § 316(b) technology, the agency must allow the company to submit entrainment data and analyses equivalent to information facilities withdrawing in excess of 125 MGD AIF are required to submit to their respective permit writers, in accordance with the final § 316(b) rule. Then, and only then, would Region 1 possess the minimum amount of information it needs to render a reasoned BTA determination. This additional information would confirm that technologies to address entrainment are not necessary at Schiller Station. Were that somehow not the ultimate result, Region 1 must at the very least allow PSNH to test CWW screens with a slot-width larger than the 0.8 mm Region 1 has prescribed as a maximum potential opening due to discoveries in recent years that demonstrate larger slot-width CWW screens can be just as effective as smaller ones at reducing entrainment in certain ecological environments—like the Piscataqua River.

The agency’s actual BAT analysis for establishing BPJ-based effluent limitations for NCMCWs at Schiller Station is also arbitrary and capricious. Region 1 has no data of isolated NCMCWs generated at Schiller Station. Without it, the agency cannot determine whether its proposed regulation of the waste stream is cost-effective. The agency also grossly underestimates the significant costs and/or logistical problems that regulation of NCMCWs in the manner it has proposed would present at Schiller Station. Section 304(b)(2)(B) of the CWA and EPA’s regulations require Region 1 to take these and other factors into consideration when adopting site-specific effluent limitations. A thorough BAT analysis, coupled with a review of the historical permitting record, should lead Region 1 to only one conclusion: NCMCWs must continue to be classified as a low volume waste in the new final permit for Schiller Station.

Each of these allegations of error is discussed at length in the comments that follow.

EPA Response to PSNH Comment V:

In this introductory portion of its detailed comments, PSNH again comments that Region 1's Draft Permit correctly proposed to renew Schiller's thermal discharge variance under CWA § 316(a). The Region agrees.

PSNH also, however, again comments that Region 1's BTA determination under CWA § 316(b) is arbitrary and capricious. PSNH again states that the modified traveling screens and an improved fish return at Schiller would satisfy the BTA standard and that the Draft Permit's requirements based on wedgewire screens with a 0.8 mm slot-width and a Unit 5 outage in June are erroneous. In addition, PSNH states that there is no evidence that Schiller's water withdrawals are having any detrimental or adverse effect on the balanced, indigenous population (BIP) of organisms in the Piscataqua River around Schiller Station. PSNH further contends that Schiller's entrainment and does not qualify as "adverse environmental impact" (AEI) under CWA § 316(b) and is de minimis.

In addition, PSNH states that if Region 1 doesn't agree with the company's proposed BTA, then the Region must allow PSNH to submit new "entrainment data and analyses equivalent to information facilities withdrawing in excess of 125 MGD AIF are required to submit to their prospective permit writers, in accordance with the final § 316(b) rule." PSNH further asserts that if the Region still concludes that AEI exists and wedgewire screens are needed, then Region 1 must allow PSNH to test screens with larger mesh sizes given that recent information suggests the efficacy of such screens.

Turning to NCMCW discharges, PSNH comments that the Draft Permit's BAT limits for NCMCWs are arbitrary and capricious. In addition, PSNH argues that Region 1's BPJ determination for the NCMCWs is inconsistent with the law because the Region has no data for isolated NCMCWs to support its assessment and that without this information, the Region cannot assess the difficulty and cost of addressing the proposed BAT limits at Schiller. PSNH concludes that NCMCWs should "continue to be classified as a low volume waste."

Again, Region 1 has carefully considered these comments and notes that PSNH repeats and elaborates upon them in its more detailed comments below. Therefore, rather than respond here to the substance of the general introductory comments, Region 1 responds to them farther below in conjunction with its responses to PSNH's more detailed comments.

PSNH Comment V.A Region 1 Correctly Determined that PSNH's Existing Variance Should Be Continued in the Renewed Final Permit

PSNH has made the requisite showing under CWA Section 316(a) that it is entitled to a continuation of its variance from Section 301 standards for its thermal discharges at Schiller Station. Specifically, PSNH has demonstrated that no appreciable harm has resulted from thermal discharges from Schiller Station through existing Outfalls 001, 002, 003, and 004 and that a BIP exists in the Piscataqua River. Thus, PSNH has demonstrated that the alternative limits it seeks will assure the protection and propagation of the BIP within the waterbody. Region 1 correctly confirmed this determination in its continuation of the existing thermal variance applicable to Schiller Station in the Draft Permit.

Under CWA § 301, because Schiller Station is a discharger of heat, it must satisfy both technology based standards and water quality standards, or obtain a variance from these standards under CWA § 316(a). CWA § 316(a) allows Region 1 to grant a variance from § 301 standards whenever:

> the owner or operator…can demonstrate…that any effluent limitation proposed for the control of the thermal component of any discharge from such source will require effluent limitations more stringent than necessary to assure the protection and propagation of a balanced, indigenous population of shellfish, fish, and wildlife in and on the body of water into which the discharge is made…[23]

If successful in this demonstration, Region 1 may instead impose alternative effluent limitations on thermal discharges "that will assure the protection and propagation of a [BIP] of shellfish, fish, and wildlife in and on that body of water." BIP is not defined by statute or regulations; however, "balanced, indigenous community" (which the regulations state is synonymous with BIP) is defined as "a biotic community typically characterized by diversity, the capacity to sustain itself through cyclic seasonal changes, presence of necessary food chain species and by a lack of domination by pollution tolerant species. Such a community may include historically non-native species introduced in connection with a program of wildlife management and species whose presence or abundance results from substantial, irreversible environmental modifications." [24]

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

> [R]eading CWA sections 301 and 316(a) together, the statute and regulations in effect establish a three- (and sometimes four-) step framework for obtaining a variance: (1) the Agency must determine what the applicable technology and WQS-based limitations should be for a given permit; (2) the applicant must demonstrate that these otherwise applicable effluent limitations are more stringent than necessary to assure the protection and propagation of the BIP; (3) the applicant must demonstrate that its proposed variance will assure the protection and propagation of the BIP; and (4) in those cases where the applicant meets step 2 but not step 3, the Agency may impose a variance it concludes does assure the protection and propagation of the BIP. [25]

EPA has promulgated regulations describing the factors, criteria, and standards for the establishment of effluent standards issued under a § 316(a) variance. [26] These regulations restate the requirements of § 316(a) and require the applicant to demonstrate that an alternative effluent limitation will "assure the protection and propagation of a balanced, indigenous community..." [27] For existing sources, this demonstration is based on the "absence of prior appreciable harm." [28]

Existing sources can show that there has been no appreciable harm in one of two ways:
(1) by employing a retrospective demonstration showing "that no appreciable harm has resulted from the normal component of the discharge[,] taking into account the interaction of such thermal component with other pollutants and the additive effect of other thermal sources to [the BIP]," or (2) through a prospective demonstration showing that, "despite the occurrence of such previous harm, the desired alternative effluent limitations (or appropriate modification thereof) will nevertheless assure the protection and propagation of [the BIP].[29] PSNH has demonstrated that no appreciable harm has resulted from its prior thermal discharges at Schiller Station through a retrospective analysis. [30]

"Appreciable harm" is not defined in EPA's regulations. However, EPA has attempted to give some meaning to the term in case law and guidance documents. In a 1974 guidance document for § 316(a), EPA describes "appreciable harm" as damage to the BIP resulting in "a substantial increase" of nuisance or heat tolerant species, a "substantial decrease" in formerly indigenous species, a "substantial" reduction of trophic structure, "reduction of the successful completion of life cycles of indigenous species," an "unaesthetic appearance, odor or taste of the waters," and "elimination of an established or potential economic or recreational use of the waters." [31]

"It is not intended that every change in flora and fauna should be considered appreciable harm;"[32] nor do all levels of impacts to a fish community rise to "appreciable harm." In fact, EPA's own guidance plainly states that some level of impact is acceptable.[33] Both the EAB and Region 1 have confirmed this interpretation.[34] In sum, an existing discharger is entitled to a § 316(a) variance if, as noted above, it shows that it has evaluated the typical indicators of long-term thermal effects (e.g., abundance, diversity, community composition) in an appropriate manner, and determined that there is no reasonable indication of thermal impacts attributable to the discharge in question.

By and through the studies and data submissions provided to Region 1 over the years, coupled with field data Region 1 collected on its own volition, PSNH has demonstrated [35] both that: (1) no appreciable harm to the BIP has resulted from thermal discharges from Schiller Station; and (2) continuation of the § 316(a) variance at Schiller Station will continue to assure the protection and propagation of the BIP. The fact that Schiller Station has significantly reduced its actual intake and corresponding discharge flows of non-contact cooling water utilized for Units 4 and 6 in recent years provides an additional margin of safety and further supports the aforementioned conclusions. Region 1 correctly agreed with PSNH's demonstrations and conclusions in the Fact Sheet and Draft Permit:

> The width and depth of the river unaffected by the Facility's thermal plume allows sufficient zone of passage for both swimming and drifting organisms. Swimming organisms have a large section of the river available in the event an avoidance response is triggered by the thermal plume. Such avoidance behavior due to elevated temperatures would only occur, if at all, in a very small area within the mixing zone. In EPA's

judgment, the thermal discharge represents little or no impediment to fish migration up or down the Piscataqua River. Moreover, EPA concludes that the thermal plume will not degrade fishing opportunities in the vicinity of Schiller Station.

Because the Piscataqua River in the area of the station retains a large portion of the river that is unaffected by the thermal plume, adult and juvenile fish species have the opportunity to easily avoid the elevated water temperature long before potential lethality is a consideration, if at all. This avoidance behavior is not judged to adversely affect the fish species. [36]

Region 1's determination is well-supported and should be included in the final permit eventually issued by the agency.

PSNH's Requests to Increase the Effluent Temperature Limit to 100°F and "Delta-T" Limit from 25°F to 30°F at Schiller Station

Region 1 proposed in its Fact Sheet to reject PSNH's requests that: (1) the temperature limits in the new final permit be raised to 100°F for cooling water discharges at Schiller Station; and (2) the temperature difference or rise between the withdrawal and discharge of water at the facility be increased from 25°F to 30°F at all times, instead of allowing a 30°F "Delta-T" for only a two-hour period during condenser maintenance for the combined Outfalls 002, 003, and 004.[37] The basis of the agency's rejection is a purported lack of data and analysis submitted by the company demonstrating that the protection and propagation of the BIP will be assured with these different thermal limitations. [38] PSNH respectfully disagrees with this conclusion. The existing record contains sufficient data and analysis regarding the limited impact of the existing thermal plume in the Piscataqua River to support a conclusion that the BIP will continue to be adequately protected even if the Station's thermal discharges increase on rare occasions by 5°F, and/or the Delta-T between the withdrawal and discharge temperatures periodically increases by 5°F. Although PSNH believes the agency already has ample evidence to make this determination, PSNH requests the opportunity to submit additional data or analyses.

PSNH requests that Region 1 revise the Draft Permit to allow PSNH the option to discharge at these requested temperature values on a conditional basis during one or more defined periods of time, subject to PSNH's collection and submission of the necessary data establishing that the protection and propagation of the BIP will be assured with these different thermal limitations. Alternatively, PSNH requests that Region 1: (1) notify PSNH if the agency is willing to allow the company to submit documentation supporting its requests prior to the new permit being issued as final; or (2) include a provision in the final permit that specifically provides PSNH with the option to submit documentation demonstrating that the BIP would continue to be adequately protected if the: (a) thermal discharge limitations applicable Outfalls 002, 003, and 004 at Schiller Station are increased by 5°F; and/or (b) Delta-T between the withdrawal and discharge of water at the facility is increased from 25°F to 30°F at all times; coupled with a statement confirming that Region 1 will timely reopen the final permit to incorporate these new thermal limitations upon determining that PSNH's submission justifies the permit modifications. PSNH is confident that under any of the scenarios its submission will confirm the continued, adequate protection of the BIP.

[23] 33 U.S.C. § 1326(a).

[24] 40 C.F.R. § 125.71(c).

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

[26] *See* 40 C.F.R. §§ 125.70-73.

[27] *Id*. § 125.73(a).

[28] *Id*. § 125.73(c)(1).

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

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

[31] See EPA, Draft 316(a) Technical Guidance – Thermal Discharges, at 23 (Sept. 30, 1974).

[32] See id. Additionally, in Brayton Point I, 12 E.A.D. at 565 n.118, the EAB stated that "[w]e note that the word 'measurable' is a synonym for 'appreciable.' (citing The Doubleday Roget's Thesaurus in Dictionary Form 31 (Sidney I. Landau & Ronald J. Bogus, eds., 1977)). In response to comments on Brayton Point's NPDES permit specifically regarding the facility's § 316(a) variance request, EPA stated that a thermal discharge must cause a significant delay in the recovery of a BIP of fish, shellfish, and wildlife to qualify as appreciable harm. See EPA Responses to Comments at III-8, Public Review of Brayton Point Station, NPDES Permit No. MA0003654 (Oct. 3, 2003) ("Brayton Response to Comments"). Moreover, EPA agreed with the permittee that "even significant adverse effects on a few species do not necessarily require a finding of appreciable harm to the BIP that would preclude a § 316(a) variance . . ."to the extent that the commenter is saying that even significant adverse effects on a few species might not create a 100 percent inviolate requirement that no § 316(a) variance could be issued." See id. at III-35; see also Brayton Point I, 12 E.A.D. at 574–75 (noting that EPA selected a temperature limitation that "represent[s] an acceptable level of impact but [does] not represent a zero impact temperature") (citing Brayton Response to Comments at III-11); In re Dominion Energy Brayton Point, LLC, 13 E.A.D. 407 (EAB 2007) (finding that § 316(a) does not require a "'no effects' standard" to prove no prior appreciable harm).

[33] See, e.g., Draft Interagency 316(a) Technical Guidance Manual & Guide for Thermal Effects Sections of Nuclear Facilities Environmental Impact Statements, at 23 (May 1, 1977) (reductions in macroinvertebrate community diversity and standing crop "may be cause of the denial of a 316(a) waiver" but "applicant can [still otherwise] show that such reductions cause no appreciable harm") (emphasis added).

[34] See, e.g., Wabash, 1 E.A.D. at 600–01 (noting that in cases, stability of community as a whole may be more dispositive than level of harm to individual species); Brayton Point I, 12 E.A.D. at 574 n.138, 139 (upholding EPA Region 1's analysis that adverse effects are allowable to the extent that they do not interfere with protection and propagation of BIP).

[35] See, e.g., AR-021 to AR-023; AR-038 to AR-043; AR-121.

[36] Fact Sheet at 64–65.

[37] Id, at 69, 77.

[38] See id.

EPA Response to PSNH Comment V.A:

EPA has considered PSNH's comments and acknowledges the Company's agreement with EPA's CWA § 316(a) determination for the Draft Permit to the extent that it proposed to grant PSNH's request for renewal of the existing permit's thermal discharge limits. PSNH states that

"Region 1's determination is well-supported and should be included in the final permit eventually issued by the agency." EPA agrees and the Final Permit does just that.

EPA also notes that PSNH's comments rely to a significant extent on EPA's 1974 Draft CWA § 316(a) Guidance, but the 1974 Draft Guidance has been superseded by another draft guidance document co-issued by EPA and the Nuclear Regulatory Commission (NRC) in 1977. *See* AR-383 (U.S. EPA, *Interagency 316(a) Technical Guidance Manual and Guide for Thermal Effects Sections Of Nuclear Facilities Environmental Impact Statements*, (May 1, 1977) (http://www.epa.gov/npdes/pubs/owm0001.pdf), p. 8). *See also* EPA Guidance Memorandum, "Implementation of Clean Water Act Section 316(a) Thermal Variances in NPDES Permits (Review of Existing Requirements)" (October 28, 2008). While there are similarities between the analytical approaches discussed in the 1974 and 1977 draft guidance documents, they are not identical, and EPA did not rely on the superseded 1974 Draft Guidance. EPA, instead, relied on the subsequent guidance documents, among other sources.

EPA also notes that PSNH disagrees with EPA's decision to deny the Company's request under CWA § 316(a) to increase both the maximum temperature limit and delta-T limit by 5°F, to 100°F and 30°F, respectively, and to eliminate thermal discharge limits for Outfall 001. In the Fact Sheet, EPA explained that it was denying PSNH's request primarily because "… PSNH has not made an adequate demonstration, or really any demonstration at all, that the protection and propagation of the BIP will be assured with discharges at that [increased] level." AR-259, p. 69. PSNH's comment offers only a conclusory contradiction of EPA's determination. The Company does not point to specific data that supports its view that the BIP will be protected despite the requested relaxation of thermal discharge limits. Instead, it simply asserts that "[t]he existing record contains sufficient data and analysis regarding the limited impact of the existing thermal plume in the Piscataqua River to support a conclusion that the BIP will continue to be adequately protected even if the Station's thermal discharges increase on rare occasions by 5°F, and/or the delta-T between the withdrawal and discharge temperatures periodically increases by 5°F." This is insufficient to carry the Company's burden under CWA § 316(a). The record that establishes that Schiller Station's *existing* thermal discharges have not caused appreciable harm to the BIP does *not* also establish that increased thermal discharges (up to 100°F and a delta-T of 30°F) also would not cause appreciable harm.

Perhaps recognizing that it has not provided supporting data with its permit application, PNSH requests the opportunity to provide additional data to EPA so that it can try to make its case in the future in favor of the increased thermal discharge limits. The Company proposes three different ways that EPA could accept such new information: 1) write the new Final Permit to conditionally allow PSNH to discharge at the higher levels for specified periods of time during which the Company would collect relevant data to submit to EPA; 2) delay Final Permit issuance to allow PSNH time to collect and submit additional data; or 3) issue the new Final Permit with a provision expressly giving the Company the option to collect and submit additional data to support its requested increases in thermal discharge limits and providing that EPA will adjust the permit's thermal limits if the Agency is convinced that the Company has carried its burden under CWA § 316(a).

While EPA is not specifically adopting any of the three options proposed by PSNH, the Agency's approach for the Final Permit is similar, in effect, to the third option proposed by the Company. Under EPA's approach, PSNH will be able to submit additional information in the future for EPA's consideration. EPA's reasoning is explained below.

First, EPA declines PSNH's suggestion that Schiller Station be *conditionally* authorized to discharge waste heat at the higher requested levels. As explained in the Fact Sheet and in these Responses to Comments, it has not been established that these limits will satisfy CWA § 316(a) or New Hampshire water quality standards. Moreover, the CWA does not authorize EPA to approve discharges that do not meet applicable requirements. Therefore, EPA cannot authorize discharges at the requested levels, which have not yet been justified, in order to see how things turn out.

Second, EPA declines to further delay the issuance of the Final Permit for Schiller Station for the collection, submission and review of additional data. Region 1 last issued Schiller Station's NPDES permit on September 11, 1990. This permit expired on September 10, 1995, but was administratively continued because the Station submitted a timely and complete application for permit reissuance. *See* 40 C.F.R. § 122.6(a). Thus, the permit has been administratively continued for more than 20 years. Extending this delay is not acceptable to EPA given that it has sufficient information to make the necessary determinations and issue the Final Permit, and does not believe further delay is necessary or advisable. EPA also notes that it has been sued twice over delay in reissuance of the Schiller Station permit and that the First Circuit indicated that it expected EPA to work diligently to issue the new permit. This is exactly what EPA has been doing. EPA is not issuing the new permit *because* it was sued over the permitting delays – EPA would be working to reissue the Schiller permit regardless of the law suits – but the fact that the Agency has been sued over delays in reissuing Schiller Station's permit is an additional consideration that militates against agreeing to unnecessary delay.

Finally, EPA declines to include in the permit a provision stating that PSNH may submit additional information and that EPA "will timely reopen the final permit" if it decides that the new information would justify revision of the permit's thermal discharge limits. Part II.A.4 of the Final Permit does, however, provide, in pertinent part, as follows:

> 4. <u>Reopener Clause</u>
> 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.
>
> *   *   *
>
> 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.

See also Part II.A.4 of 1990 Permit. (EPA notes that neither 40 C.F.R. § 122.62(a)(7) nor 40 C.F.R. § 122.44(c), which provide for permit "reopeners" in certain situations, apply to the thermal discharges limits at issue here.)

Under EPA's permit modification regulations, *see* 40 C.F.R. § 122.62(a)(2), PSNH may submit new data and request a permit modification whenever it is ready to do so. If PSNH provides compelling justification for relaxing the permit's thermal discharge limits under CWA § 316(a), then EPA may modify the permit under 40 C.F.R. § 122.62(a). If PSNH, or another interested person, finds EPA's response to such a modification request to be unacceptable, it may challenge EPA's response. *See* 40 C.F.R. §§ 124.5(b), 124.15(a), and 124.19(a). Beyond that, EPA finds that it is unnecessary, and that it would be unwise, for the Agency to commit in advance to a particular approach or timeline for handling a modification request. Instead, EPA would need to consider any modification request in light of the circumstances surrounding the request and any competing work priorities demanding Agency focus at the time. PSNH is free to collect and submit new information and request a permit modification from EPA on the basis of that information and the requirements of EPA's permit modification regulations.

With regard to obtaining data that PSNH could use in trying to demonstrate that the permit's maximum temperature and/or delta-T limits could be raised, EPA suggests that rather than discharge waste heat in violation of applicable permit limits, PSNH should conduct a modeling analysis to characterize the thermal plume (*e.g.*, its size and thermal profile) that would be generated by the Schiller Station's discharge at different temperatures and under varying representative river and seasonal conditions. EPA contemplates that PSNH could use thermal discharge and river data collected under the current permit's thermal limits as the starting point for such an exercise. Moreover, EPA would be willing to review and comment on a preliminary modeling plan for examining the near-field and far-field impacts of these increased temperatures under the conditions and for the duration that PSNH would expect the elevated discharge temperatures to continue.

PSNH Comment V.B EPA's 316(b) BTA Determination is Arbitrary and Capricious

Region 1's CWA § 316(b) BTA determination is flawed and unsupported. The installation of modified traveling screens with an upgraded fish return system at Schiller Station constitutes BTA and satisfies the requirements of § 316(b). Region 1 erroneously determined that technologies to address entrainment are necessary at Schiller Station. The agency rendered this conclusion despite not first definitively declaring that the environmental impacts caused by the CWISs at Schiller Station are having any harmful or adverse effects on the BIP within the Piscataqua River—a prerequisite to any reasoned BTA determination rendered pursuant to § 316(b). In fact, Region 1 stated time and again in its Fact Sheet that it has found "no evidence" that operation of the CWISs are causing or having any major effects on the BIP. Thus, Region 1 has proposed saddling the facility with additional technological requirements to supposedly address a problem the agency freely admits does not exist. This is arbitrary and capricious.

Requiring technologies for entrainment at Schiller Station is also at odds with the 125 MGD AIF policy-driven compliance threshold EPA established in the final § 316(b) rule. This threshold was established to allow the agency to focus on the most impactful facilities while not burdening those facilities causing minimal to no impact. The 72.4 MGD AIF at Schiller Station is far below this established 125 MGD AIF threshold. Region 1 has failed to explain why impacts from entrainment are so severe at the facility to justify overriding the dividing line EPA established less than two years ago as part of its national rulemaking. There is no rational justification given that the entrainment impacts at the facility are miniscule. In fact, they are de minimis. Schiller Station's average AIF of 72.4 MGD is one of the lowest within the industry. When this withdrawal volume is considered in conjunction with the source waterbody—the Piscataqua River—it becomes impractical to assert that entrainment caused by the existing CWISs at the facility is anything but de minimis. This is because the 72.4 MGD AIF amounts to a mere 0.0018 percent of the peak Piscataqua River withdrawal zone flow during each tidal cycle. The withdrawal of this infinitesimal percentage of overall water cannot be causing any environmental impact that is adverse to the Piscataqua River. Accordingly, installation of technologies at Schiller Station to address entrainment is unwarranted and Region 1's contrary determination is arbitrary and capricious.

Should Region 1 erroneously persist in requiring technologies to address entrainment at Schiller Station despite the aforementioned arguments, the agency must, at a minimum, first allow PSNH the opportunity to submit additional information the agency must have to render a legally defensive BTA determination. The additional information PSNH should be allowed to submit consists of data that reflects the current understanding of the true efficacy of CWW screens that has been better quantified in more recent years since PSNH submitted information of this kind to the agency, as well as studies and analyses substantially similar to the ones facilities with a withdrawal volume in excess of 125 MGD AIF are required to submit to their respective permit writers under the final § 316(b) rule to ensure the permit writer can make an informed BTA determination. Submission of this information would confirm entrainment controls are not necessary at Schiller Station. If it somehow does not, PSNH should be allowed to test CWW screens with a slot-width larger than the 0.8 mm Region 1 has prescribed as a maximum potential opening.

Further, a June outage for Unit 5 at Schiller Station is not possible and/or prudent. And, if PSNH is ultimately required to install CWW screens at Schiller Station, no accompanying operational measure is warranted to satisfy the § 316(b) BTA standard. PSNH previously communicated to Region 1 that it could not schedule its annual outages at Schiller Station between June and September. The agency acknowledged this reality in its Fact Sheet but then included a June outage requirement for Unit 5 in its BTA determination anyway, without offering any support for its determination. This too is arbitrary and capricious.

Finally, the proposed timeline for the design, permitting, and construction of CWW screens at Schiller Station is unreasonable and must be overhauled. PSNH maintains that such technologies are not needed at the facility. Nonetheless, PSNH has included a workable schedule if the company is ultimately forced to install the technology. Detailed comments with respect to each of these issues are set out below.

EPA Response to PSNH Comment V.B:

PSNH's introductory comment raises several issues pertaining to the NPDES permit's requirements under CWA § 316(b), including PSNH's view that EPA's determination of the BTA is arbitrary and capricious and that installation of modified traveling screens with an upgraded fish return system at Schiller Station constitutes the BTA in compliance with the requirements of § 316(b). EPA has carefully considered the comment but disagrees with many of the individual points that it makes. Indeed, in many respects, PSNH's comment reflects a misunderstanding of the requirements of CWA § 316(b) and the 2014 CWA § 316(b) Final Rule. As PSNH notes, however, "Detailed comments with respect to each of these issues are set out below." Therefore, rather than respond here in detail to the substance of each issue raised in PSNH's introductory comment, EPA maintains that under the Final Rule entrainment controls are warranted for this facility—based on the availability of technologies to address entrainment, the relative costs and benefits of the technologies, the number of organisms entrained, and other relevant factors—and provides comprehensive responses to PSNH's specific comments later in this document.

PSNH Comment V.B.1 Legal Background

Section 316(b) of the CWA requires the location, design, construction, and capacity of CWISs to reflect BTA in order to protect and minimize adverse environmental impacts to aquatic organisms. [39] Regulation of CWISs under § 316(b) originated in 1972. EPA published its first § 316(b) final rule in 1976 [40]; however, this rule was invalidated by the Fourth Circuit in 1977.[41] In place of the defunct rule, EPA published guidance for evaluating the adverse impact of CWISs and the general method for incorporating § 316(b) conditions into NPDES permits. [42] The Draft EPA 316(b) Guidance outlined an approach for collecting information intended to support BPJ determinations made by the permitting authority; however, it did not establish a national technology based BTA standard, as required by the CWA. In fact, EPA decided to forgo any further promulgation of § 316(b) regulations following issuance of this Draft EPA 316(b) Guidance and, instead, decided to rely on individual BPJ determinations.

Over fifteen years passed with no additional standards developed by EPA. Frustrated by this inaction, environmental groups initiated a citizen suit in 1995, demanding that EPA promulgate regulations to reduce impingement and entrainment caused by CWISs. The parties entered into a consent decree, with EPA agreeing to promulgate new § 316(b) regulations in accordance with a three-phase schedule. [43]

EPA promulgated Phase II of the regulatory phasing-schedule, which applied to CWISs located at existing power plants with a design capacity of greater than 50 million gallons per day in September 2004.[44] In the 2004 Phase II regulations, EPA called for an overall reduction in impingement of 80 to 95 percent, and an overall reduction in entrainment of organisms by 60 to 90 percent over a baseline value that reflected the level of impingement mortality and entrainment that would occur absent specific controls. [45] Percentile ranges for impingement and entrainment reductions were included in the rule because it did not establish a single technology as BTA. Instead, EPA offered five compliance alternatives for a facility to select and implement to satisfy the BTA standard, such as using existing technologies, selecting additional fish protection technologies (such as screens with fish return systems), and using restoration measures. [46]

Several aspects of EPA's 2004 Phase II regulations were eventually challenged in *Riverkeeper*, Inc. *v. EPA*, 475 F.3d 83 (2d Cir. 2007) *("Riverkeeper II").* Ultimately, the court rejected various provisions of the Phase II rule. In reaching its decision, the court relied on its earlier decision in *Riverkeeper, Inc. v. EPA*, 358 F.3d 174 (2d Cir. 2004) *("Riverkeeper I")*, a challenge of EPA's 2001 § 316(b) Phase I rule for new facilities, which held that a provision allowing power plants to undertake restoration measures as an alternative to implementing BTA violated the intent of the CWA and was based on an impermissible construction of § 316(b). The *Riverkeeper II* court ultimately remanded a significant portion of the regulations back to EPA for further development, including EPA's use of the "significantly greater" cost-benefit standard to assess the most effective CWIS technology to install at individual plants. On July 9, 2007, however, EPA formally suspended all but one section of the rulemaking, 40 C.F.R. § 125.90(b), which provides, in relevant part, that existing facilities not subject to any other subpart of 40 C.F.R. Part 125 must meet requirements under § 316(b) of the CWA determined by EPA on a case-by-case, BPJ basis. [47]

Despite suspension of the 2004 rulemaking by EPA in 2007, EPA's use of the "significantly greater" standard in the 2004 rule and its established practice of considering costs and relative benefits in making § 316(b) BTA determinations was heard by the U.S. Supreme Court in *Entergy Corp. v. Riverkeeper Inc*. [48] In its decision, the U.S. Supreme Court confirmed that § 316(b) allows permit writers to consider costs and benefits in determining BTA to minimize adverse environmental impacts. In doing so, the court provided that the term "minimize" within § 316(b) "admits of degree and is not necessarily used to refer exclusively to the 'greatest possible reduction.'" [49] The *Entergy* Court also referenced EPA's prior use of a "wholly disproportionate" cost-benefit standard and stated that although that standard may be somewhat different than the "significantly greater" standard utilized in the 2004 rule, "there is nothing in the statute that would indicate that the former is a permissible interpretation while the latter is not." [50] Thus, the Court concluded, use of either cost-benefit standard is acceptable for determining BTA for § 316(b) at existing facilities. [51]

On August 15, 2014, EPA published in the Federal Register its CWA final § 316(b) rule for CWISs. [52] The final rule became effective on October 14, 2014.[53] It applies to existing industrial facilities that withdraw greater than 2 MGD and utilize 25 percent or more of that water exclusively for cooling purposes. [54] The new regulations are codified under 40 C.F.R. Part 125, Subpart J, and establish categorical standards for determining and implementing BTA to minimize impingement and entrainment impacts of CWISs. The final § 316(b) rule modified and combined into a single rulemaking portions of its previous phased CWA § 316(b) rulemakings that had been litigated and remanded following judicial review. [55]

The primary requirements applicable to existing facilities in the final § 316(b) rule include the requirement that any facility with a DIF greater than 2 MGD install one of several approved technologies to reduce fish impingement mortality at its CWIS and the requirement that any existing facility with an AIF over 125 MGD conduct certain studies regarding entrainment of aquatic organisms in the facility's CWIS that will allow the permitting authority to establish BTA standards for entrainment on a site-specific basis. [56] As an existing facility withdrawing less than 125 MGD AIF, Schiller is subject only to the first of these two primary requirements.

For facilities subject to impingement mortality controls, such as Schiller Station, EPA advanced seven "pre-approved" control technologies from which a facility may choose to satisfy the BTA standard. [57] The new regulations also allow facilities to select other technologies upon a demonstration to the permitting authority that the selected technology will perform adequately. [58] The seven impingement control technologies for impingement mortality control set forth in the final § 316(b) rule include:

(1) operate a closed-cycle recirculating system;
(2) operate a CWIS with a designed maximum through-screen design intake velocity of 0.5 fps;
(3) operate a CWIS with actual maximum through-screen design intake velocity of 0.5 fps;
(4) operate an offshore velocity cap if installed before October 14, 2014;
(5) operate a modified traveling screen that incorporates certain protective measures as defined by 40 C.F.R. § 125.92(s);
(6) operate any other combination of technologies, management practices, and operational measures that the permit writer determines is BTA for impingement reduction; and
(7) achieve the specified impingement mortality performance standard.[59]

Options 1, 2, and 4 are essentially "pre-approved" technologies the implementation of which would not generally require a demonstration to or approval by the permitting authority. Option 3 requires at least daily monitoring of the actual velocity at the screen in perpetuity, and Option 7 requires biological monitoring in perpetuity at a minimum frequency of monthly to demonstrate compliance with the impingement mortality performance standard. [60] If a facility chooses Options 5 or 6 to comply with the rule, it must undertake an "impingement technology performance optimization study." [61] That study takes place after the installation of the chosen impingement technology, and therefore following the issuance of a new final NPDES permit (i.e., "post-permit"), and must include two years of at least monthly impingement mortality monitoring and set forth biological data measuring the reduction in impingement mortality achieved by operation of the chosen compliance option, including a demonstration that operation of the compliance option has been optimized to minimize impingement mortality. [62]

For entrainment reduction, the final 316(b) rule establishes regulations requiring the permitting authority to make a site-specific BTA determination—including a possible determination that no entrainment controls at a facility are necessary—after consideration of certain specified factors and based on all available entrainment data for a facility. [63] Specifically, 40 C.F.R. § 125.98(f) states that a permitting authority must consider the following factors in making such a site-specific determination:

(i) Numbers and types of organisms entrained, including, specifically, the numbers and species (or lowest taxonomic classification possible) of Federally-listed, threatened and endangered species, and designated critical habitat (e.g., prey base);
(ii) Impact of changes in particulate emissions or other pollutants associated with entrainment technologies;
(iii) Land availability inasmuch as it relates to the feasibility of entrainment technology;
(iv) Remaining useful plant life; and
(v) Quantified and qualitative social benefits and costs of available entrainment technologies when such information on both benefits and costs is of sufficient rigor to make a decision. [64]

In terms of social costs and relative benefits, Region 1 aptly notes in its Fact Sheet that, "[c]onsistent with the Entergy decision… [the final § 316(b) rule] call[s] for consideration of relative costs and benefits in determining the BTA for entrainment reduction." [65] In other words, the "significantly greater than" and "wholly disproportionate" cost-benefit standards remain in effect following promulgation of the final § 316(b) rule. Region 1 recognized that "the regulations also provide that '[t]he Director may reject an otherwise available technology as a BTA standard for entrainment if the social costs are not justified by the social benefits.'" [66]

Notably, the quantifiable costs and relative benefits of EPA's final § 316(b) rule have a ratio of 8.25 to 1 and/or 10.29 to 1, utilizing a 3 percent and 7 percent discount rate, respectively. [67]

> The cost of additional technologies that may be required to meet the site-specific BTA for entrainment are not included in this analysis because…EPA cannot estimate, with any level of certainty, what site-specific determinations will be made based on the analyses that will be generated as a result of the national BTA standard for entrainment decision-making established [by the final rule].[68]

This ratio likewise omits certain categories of benefits generically referred to as "the benefits associated with fish other than commercially and recreationally harvested fish;" [69] although, it is logical to assume that the costs associated with entrainment compliance will exceed these additional benefits even if they were quantified, meaning the aforementioned ratios would almost certainly increase if these two additional categories were quantitatively evaluated by the agency.

In addition to the five aforementioned mandatory factors, the permitting authority may also consider several other factors in reaching a site-specific BTA determination for entrainment, which include:

(i) Entrainment impacts on the waterbody;
(ii) Thermal discharge impacts;
(iii) Credit for reductions in flow associated with the retirement of units occurring within the ten years preceding October 14, 2014;
(iv) Impacts on the reliability of energy delivery within the immediate area;
(v) Impacts on water consumption; and
(vi) Availability of process water, gray water, waste water, reclaimed water, or other waters of appropriate quantity and quality for reuse as cooling water. [70]

The regulations further specify that the weight given to the mandatory factors may vary depending upon the circumstances of an individual facility. [71]

The permitting authority's consideration of the aforementioned factors in making a BTA determination is to be "based on [a facility's] submission of certain . . . required information" relating to entrainment impacts at a facility. [72] Specifically, to ensure that the permitting authority has access to the information necessary to make an informed BTA determination about a facility's site-specific entrainment controls, the final 316(b) rule requires any existing facility with "major cooling water withdrawals"—greater than 125 MGD AIF—to collect the following types of entrainment-related information: [73]

> Entrainment Characterization Study: A study of at least two years of entrainment data, identifying and documenting "organisms collected to the lowest taxon possible of all life stages of fish and shellfish that are in the vicinity of the cooling water intake structure(s) and are susceptible to entrainment, including any organisms identified by [EPA], and any species protected under Federal, State, or Tribal law, including threatened and endangered ("T&E") species with a habitat range that includes waters in the vicinity of the cooling water intake structure";
>
> Comprehensive Technical Feasibility and Cost Evaluation Study: A description of the technical feasibility and incremental costs of candidate entrainment control technologies. The study must include an evaluation of the technical feasibility of closed-cycle cooling, fine-mesh screens with a mesh size of 2 mm or smaller, reuse of water or alternate sources of cooling water, and any other entrainment reduction technologies identified by the applicant or requested by the permitting authority;
>
> Benefits Valuation Study: A detailed discussion of the magnitude of water quality benefits, both monetized and non-monetized, of the entrainment mortality reduction technologies evaluated in the Comprehensive Technical Feasibility and Cost Study, including discussion of recent mitigation efforts already completed and how these have affected fish abundance and ecosystem viability in the intake structure's area of influence as well as other benefits to the environment and the community; and
>
> Non-water Quality and Other Environmental Impacts Study: A detailed discussion of the changes in non-water quality factors attributed to technologies and/or operational measures considered. [74]

As EPA explained in the final 316(b) rule, these entrainment study requirements are limited to facilities with actual water withdrawals exceeding 125 MGD because:

> this threshold will capture 90 percent of the actual flows but will apply only to 30 percent of existing facilities. EPA concluded that this threshold struck the appropriate balance between the goal of capturing the greatest portion of intake flow while minimizing the study requirements for smaller facilities…The selected threshold would significantly

> limit facility burden at more than two-thirds of the potentially in-scope facilities while focusing the Director on major cooling water withdrawals. [75]

Stated differently, facilities above the 125 AIF threshold comprise approximately 200 billion of the total 222 billion combined AIF gallons, which is why EPA determined in the final § 316(b) rule that it is these larger facilities (i.e., > 125 MGD AIF) that have “the highest likelihood of causing adverse impacts” from entrainment. [76]

Facilities falling below this 125 AIF threshold supposedly are not universally exempt from the entrainment requirements of the final § 316(b) rule, according to EPA. Yet, the agency recognized in its proposed rule that a BTA determination for entrainment at facilities within the 2 MGD DIF to 125 MGD AIF range could very well be “no other technologies beyond impingement control…because no other technologies are feasible and/or their benefits do not justify their costs.” [77] Nevertheless, EPA provided permitting authorities the right to “require reasonable information to make informed decisions at the smaller facilities” regarding what entrainment controls, if any, may be necessary to satisfy the BTA standard. [78]

Regarding implementation, 40 C.F.R. § 125.98(g) provides:

> In the case of permit proceedings begun prior to October 14, 2014 whenever the Director has determined that the information already submitted by the owner or operator of the facility is sufficient, the Director may proceed with a determination of BTA standards for impingement mortality and entrainment without requiring the owner or operator of the facility to submit the information required in 40 C.F.R. 122.21(r)…In making the decision on whether to require additional information from the applicant, and what BTA requirements to include in the applicant’s permit for impingement mortality and site-specific entrainment, the Director should consider whether any of the information at 40 C.F.R. 122.21(r) is necessary. [79]

Region 1 “has determined that the information already submitted by the Facility is sufficient” and that it does not need any of the additional permit application information described in 40 C.F.R. § 122.21(r) to support its permit decision. [80]

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[39] 33 U.S.C. § 1326(b).

[40] See 41 Fed. Reg. 17,387 (April 26, 1976).

[41] Appalachian Power Co. v. Train, 566 F.2d 451 (4th Cir. 1977).

[42] See Draft Guidance for Evaluating the Adverse Impact of Cooling Water Intake Structures on the Aquatic Environment: § 316(b) (May 1, 1977) (“Draft EPA 316(b) Guidance”).

[43] See Cronin v. Browner, 898 F. Supp. 1052, 1055–56 (S.D.N.Y. 1995); see also Riverkeeper, Inc. v. Whitman, 32 Envtl. L. Rep. 20382, 2001 WL 1505497, at *1 (S.D.N.Y. Nov. 27, 2001) (discussing the litigation that resulted in the consent order requiring EPA to promulgate three phases of CWIS regulations).

[44] See 69 Fed. Reg. 41,576 (July 9, 2004) (“2004 Phase II regulations”).

[45] Id. at 41,590.

[46] See id. at 41,630.

[47] See 40 C.F.R. § 125.90(b).

[48] 556 U.S. 208 (2009).

[49] Id. at 209. Moreover, in speaking about the promulgation of regulations generally, both Justices Scalia and Breyer provided that some consideration of costs and benefits is a part of "rational" and "reasonable" decision making, or at least that imposing enormous costs with very small benefits would be "unreasonable" and "irrational." Id. at 232–33. Justice Scalia further provided that "whether it is 'reasonable' to bear a particular cost may well depend on the resulting benefits." Id. at 225–26. A decision imposing "massive costs far in excess of any benefit," according to Justice Breyer, would conflict with a test of reasonableness. Id. at 225–26. Allowing EPA to weigh costs and benefits "prevent[s] results that are absurd or unreasonable in light of extreme disparities between costs and benefits." Id. at 234. According to Justice Breyer, an absolute prohibition of a cost-benefit analysis would bring about "irrational" results, because "it would make no sense to require plants to 'spend billions to save one more fish or [plankton].'" Id. at 233–34. This is "particularly so in an age of limited resources available to deal with grave environmental problems, where too much wasteful expenditure devoted to one problem may well mean considerably fewer resources available to deal effectively with other (perhaps more serious) problems." Id. at 233.

[50] Id. at 225.

[51] Id. at 226. Subsequent to the Supreme Court's Entergy decision, President Obama issued Executive Order 13,563, which specifically mandates the benefits of any "regulation" justify its costs. Exec. Order No. 13,563, 76 Fed. Reg. 3,821 (Jan. 16, 2011) ("Exec. Order 13,563"). "Our regulatory system…must be based on the best available science… must promote predictability and reduce uncertainty. It must identify and use the best, most innovative, and least burdensome tools for achieving regulatory ends. It must take into account benefits and costs, both quantitative and qualitative." Id. "[E]ach agency must, among other things…propose or adopt a regulation only upon a reasoned determination that its benefits justify its costs (recognizing that some benefits and costs are difficult to quantify)." Id.

PSNH recognizes that issuance of a draft permit may not be deemed equal to promulgating a regulation. However, § 1(a) of Exec. Order 13,653, by its express terms, applies more broadly to the United States' "regulatory system" as a whole, which includes regulations, as well as permits issued by agencies pursuant to such regulations. Id.

[52] 79 Fed. Reg. 48,300 (Aug. 15, 2014)

[53] Id. at 48,358.

[54] See 40 C.F.R. § 125.91(a).

[55] See, e.g., 79 Fed. Reg. at 48,328.

[56] See 40 C.F.R. § 125.94(c); id. § 122.21(r)(9)–(12).

[57] See id. § 125.94(c).

[58] See id. § 125.94(c)(6), (7).

[59] See id. § 125.94(c)(1)–(7).

[60] See id. § 125.94(c)(3), (7).

[61] See id. § 122.21(r)(6)(i), (ii).

[62] See id.

[63] See id. § 125.94(d).

[64] Id. § 125.98(f)(2).

[65] Fact Sheet at 83.

[66] Id. at 83–84 (quoting 40 C.F.R. § 125.98(f)(4)) (alteration in original).

[67] See 79 Fed. Reg. at 48,303–04.

[68] Id. at 48,304.

[69] Id.

[70] 40 C.F.R. § 125.98(f)(3).

[71] Id. § 125.98(f)(2).

[72] See 76 Fed. Reg. 22,174, 22,204 (Apr. 20, 2011) (proposed 316(b) Rule).

[73] See 79 Fed. Reg. at 48,309; 40 C.F.R. § 122.21(r)(9); see also EPA, Technical Development Document for the Proposed Section 316(b) Phase II Existing Facilities Rule, Dock. ID EPA-HQ-OW-2008-0667-1282, at 7-7 (Mar. 28, 2011) ("Proposed 316(b) TDD") (noting that "the permit writer would have access to all the information necessary for an informed decision about [a site-specific BTA determination] … to reduce entrainment mortality at facilities above 125 MGD AIF" because "the facility's permit application must include information to support such an evaluation").

[74] See 40 C.F.R. § 122.21(r)(9)–(13). Discussion of the changes in non-water quality factors attributed to technologies and/or operational measures considered, include but are not expressly limited to evaluating increases and decreases in energy consumption, thermal discharges, air pollutant emissions, water consumption, noise, safety, grid reliability, and facility reliability.

[75] EPA Technical Development Document for the Final Section 316(b) Phase II Existing Facilities Rule,

Dock. ID EPA-HQ-OW-2008-0667-4138, at 3-8 (May 19, 2014) ("Final 316(b) TDD").

[76] 79 Fed. Reg. at 48,309.
[77] 76 Fed. Reg. at 22,005.
[78] 79 Fed. Reg. at 48,309.
[79] 40 C.F.R. § 125.98(g).
[80] See Fact Sheet at 84.

EPA Response to PSNH Comment V.B.1:

In its comment, PSNH summarizes its understanding of the rulemaking history for national standards for Section 316(b) of the CWA. PSNH characterizes this section of its comments as "Legal Background." In the Fact Sheet, EPA summarized the legal requirements applicable to cooling water intake structures, *see* FS at 78-88, and reiterates and incorporates that discussion by reference here.

To the extent that PSNH's comments address past legal requirements that are no longer in effect, did not apply to the Draft Permit, and do not apply to the Final Permit, EPA does not need to reply to such comments here because they are immaterial for the current permit proceeding. If EPA does not respond to some or all of such comments, it should not be read to indicate EPA's agreement with PSNH's characterization of those past requirements.

The comment also presents PSNH's interpretation of the now existing CWA § 316(b) regulations promulgated in 2014. For the most part, PSNH's comments here neither present an interpretation of how the regulations should be applied specifically to the Schiller Station permit, nor request that EPA change the Draft Permit in any way. To the extent that PSNH's comments elsewhere echo one or more of the comments above and, based on the legal interpretations propounded here, suggest that certain permit conditions are inappropriate or request changes to permit conditions, EPA will respond to those later comments in appropriate detail.

Having said that, PSNH's comments make a number of statements regarding the Supreme Court's *Entergy* decision and the requirements of the Final Rule that EPA does not agree with and which warrant response. First, according to the comment, the "primary requirements" of the Final Rule are (1) compliance with one of the standards for the best technology available to minimize impingement mortality at 40 C.F.R. § 125.94(c); and (2) that any existing facility with an AIF over 125 MGD must conduct and submit the results of certain studies regarding entrainment at 40 C.F.R. § 122.21(r)(9) through (13) to help support the permitting agency's effort to develop BTA requirements for permit. Yet, the commenter's list is far from complete.

In EPA's view, the "primary requirements" for existing facilities in the Final Rule are set out in 40 C.F.R. § 125.94(a), which states:

> On or after October 14, 2014, the owner or operator of an existing facility with a cumulative design intake flow (DIF) greater than 2 mgd is subject to the BTA (best technology available) standards for impingement mortality under paragraph (c) of this section, and entrainment under paragraph (d) of this section including any measures to protect Federally-listed threatened and endangered species and designated critical habitat established under paragraph (g) of this section.

The primary requirements established by the Final Rule are the BTA standards for impingement mortality *and* entrainment. The permit application requirements simply help provide permitting agencies with information to support the determination of requirements meeting the BTA standards set out in 40 C.F.R. §§ 125.94(c) and (d). The application requirements for all facilities are set forth at 40 C.F.R. § 122.21(r)(3) through (8), while additional requirements for facilities with actual intake flows (AIF) greater than 125 MGD are detailed at 40 C.F.R. §§ 122.21(r)(9) through (13). According to PSNH, the additional information required from "any existing facility with 'major cooling water withdrawals'—greater than 125 MGD AIF" is mandated to ensure that the permitting authority "has access to the information necessary to make an informed BTA determination about a facility's site-specific entrainment controls." PSNH further suggests that the implication of EPA's not requiring this information for facilities with intake flows less than 125 MGD is that such facilities need not install any entrainment controls. In its comment above, as well as in Comments V.B.2.a. and b., PSNH suggests that EPA did not intend under the Final Rule for entrainment requirements to be established for facilities with an AIF less than 125 MGD. For example, PSNH states that "[f]acilities falling below this 125 AIF threshold *supposedly* are not universally exempt from the entrainment requirements" (emphasis added), and further states that "the agency recognized in its proposed rule that a BTA determination for entrainment at facilities within the 2 MGD DIF to 125 MGD AIF range could very well be 'no other technologies beyond impingement control…'" (citations and footnotes omitted).[1]

Yet, PSNH's comments appear to misunderstand or misconstrue the Rule. While only facilities with an AIF greater than 125 MGD must submit the additional entrainment related studies, a site-specific determination of the BTA for entrainment must be made for *all* facilities subject to the Final Rule. *See* 40 C.F.R. §§ 125.91(a)(2), 125.94(d), and 125.98(f). The text quoted above from 40 C.F.R. § 125.95(a) expressly states that facilities withdrawing 2 MGD or more must satisfy the Rule's BTA standards for entrainment control. Nothing in the Final Rule exempts facilities with an AIF above 2 MGD but below 125 MGD from needing entrainment controls, and there is no regulatory presumption in the Final Rule that facilities withdrawing less than 125 MGD are not causing adverse impacts. *See, e.g.*, 79 Fed. Reg. at 48,355 ("since any facility *at any flow* may have an adverse environmental impact" (emphasis added)). In support its argument that adverse impacts from entrainment are limited to facilities greater than 125 MGD AIF, PSNH cites to a passage from EPA's Technical Development Document (TDD) for the Final Rule which states that "this threshold [of 125 MGD] will capture 90 percent of the actual flows but will apply only to 30 percent of existing facilities." Yet, this passage goes on to explain that:

> [c]ontrary to a number of public comments, however, EPA is not implying or concluding that the 125 mgd threshold is an indicator that facilities withdrawing less than 125 mgd are (1) not causing any adverse impacts or (2) automatically qualify as meeting BTA. In other words, the threshold, while justified on a technical basis, does not result in exemptions from the rule. Instead, EPA is

[1] EPA notes that the preamble does not use the phrase "very well" while noting that facilities may not be required to install additional technology for entrainment control in all cases. EPA also notes that even facilities withdrawing more than 125 MGD might not, in a particular case, be required to install additional technology for entrainment control. *See* 40 C.F.R. § 125.98(f)(4).

> making a policy decision as to which facilities must provide a certain level and type of information.

TDD at 3-8. *See also* 79 Fed. Reg. at 48,309 (including the same statement). Thus, EPA made it abundantly clear in the preamble to the Final Rule, in the TDD, and in the regulations themselves, that 125 MGD AIF is a threshold for determining which facilities must provide certain types of additional studies. It does not determine whether site-specific entrainment controls are needed at a particular facility and it does not limit the permitting agency's ability to establish such entrainment controls in a NPDES permit. Indeed, contrary to other of its comments, PSNH recognizes this when it quotes from the preamble to the Final Rule in its comment, stating that "EPA provided permitting authorities the right to 'require reasonable information to make informed decisions at the smaller facilities' regarding what entrainment controls, if any, may be necessary to satisfy the BTA standard" (footnote omitted). Thus, the regulations authorize EPA to require additional information, beyond the otherwise specified types of information, to support BTA findings for facilities withdrawing more than 2 MGD of water. *See* 40 C.F.R. § 122.21(r). 40 C.F.R. §§ 122.21(r)(1)(ii)(C), 125.98(i). EPA responds in more detail to PSNH's interpretation of the site-specific entrainment requirements and the administrative threshold of 125 MGD in Responses to PSNH Comments V.B.2 and V.B.4.

PSNH characterizes the BTA standards for impingement in the Final Rule as "seven 'pre-approved' control technologies from which a facility may choose to satisfy the BTA standard." As PSNH recognizes in its description of the alternative technologies, EPA only characterizes as "pre-approved" the three technologies that require no further demonstration or monitoring: closed cycle cooling, a *design* through-screen velocity no greater than 0.5 fps, and an existing offshore velocity cap. 40 C.F.R. § 125.94(c)(1), (2), (4). Complying with the BTA for impingement mortality either through an *actual* through-screen velocity of 0.5 fps or by meeting the impingement mortality performance standard require ongoing monitoring. *Id.* § 125.94(c)(3), (7). In other words, while a permittee may elect to comply with the BTA for impingement mortality using either of these alternatives, the permittee must perform ongoing monitoring to demonstrate compliance with the standard. In addition, both the modified traveling screens and system of technologies options require submission of an impingement technology performance optimization study for the permitting authority to review before either technology may be determined to be the best technology available for impingement mortality. *Id.* § 125.94(c)(5), (6); *see also, e.g.,* 79 Fed. Reg. 48,321. In other words, the permittee may choose the alternatives at § 125.94(c)(5) or (6) to comply with the impingement mortality BTA standard, but the permitting authority must approve the technology and include permit conditions that ensure it is operated consistent with the optimization study. Finally, EPA clarifies that for sites that already operate a traveling screen, the optimization study could be performed prior to issuance of a new final NPDES permit. *See* 79 Fed. Reg. at 48,346-47.

In the above comment, PSNH neither argues that EPA's consideration of costs and benefits for the site-specific determination at Schiller Station was incorrect nor explains how its comments on costs and benefits would impact the decision at issue in this permit proceeding. In any event, EPA agrees with PSNH that in *Entergy Corp. v. Riverkeeper, Inc*. 556 U.S. 208 (2009), the Supreme Court held that the CWA gives EPA the discretion to rely on cost-benefit analysis in establishing § 316(b) permitting requirements. The majority opinion allowed that in considering costs and benefits, the "wholly disproportionate" standard and the "significantly greater than" standard, or some other test, would all be within EPA's discretion under the statute. The Court did not conclude that EPA's consideration of costs and benefits under §316(b) *must* use a particular standard.

PSNH's comment discusses the fact that for EPA's Final Rule, the estimated monetized costs of impingement remedies exceeded the estimated monetized benefits by a ratio of from round 8.25 to 1 and/or 10.29 to 1. As the comment mentions, EPA's did not estimate costs and benefits for entrainment remedies because it could not reasonably estimate such values given the Final Rule's regime of site-specific determinations of BTA for entrainment control. *See* 79 Fed. Reg. 48,304 (Aug. 15, 2014). With regard to the impingement control-related costs and benefits, EPA indicated that the monetized benefits did not include important categories of benefits that could not be monetized and the decision makes clear that monetized benefits need not be equal to, or greater than, the costs to support the BTA determination. *Id.* PSNH comments that "… it is logical to assume that the costs associated with entrainment compliance will exceed … [the associated] benefits even if they were quantified," but EPA notes that this conclusion is not compelled by either logic or any facts that have been presented. Without information about specific technologies, their cost, and their ability to reduce entrainment at a particular facility, as well as information about whether the costs and/or benefits can be monetized for that particular case, the ratio of "quantified" (by which we believe the commenter means *monetized*) costs to benefits cannot be determined.

In the case of the Schiller Station permit, when considering the costs and benefits of the available technologies in determining the BTA, EPA applied the requirements of the Final Rule, which specifies that site-specific requirements must reflect "the maximum reduction in entrainment warranted after consideration of factors relevant for determining the best technology available for minimizing adverse impact at each facility," 40 C.F.R. § 125.98(f), and that the social costs must be "justified by" the social benefits, *id*. § 125.98(f)(4). In the record for this Permit, EPA explained its determination under these narrative tests. PSNH's comment does not suggest that EPA's consideration of costs and benefits in this permit is inconsistent with the requirements of the Final Rule.

Finally, PSNH's comment also cites to, and quotes from, the regulations that detail the various factors, some mandatory and others discretionary, that permitting authorities are to consider when rendering site-specific BTA determinations for controlling entrainment. *See* 40 C.F.R. § 125.98(f)(2) and (3). As the comment also notes, permitting agencies have discretion to determine the weight to assign to the various factors in their BTA determinations. In addition, PSNH's comment notes the terms of 40 C.F.R. § 125.98(g), which authorizes permitting agencies to forego requiring additional information submissions for "ongoing permit proceedings."

PSNH Comment V.B.2 Technologies to Address Entrainment Are Not Necessary at Schiller Station Because the Existing CWIS at The Facility Are Not Causing Any AEI to The Piscataqua River

PSNH should not be required to implement entrainment controls at Schiller Station because: (1) Region 1 has not determined that the CWISs impose an AEI to the aquatic ecosystems of the Piscataqua River in the vicinity of Schiller Station; (2) AIF at the facility is well below the 125 MGD compliance threshold set out in the final § 316(b) rule; and (3) entrainment at Schiller Station is de minimis, given that the facility's actual intake volume is 0.0018 percent of the peak Piscataqua River withdrawal zone flow during a tidal cycle. [81] The proposed technologies set out in the Fact Sheet and Draft Permit to address entrainment are therefore arbitrary and capricious and must be revised before Region 1 issues the permit as final.

[81] *See* 2016 Enercon-Normandeau Comments at 10.

EPA Response to PSNH Comment V.B.2:

PSNH comments that entrainment controls should not be required at Schiller Station because, as the comment states, EPA did not determine that the cooling water intake structures (CWISs) are causing an adverse environmental impact, the actual intake flow (AIF) at the cooling water intake structure (CWIS) is below 125 MGD, and entrainment is *de minimis*. EPA responds to PSNH's detailed comments on each of these points in the response to comments below. To its first point, EPA maintains that the Fact Sheet demonstrates, and these responses to comments confirm, that entrainment and impingement at Schiller Station's CWISs is an adverse environmental impact on the waterbody. PSNH's assertion that CWIS impacts can only be adverse within the meaning of § 316(b) and its implementing regulations if a population-level effect is demonstrated is without basis. Second, PSNH inaccurately interprets the Final Rule's administrative threshold of 125 MGD AIF as an indication that facilities with a lower AIF are not subject to entrainment requirements. This is not the case. Finally, EPA views the hundreds of millions of eggs and larvae taken from the Piscataqua River ecosystem and killed by the CWISs as an adverse environmental impact that needs to be addressed under CWA § 316(b) and that these losses are not *de minimis*. For the reasons laid out in the responses to comments below, EPA concludes that a technology (or system of technologies) to minimize the adverse environmental impacts from entrainment is warranted at Schiller Station.

PSNH Comment V.B.2.a. Region 1 Cannot Impose Technologies to Further Minimize Entrainment at Schiller Station Without First Establishing Environmental Impact That Is Adverse to The Piscataqua River.

Throughout its Fact Sheet for the Draft Permit, Region 1 provides that any entrainment caused by the operation of the current CWISs at Schiller Station is not causing an impact that is adverse to the aquatic ecosystem of the Piscataqua River. For instance, the agency states:

- Region 1 "has no evidence that entrainment and/or impingement losses at Schiller Station are causing or significantly contributing to declines in local populations of the affected species of aquatic organisms or to disruptions in the local community or assemblage of organisms in the Piscataqua River. "[82] "This is not surprising given that Schiller Station's [maximum designed] withdrawal of 125 MGD is only 0.5% of the tidal prism of the Piscataqua River Estuary (approximately 25,000 MGD)."[83]

- Entrainment at Schiller Station "has not been associated with higher level impacts, such as major effects on local populations of impacted species or the overall community of organisms in the river, or with impacts to endangered species." [84]

In a conclusory fashion, the agency contradicts the aforementioned statements by providing that it believes the "entrainment and impingement losses from the current operation [at Schiller Station are] adverse environmental impacts." [85] Yet even this abstract statement is immediately followed by the agency's acknowledgement that it has been unable to find that impingement and/or entrainment at Schiller Station is negatively impacting the Piscataqua River: "[T]he available information is insufficient to draw conclusions that [impingement and entrainment] losses have caused either a particular reduction in the Great Bay estuary's populations of the affected species or an imbalance in the overall assemblage of aquatic organisms in the estuary."[86]

Section 316(b) of the CWA provides: "Any standard established pursuant to [§ 301 or § 306 of the CWA] and applicable to a point source shall require that the location, design, construction, and capacity of cooling water intake structures reflect the best technology available for minimizing <u>adverse environmental impact</u>." [87] A careful examination of this last phrase is important. What constitutes "adverse environmental impact" has never been conclusively defined by Congress, EPA, or the courts. Important in the present context is the term "adverse," because anyone could argue that just about anything results in an "impact" to the "environment."

In the absence of a statutory definition, courts "construe a statutory term in accordance with its ordinary or natural meaning" [88] and courts assume that "Congress legislates with knowledge of [this] basic rule[] of statutory construction." [89] The generally accepted definition of "adverse" is "[p]reventing success or development" and/or "harmful." [90] Utilizing this definition within the key "adverse environmental impact" phrase, the intent of CWA § 316(b) is made clear: to reasonably require PSNH to install technologies to further minimize entrainment occurring at Schiller Station, Region 1 must first demonstrate that the current entrainment or "environmental impact" caused by the CWISs at Schiller Station is in some way preventing the success or development of (or is "harmful" or "adverse" to) the aquatic ecosystem within the Piscataqua River .[91] This the agency has not done. The above-quoted statements by the agency underscore this fact. Region 1 knows what constitutes environmental impact that is actually adverse to a waterbody justifying the need for additional technological controls:

> Entrainment and impingement can kill or injure large numbers of the aforementioned aquatic organisms. In some cases, these losses may contribute to diminished populations of local species of commercial and/or recreational importance, locally important forage species, and/or local threatened or endangered species. As a result, CWISs can have effects across the food web. In effect, CWISs can substantially degrade the quality of aquatic habitat by placing within the ecosystem a significant anthropogenic source of mortality to resident organisms. In addition to considering the direct adverse impacts of CWISs, their effects as cumulative impacts or stressors in conjunction with other existing stressors, including CWISs at multiple facilities, on the affected 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.[92]

Region 1 has made no statements of this kind regarding the effects of entrainment and/or impingement at Schiller Station on the aquatic ecosystem of the Piscataqua River. Instead, the agency has stated time and again in the Fact Sheet that the CWISs at Schiller Station are not causing any environmental impact that is adverse to the waterbody, or that the data and information it has collected over the years is, at worst, inclusive. More is required for Region 1 to legally impose entrainment technology controls at Schiller Station. In actual fact, no such controls are necessary at Schiller Station because the environmental impact that is occurring at the facility is not adverse to the source waterbody. Region 1's BTA determination imposing entrainment controls at the facility therefore lacks foundation, is arbitrary and capricious, and must be revisited by the agency.

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[82] Fact Sheet at 158 (emphasis added).

[83] *Id*.

[84] *Id*. at 157–58.

[85] *Id*. at 97.

[86] *Id*.

[87] 33 U.S.C. § 1326(b) (emphasis added).

[88] FDIC v. Meyer, 510 U.S. 471, 476 (1994) Words that are not terms of art and that are not statutorily defined are customarily given their ordinary meanings, often derived from the dictionary. Id.

[89] McNary *v*. Haitian Refugee Ctr., 498 U.S. 479, 496 (1991).

[90] See Oxford Dictionaries, Adverse, http://www.oxforddictionaries.com/us/definition/american_english /adverse (last visited January 18, 2016).

[91] EPA's own discussions in its latest proposed rule for the now final § 316(b) regulations support this interpretation. Specifically, EPA conceded that not all entrainment of eggs and larvae or impingement of fish is "adverse" inasmuch as the proposed rule authorized the permitting authority to may determine that "all life stages" do not include invasive and naturally moribund species (proposed 40 C.F.R § 125.92, 76 Fed. Reg. at 22,281), and insofar as the proposed rule approved the selection of "species of concern" (proposed 40 C.F.R. § 125.98(c), 76 Fed. Reg. at 22,287). Therefore, while reducing the number of nuisance or invasive species must be deemed an "environmental impact," it is an impact that is beneficial, not "adverse."

The CWISs at Schiller Station impinge and/or entrain a number of organisms that are or have been considered nuisance or invasive species. The green crab is a prime example. See, e.g., USDA National Invasive Species Information Center, European Green Crab, http://www.invasivespeciesinfo.gov/aquatics/greencrab.shtml (last modified January 21, 2016) (identifying the green crab as a nuisance and invasive species). PSNH should therefore be credited and not scorned for the positive environmental impacts the CWISs at Schiller Station have on the green crab population within the Piscataqua River.

[92] Fact Sheet at 88.

EPA Response to PSNH Comment V.B.2.a:

PSNH comments that EPA's determination that entrainment and impingement losses at the facility are adverse environmental impacts "contradicts" EPA statements that impingement and/or entrainment at Schiller Station have not been found to be causing either a particular reduction in the Great Bay estuary's populations of the affected species or an imbalance in the overall assemblage of aquatic organisms in the Piscataqua River. EPA disagrees with this comment; there is no contradiction between the two stated aspects of EPA's CWA § 316(b) analysis. The commenter suggests there is a contradiction based only on its incorrect assertion that an "environmental impact" may only be considered "adverse" under CWA § 316(b) if it has a negative, population-level effect. The commenter's interpretation, however, is incorrect and finds no support in either the statute, the Final Rule, or past EPA interpretations from § 316(b)'s rulemaking history. Moreover, the commenter's interpretation of "adverse environmental impacts" has been rejected by the courts.

In the Fact Sheet, EPA plainly identified the impingement and entrainment at Schiller Station as adverse environmental impacts:

> Schiller Station entrains and impinges large numbers of fish and macrocrustacean eggs, larvae, juveniles and adults. EPA considers these entrainment and impingement losses from the current operation to be adverse environmental impacts.

Fact Sheet at 97. The Fact Sheet further states that "the available information is insufficient to draw conclusions that these losses have caused either a particular reduction in the Great Bay estuary's populations of the affected species or an imbalance in the overall assemblage of aquatic organisms in the estuary." *Id*. Thus, EPA lacks the data from which to characterize the baseline populations and/or communities of aquatic organisms in the Great Bay estuary and confirm whether or not the impacts from the CWIS may be causing reductions at the population level or affecting community biodiversity. Nevertheless, EPA explains in the Fact Sheet that:

> EPA clearly is *not* concluding that nothing needs to be done about Schiller Station's entrainment. To the contrary, EPA regards it to be important to reduce entrainment mortality (and impingement mortality) caused by Schiller Station's CWISs. EPA finds that current entrainment and impingement losses at Schiller Station represent avoidable mortality to aquatic organisms in a productive river of public importance that is subject to cumulative stresses from, among other sources, municipal storm water runoff, industrial discharges, land use changes, upstream flow alterations and other power plant water withdrawals. These losses are avoidable in the sense that available technology could be added to the Facility at an appropriate cost that would enable Schiller Station to continue generating electricity while harming far fewer aquatic organisms.

Fact Sheet at 158. Moreover, EPA indicated that "some of the species affected by entrainment and impingement at Schiller Station are not doing well on a regional basis (*e.g.*, rainbow smelt, herring) and taking reasonable steps to reduce mortality is appropriate." *Id.* The Fact Sheet establishes that the CWIS at Schiller Station likely results in the impingement of over 5,500 fish, and the entrainment of more than 145 million fish eggs and larvae each year. EPA characterizes these losses as adverse environmental impacts and, consistent with CWA § 316(b), the Final Permit requires the facility to implement a technology that aims to reduce them.

The commenter argues that neither the statute, regulations nor court decisions have indicated the meaning of the term "adverse environmental impact" as used in CWA § 316(b) and that, therefore, one must look to the common meaning (or dictionary definition) of the term "adverse" to inform application of the term. The commenter then looks to the dictionary to define the term "adverse" as "[p]reventing success or development" and/or "harmful," and argues that, before making a determination on the BTA, "Region 1 must first demonstrate that the current entrainment or 'environmental impact' caused by the CWISs at Schiller Station is in some way preventing the success or development of (or is 'harmful' or 'adverse' to) the aquatic ecosystem within the Piscataqua River." Yet, even by this definition, the impacts of Schiller Station's CWISs *(i.e.,* killing many millions of aquatic organisms and preventing those early life stage individuals from developing into adults) are *adverse* in EPA's judgment. The annual destruction of millions of aquatic organisms from the Piscataqua River by entrainment and impingement is a "harmful" environmental effect and it prevents the "success or development" of those organisms. This constitutes adverse environmental impact under CWA § 316(b).

In support of its claim that EPA cannot impose technologies to minimize entrainment without first establishing environmental impact is adverse to the Piscataqua River, the commenter maintains that EPA conceded in the Proposed Rule that not all entrainment of eggs and larvae or impingement of fish is adverse inasmuch as the rule authorizes the permitting authority to determine that "all life stages" do not include invasive and naturally moribund species (Proposed Rule at 40 C.F.R. § 125.92, 76 Fed. Reg. 22,281).[2] Under the Final Rule "all life stages of fish and shellfish" is defined to mean:

> Eggs, larvae, juveniles, and adults. It does not include members of the infraclass Cirripedia in the subphylum Crustacea (barnacles), green mussels (*Perna viridis*), or zebra mussels (*Dreissena polymorpha*). The Director may determine that all life stages of fish and shellfish does not include other specified nuisance species.

40 C.F.R. § 125.92(b). *See also* 79 Fed. Reg. 48,376. PSNH points out that Schiller Station impinges and entrains "a number of organisms that are or have been considered a nuisance or invasive species [and that t]he green crab is a prime example." (Fn 91 at 35). According to the commenter, "while reducing the number of nuisance or invasive species must be deemed an 'environmental impact,' it is an impact that is beneficial, not 'adverse.'"

EPA acknowledges that Schiller Station entrains a large number of green crab larvae, an invasive species, and discusses this issue in more detail in Responses to PSNH Comment VII.A.13 and Sierra Club Comment IV.A.1, below. However, Schiller Station also annually entrains more than 145 million fish larvae and eggs comprised of non-invasive, resident and migratory species, including several commercially and recreationally important species (*e.g*., winter flounder, Atlantic herring, Atlantic mackerel). Even if the entrainment of green crab, as an invasive species, does not represent an adverse impact, the entrainment of over 145 million fish eggs and larvae, many from commercially and recreationally important species and others of ecological importance as forage species, does, on its own merit, constitute an adverse environmental impact. In any event, the Rule's recognition that entrainment of certain invasive species may not

[2] PSNH also points to the Proposed Rule at 125.98(c) and 76 Fed. Reg. 22,287, allowing the approval of the selection of "species of concern." In contrast to the proposed rule, the Final Rule does not contain the term "species of concern." EPA found that the term was similar to terms used in the context of threatened and endangered species and may further cause confusion over existing Services or State requirements for such species. Instead, EPA adopts the term "fragile species" (defined at § 125.92(m) as a species of fish or shellfish that has an impingement survival rate of less than 30 percent) and uses the term as it is used with the impingement mortality data and criteria used in calculating the impingement mortality performance standard for the rule. *See* 79 Fed. Reg. at 48,323, 48,363, 48,364.

be "adverse" does not support PSNH's suggestion that an environmental impact may only be considered adverse if it rises to the level of endangering communities or populations of aquatic organisms.

As the commenter points out, 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 those effects may be considered "adverse environmental impacts that trigger the BTA requirement. Indeed, 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 excepting *de minimis* effects.

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 has also long been EPA's view generally. EPA has consistently interpreted the entrainment and impingement of aquatic organisms to constitute adverse environmental impact, without requiring a demonstration of broader-scale harm to populations of individual species or particular communities of organisms.

Consistent with this interpretation of the law, EPA explained in a 1977 draft guidance document, that:

> [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. At the same time, EPA also considered whether there might be population-level effects as part of its assessment of the significance or magnitude of the adverse environmental effects. *Id.*, p. 15. Similarly, EPA General Counsel Decisions from 1976 and 1977 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 Elec. Plant)*, at 203 (June 1, 1976) ("The [cooling water intake] structures must reflect the best technology available for *minimizing* . . . adverse environmental impact – significant or otherwise."); *Decision of the General Counsel No. 63 (In re Central Hudson Gas and Elec. Corp.)*, at 381–82 (July 29, 1977) ("Under Section 316(b), EPA may impose the best technology available . . . in order to minimize . . . adverse environmental impacts – significant or otherwise.").

In EPA's 2001 Phase I CWA § 316(b) regulations applicable to new facilities, *see* 40 C.F.R. Part 125, Subpart I, EPA embraced the same interpretation of "adverse environmental impact" that the Region embraced here. When this interpretation was challenged, the United States Court of Appeals for the Second Circuit specifically addressed and upheld EPA's position. *Riverkeeper, Inc. v. EPA*, 358 F.3d 174, 196 (2d Cir. 2004) ("*Riverkeeper I").* In *Riverkeeper I*, industry petitioners argued that, under the Phase I Rule, the "EPA should only have sought to regulate impingement and entrainment where they have deleterious effects *on the overall fish and shellfish populations in the ecosystem*," because "removing large *numbers* of fish or eggs is not, by itself, an adverse impact." *Id.* (emphases added). The court found, however, that "the EPA's focus on the *number* of organisms killed or injured by cooling water intake structures is eminently reasonable" and that "Congress rejected a regulatory approach that relies on water quality standards, which is essentially what [the industry petitioners] urge[] here in focusing on fish *populations* and consequential environmental harm. . . . [W]e are inclined to defer to the EPA's judgment of how best to define and minimize 'adverse environmental impact.'" *Id.* at 196-197 (emphases added).

The same issue came up again in litigation concerning the later withdrawn Phase II CWA § 316(b) regulations and, again, the Second Circuit upheld EPA's interpretation. *Riverkeeper, Inc. v. EPA*, 475 F.3d 83, 123–24 (2d Cir. 2007) (citations omitted) ("*Riverkeeper II*"), *rev'd on other grounds, Entergy Corp. v. Riverkeeper, Inc.*, 556 U.S. 208 (2009). In *Riverkeeper II*, in a challenge to the Phase II Rule, the court explained that:

> [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.

The *Riverkeeper II* court once again rejected the argument advanced by the industry petitioners in *Riverkeeper I*. 475 F.3d at 124. In particular, the court explained:

> In *Riverkeeper I*, we rejected the argument[] . . . that removing large numbers of aquatic organisms from waterbodies is not in and of itself an adverse impact. We specifically rejected the view that 'the EPA should only have sought to regulate impingement and entrainment where they have deleterious effects on the overall fish and shellfish populations in the ecosystem, which can only be determined through a case-by-case, site-specific regulatory regime.' We emphasized that 'the EPA's focus on the number of organisms killed or injured by cooling water intake structures is eminently reasonable.' We reiterated that Congress had 'rejected a regulatory approach that relies on water quality standards,' analogizing the argument pressed there as urging what is essentially a water quality standard that focuses on fish populations and consequential environmental harm. [FN omitted]. Given that the record evidence on this issue has not changed in any meaningful way since the Phase I rulemaking, we are both persuaded and bound by our statements on this issue in *Riverkeeper I*.

> Were we considering the issue in the first instance, however, we would be inclined to defer to the EPA's judgment in any event. The EPA explained that it has set 'performance standards for minimizing adverse environmental impact based on a relatively easy to measure and certain metric -- reduction of impingement mortality and entrainment.' It explained further that it chose this approach 'because impingement and entrainment are primary, harmful environmental effects that can be reduced through the use of specific technologies' and stated that 'where other impacts at the population, community, and ecosystem levels exist, these will also be reduced by reducing impingement and mortality.' We see no reason to second-guess this judgment, given the Agency's consideration of the various environmental consequences of cooling water intake structures.

Id. at 124–25 (internal citations omitted). The court also noted that the "statutory structure [of the CWA] indicates that Congress did not intend to limit 'adverse environmental impact' in section 316(b) to population-level effects." *Id.* at 125 n.36. More specifically, the court observed:

> It is significant that in section 316(a), which governs thermal discharges, Congress permits the EPA to vary the standard applicable to a point source "by considering the particular receiving waterbody's capacity to dissipate the heat and preserve a 'balanced, indigenous' wildlife population." It is also significant that Congress "did not include that [water quality or population level] approach (or make any reference to it) in the very next subsection," since "where Congress includes particular language in one section of a statute but omits it in another section of the same Act, it is generally presumed that Congress acts intentionally and purposely in the disparate inclusion or exclusion."

Id. (alterations in original) (internal citations omitted).[3] Thus, EPA's interpretation of "adverse environmental impact" under CWA § 316(b) is consistent with the statute, is longstanding, and has been upheld by the courts.

The 2014 Final Rule, consistent with *Riverkeeper I* and *II*, explains:

> Aquatic organisms drawn into CWIS are either impinged (I) on components of the intake structure or entrained (E) in the cooling water system itself. In CWA section 316(b) and in this rulemaking, these impacts are referred to as adverse environmental impact (AEI).

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[3] *See also ConocoPhillips Co. v. EPA*, 612 F.3d 822, 840–42 (5th Cir. 2010) (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); *In re Pub. Serv. Co. of New Hampshire (Seabrook Station, Units 1 & 2),* 1 E.A.D. 332, 341-42 (Adm'r 1977), 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).

79 Fed. Reg. at 48,303; *see also id.* at 48,304 ("Today's final rule establishes national requirements applicable to the location, design, construction, and capacity of cooling water intake structures at existing facilities that reflect the BTA for minimizing the adverse environmental impacts−impingement and entrainment−associated with the use of these structures"). For the Final Rule, EPA considered and rejected the argument that PSNH makes in its comment above. *See* 79 Fed. Reg. at 48,354. *See also* Final Rule Response to Comments (RTC) at 105-107; 101. Finally, EPA has clearly maintained the same interpretation of AEI through the Phase I rule, the remanded Phase II rule, the Phase III rule, and the proposal to the 2014 Final Rule. *See* 66 Fed. Reg. 65,289-97 (December 18, 2001); 69 Fed. Reg. 41,612 (July 9, 2004); 71 Fed. Reg. 35,019 (June 16, 2006); and 76 Fed. Reg. 22,196 (April 20, 2011).

Moreover, as indicated above, EPA maintained this view in the 2014 Final Rule as well. The regulations do not provide that EPA must first determine that a facility is causing population-level impacts before it can find adverse environmental effects and establish site-specific BTA standards for entrainment reduction. *See* 40 C.F.R. § 125.94(d). Moreover, when establishing requirements for entrainment, the regulations actually provide that EPA *must* consider several factors, including the "*[n]umbers* and types of organisms entrained." 40 C.F.R. § 125.98(f)(2)(i) (emphasis added). The regulations further provide that EPA *may* consider entrainment impacts on the waterbody. *Id.* § 125.98(f)(3)(i). In other words, the Final Rule *requires* EPA, when establishing entrainment controls, to consider the number of organisms entrained, while also permitting EPA to consider potential waterbody-level effects at its discretion. Thus, the regulations contradict PSNH's claim that only population-level impacts are "adverse." EPA's assessment in this case has been entirely consistent with these regulatory requirements in establishing the BTA requirements for entrainment at Schiller Station. To be clear, EPA is not saying that it cannot consider waterbody-level effects in assessing, for example, whether the costs of particular technologies are justified by the benefits to be attained. EPA is simply saying that population-level effects are not required to constitute "adverse environmental impact" under CWA § 316(b).

EPA's consideration of the adverse environmental impacts caused by Schiller Station'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 Schiller Station 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 are insufficient data to estimate local fish populations in the Piscataqua 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 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, pp. 89-98, 106, 158-164, 187-196. Finally, EPA also considered the cumulative adverse impacts from entrainment and impingement at PSNH's Schiller and Newington Stations, as well as Newington Energy, which are all located along an approximate 2-mile segment of the Piscataqua River. These cumulative impacts 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.

In sum, the Agency continues to regard the hundreds of millions of eggs and larvae taken from the Piscataqua River ecosystem and killed by the CWISs to constitute an adverse environmental impact properly addressed under CWA § 316(b). EPA rejects the comment 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, a comment that ignores past EPA rulemakings and judicial decisions.[4] EPA reasonably decided to move ahead with permitting based on the information that was presently available, which indicates that Schiller Station's CWISs take a large number of eggs and larvae from the biotic community of the Piscataqua River.

PSNH Comment V.B.2.b AIF at The Facility Is Well Below the 125 MGD Compliance Threshold Set Out in The Final 316(b) Rule

Schiller Station should not be subject to entrainment controls at all because its daily AIF falls well below the 125 MGD compliance threshold EPA established in the final § 316(b) rule. EPA's reason for establishing a 125 MGD AIF compliance threshold for entrainment is well founded. EPA found that all of the facilities, like Schiller Station, withdrawing less than this amount, combined, represent only 10 percent of the nationwide potential for AEI from entrainment, despite comprising approximately 70 percent of all facilities potentially subject to the final § 316(b) rule. [93] EPA logically concluded in the final rule that the 125 MGD AIF threshold is therefore "justified on a technical basis" and was selected for the purpose of "focus[ing] on the facilities with the highest intake flows and the highest likelihood of causing adverse impacts…"[94] The final rule recognized that facilities like Schiller Station that withdraw fewer than 125 MGD AIF are far less likely to cause entrainment impacts, and it makes practical sense to allow permitting authorities the discretion to require submission of the entrainment studies to make an informed and legally defensible entrainment determination, which often may be that no entrainment controls are justified at all. [95]

EPA recognized in the preamble to the final § 316(b) rule that it is possible a permitting authority may find it necessary to require entrainment compliance for a facility with an average AIF below 125 MGD. [96] Yet, it is clear that EPA expected this to be the exception and not the norm for such facilities because it went to great lengths to explain that the 125 AIF threshold was

[4] We also note that in Comment V.B, the introductory comment summarizing all of its Section 316(b)-related comments later presented in more detail, including Comment V.B.2.a., PSNH conflates the separate standards of § 316(a) and 316(b), stating that "Region 1 erroneously determined that technologies to address entrainment are necessary at Schiller Station . . . despite not first definitively declaring that the environmental impacts caused by the CWISs at Schiller Station are having any harmful or adverse effects *on the BIP* [balanced, indigenous population] within the Piscataqua River—a prerequisite to any reasoned BTA determination rendered pursuant to § 316(b)." (emphasis added). EPA disagrees. A conclusion about effects "on the BIP" is not a "prerequisite" to a BTA determination pursuant to § 316(b) for the reasons discussed above. Moreover, the term "balanced, indigenous population" only appears in § 316(a), not § 316(b), a difference that the Second Circuit found to be significant when it affirmed EPA's interpretation of § 316(b) and rejected the interpretation put forth in the comment. *Riverkeeper II*, 475 F.3d at 125 n.36.

created to differentiate between larger facilities whose water withdrawals likely pose a significant risk of AEI due to entrainment from those whose withdrawals do not. Were the final rule and/or the agency to presuppose that facilities withdrawing less than 125 MGD AIF would be subject to the same entrainment requirements as those above that intake threshold, EPA's establishment of the threshold in the first place would be wholly arbitrary, capricious, and as a practical matter, pointless. Therefore, while exemption from entrainment controls is not "automatic," the final rule, at a minimum, presupposes that a facility withdrawing less than 125 MGD AIF likely represents little to no impact to aquatic organisms and thus need not specifically be forced to install costly entrainment compliance controls unless the information available to a permitting authority in fact indicates otherwise.

EPA promulgated entrainment control standards in the final rule to "establish a detailed specific framework for determining BTA entrainment control requirements," a critical component of which is requiring that certain information be collected by the facility and submitted to the permitting authority for consideration in making the BTA determination on a site-specific basis. [97] Indeed, EPA requires that entrainment BTA determinations be based upon the specific information provided in a number of specific studies that only facilities withdrawing greater than 125 MGD AIF are required to collect and submit. EPA's Technical Development Document accompanying the final § 316(b) rule highlights the importance of the permitting authority's access to these site-specific studies, explaining that the purpose of the requirement is to allow "the permit writer [to] have access to all <u>the information necessary for an informed decision</u> about [a site-specific BTA determination]…to reduce entrainment mortality at facilities above 125 MGD AIF." [98] Thus, the requirement to collect and submit specific information about entrainment impacts is inherently tied to the underlying entrainment BTA requirements.

Exempting a facility from submitting "information necessary for an informed decision" about the appropriateness of entrainment controls, yet purporting to make such a decision in the absence of that "necessary" information, defies logic and defeats the purpose of the entrainment study requirement altogether. Permitting authorities enjoy discretion to request specific entrainment-related information from a facility with an AIF below 125 MGD. [99] Yet, one must presume that such requests are meant to be reserved for facilities that fall just below this threshold because they are causing significant AEI due to high entrainment losses, meaning further study of entrainment AEI is warranted. That is not the case with Schiller Station, however.

Within the context of the national framework for regulating entrainment impacts from CWISs, including its policies of focusing on facilities most likely to cause AEI (i.e., those withdrawing greater than 125 MGD AIF) and ensuring that "informed decisions" regarding BTA determinations are based upon comprehensive, site-specific entrainment studies, Region 1's entrainment BTA determination for Schiller Station is unfounded. Region 1's own determination that it has found "<u>no evidence</u> that entrainment and/or impingement losses at Schiller Station are causing or significantly contributing to declines in local populations of the affected species of aquatic organisms or to disruptions in the local community or assemblage of organisms in the Piscataqua River"[100] renders arbitrary and capricious Region 1's site-specific entrainment BTA determination at Schiller. The fact that the agency issued this incongruent decision without the benefit of any of the information that EPA itself recognizes in the final rule as "necessary to make an informed decision" further highlights the fact that the agency's proposed BTA determination is the epitome of arbitrary and capricious decision-making.

Despite Schiller Station falling well below EPA's policy-driven compliance threshold for entrainment, and its blatantly minimal impacts on the Piscataqua River (explained in detail below), Region 1 has chosen to rigidly apply the BTA entrainment standard to Schiller Station while selectively ignoring the evidentiary void in its determination. A rigid, across-the-board BTA determination is precisely what EPA intended to avoid in promulgating the national § 316(b) standards, particularly as applied to smaller, low-impact facilities:

> EPA acknowledges that there may be circumstances where flexibility in the application of the rule may be called for and the rule so provides…[T]he flexibilities contained in the rule for the Director to consider the site-specific characteristics of each intake structure within the national standard provide a useful mechanism for facilities with lower intake flows and low impacts to be considered. [101]

Thus, while EPA intended that its new § 316(b) standards apply consistently and predictably to those facilities presenting the most significant AEIs, it recognized that the rule should be applied flexibly and pragmatically to facilities that present little or no environmental impact. Given Schiller Station's lack of impact on the aquatic environment within the waterbody, EPA's national policies of focusing on the most impactful facilities so as to not burden the minimally impactful facilities, and Region 1's lack of pertinent information upon which it was required to base an entrainment BTA determination, the agency's BTA conclusion for entrainment in the Draft Permit is arbitrary and capricious.

[93] 79 Fed. Reg. at 48,309.

[94] *Id*.

[95] *Id*. at 48,309–10.

[96] *Id*. at 48,361 ("not[ing] that facilities below the 125 mgd threshold are not automatically exempt from entrainment requirements").

[97] *Id.* at 48,330.

[98] Proposed § 316(b) TDD at 7-7 (emphasis added).

[99] 79 Fed. Reg. at 48,309.

[100] Fact Sheet at 158 (emphasis added).

[101] 79 Fed. Reg. at 48,309 (emphasis added).

EPA Response to PSNH Comment V.B.2.b:

PSNH comments that Schiller Station should not be subject to any entrainment controls because its daily actual intake flow ("AIF") falls well below a 125 MGD "compliance threshold for entrainment" that, according to the commenter, EPA established in the 2014 CWA § 316(b) Final Rule. EPA fundamentally disagrees. Nothing in the Final Rule "establishes" or "presupposes" that facilities with an AIF below 125 MGD "should not be subject to entrainment controls at all." Nor does the Final Rule presume that facilities withdrawing less than 125 MGD have "little to no impact to aquatic organisms." The comment is particularly misplaced for a facility like Schiller Station that entrains more than 740 million organisms per year. *See* Fact

Sheet pp. 92-97. Simply put, there is no such "compliance threshold for entrainment" in the Rule.

EPA notes that this comment essentially restates comments that EPA rejected during promulgation of the 2014 CWA § 316(b) Final Rule. As EPA stated in the preamble to the Rule:

> [c]ontrary to a number of public comments, however, EPA is not implying or concluding that the 125 mgd threshold is an indicator that facilities withdrawing less than 125 mgd are (1) not causing any adverse impacts or (2) automatically qualify as meeting BTA. In other words, the threshold, while justified on a technical basis, does not result in exemptions from the rule. Instead, EPA is making a policy decision on which facilities must *provide a certain level and type of information*.

79 Fed. Reg. 48,300, 48,309 (Aug. 15, 2014) (emphasis added); *see also* EPA, Technical Development Document for the Final Section 316(b) Existing Facilities Rule (May 19, 2014) at 3-8 to 3-9 (hereinafter referred to as "TDD"). Thus, while the Rule requires certain facilities to submit additional studies and other materials with their permit application materials, *see* 40 CFR § 122.21(r)(1)(B), (r)(9) - (13), these provisions do not establish a "compliance threshold for entrainment." Indeed, the phrase "compliance threshold for entrainment" does not appear in either the Final Rule or the preamble to it.

The additional permit application requirements also do not constitute a presumption that facilities below the 125 MGD threshold do not require entrainment controls or suggest that "EPA expected" that requiring entrainment controls at facilities with an AIF less than 125 MGD would "be the exception."[5] Thus, EPA disagreed with a comment on the CWA § 316(b) Proposed Rule that suggested that facilities withdrawing less than 125 MGD "should be presumed as entrainment mortality compliant." EPA explained that "any facility *at any flow* may have an adverse environmental impact." 79 Fed. Reg. at 48,355 (emphasis added); *see also* Final Rule RTC at 101-02 (Essay 15) (disagreeing with the comment that "EPA appears to have identified 125 mgd as the flow threshold for the occurrence of adverse impacts and that any facility below that threshold should be presumed to employ BTA for both impingement and entrainment"). In the preamble to the 2014 CWA § 316(b) Final Rule, EPA also explained that it made the policy decision to include additional permit application requirements in § 122.21(r) only for relatively larger facilities partly to reduce the potential burden of the permit application process on relatively smaller facilities. *See* 79 Fed. Reg. at 48,309, 48,357. Similarly, EPA explained in the TDD that it chose the 125 MGD application requirements threshold because it "struck the appropriate balance between the goal of capturing the greatest portion of intake flow while minimizing *the study requirements* for smaller facilities." TDD at 3-8 (emphasis added). The Rule does not exempt facilities that withdraw less than 125 MGD from the Rule's BTA requirements for minimizing entrainment.

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[5] The converse is also true: the 2014 CWA § 316(b) Final Rule does not create a presumption that facilities that withdraw more than 125 MGD through their cooling water intake structures must install any particular entrainment reduction technologies. BTA decisions for entrainment reduction at facilities withdrawing 2 MGD or more are made on a site-specific basis considering the variety of factors specified in 40 C.F.R. § 125.98(f).

Not only are facilities below the 125 MGD threshold "not automatically exempt from entrainment requirements," as PSNH concedes in a footnote to the comment (PSNH fn 96), but EPA made clear in the Final Rule that the permitting authority may determine "that entrainment controls may need to be installed *for any cooling water intake structure*." 79 Fed. Reg. at 48,361 (emphasis added). Indeed, even facilities with an AIF at or below 2 MGD, and to whom the Final Rule therefore does not apply, *see* 40 C.F.R. § 125.91(a), are still subject to CWA § 316(b)'s requirement to minimize adverse environmental impacts associated with the use of cooling water intake structures. *See* 40 C.F.R. § 125.90(b). Thus, the commenter is mistaken when it characterizes EPA's decision not to subject smaller facilities to more costly study requirements as a presumption that facilities with an AIF less than 125 MGD will have "little to no impact to aquatic organisms" and do not require entrainment controls. EPA concluded that the rule applicability threshold of just 2 MGD "ensures that the users of cooling water causing the most adverse environmental impact are subject to the rule." 79 Fed. Reg. at 48,309. During the rulemaking, EPA considered raising this applicability threshold to 50 MGD, but decided against it, in part because facilities below 50 MGD "are twice as likely to have no controls in place for impingement or entrainment than are facilities with intake flows greater than 50 mgd." 79 Fed. Reg. at 48,308. Indeed, as EPA recognized in the Fact Sheet, the CWISs at Schiller Station essentially have no effective means of preventing the killing of large numbers of early life stages of the river's fish and "have been allowed to operate essentially without modification or limitation for approximately 50 years despite the existence of technological and/or operational restrictions that could reduce the[] entrainment and impingement losses." Fact Sheet at 163. In sum, the permit application requirements in the regulations simply do not establish a presumption that facilities withdrawing less than 125 MGD "should not be subject to entrainment controls at all." *See also, e.g.*, 79 Fed. Reg. at 48,309-10 (The 125 MGD permit application requirements are "not an indicator that facilities under that threshold are no longer of concern in the final rule."); Final Rule RTC at 101-02 (Essay 15) ("EPA's selection of 125 mgd as a threshold is not the result of an assessment of biological impacts.... [T]he 125 mgd threshold is not intended to be an indicator of impacts . . ..").

The plain language of the regulations indicates that PSNH's theory is without basis. As PSNH concedes elsewhere, the CWA § 316(b) Final Rule "applies to existing industrial facilities that withdraw greater than 2 MGD and utilize 25 percent or more of that water exclusively for cooling purposes." Comment V.B.1 (citing 40 C.F.R. § 125.91(a)).[6] Moreover, the Final Rule plainly states that such existing facilities are required to meet both the impingement mortality standard at 40 C.F.R. § 125.94(c) *and* the site-specific entrainment standard at 40 C.F.R. § 125.94(d).[7] 40 C.F.R. § 125.94(a).

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[6] The commenter does not dispute that the permitted facility is a point source, that it uses CWISs with a cumulative DIF of greater than 2 MGD to withdraw water from waters of the United States, that it uses 25 percent or more of that water on an actual intake flow basis exclusively for cooling purposes, or that it is, consequently, subject to the Final Rule. *See* 40 C.F.R. § 125.91(a).

[7] In the TDD accompanying the Final Rule, EPA specifically noted that the permitting authority's "determination of BTA *for entrainment requirements* under 40 CFR 125.94(d)" is an applicable requirement of the Rule for an "[e]xisting facility with a DIF greater than 2 mgd *but AIF not greater than 125 mgd*." TDD at 3-1 (Exhibit 3-2) (emphases added).

As EPA explained in the preamble to the Rule:

> EPA has established a national BTA standard for entrainment for existing units that requires determination of BTA entrainment requirements on a site-specific basis in a structured permitting setting. The framework for determining entrainment requirements provides for the consideration at a minimum of certain specified factors that must be considered in the Director's determination of the BTA controls.

79 Fed. Reg. at 48,337. Specifically, 40 C.F.R. § 125.94(d) provides that the permitting authority must establish BTA requirements for entrainment reduction on a site-specific basis that reflect the permitting authority's determination of the maximum reduction in entrainment warranted "after consideration of the relevant factors *as specified in §125.98*" (emphasis added). Factors that the permitting authority *must* consider are specified in 40 C.F.R. § 125.98(f)(2), while factors that it *may* consider are listed in 40 C.F.R. § 125.98(f)(3).[8] Notably, neither list includes consideration of whether the facility's AIF is above or below 125 MGD or, indeed, what the facility's AIF is at all.

Instead, the permitting authority is required to consider the "[n]umbers and types of organisms entrained," the "particulate emissions or other pollutants associated with entrainment technologies[, l]and availability inasmuch as it relates to the feasibility of entrainment technology[, r]emaining useful plant life[, and q]uantified and qualitative social benefits and costs of available entrainment technologies." 40 C.F.R. § 125.98(f)(2). The 125 MGD threshold established in the application requirements of § 122.21(r) simply does not represent a presumption that facilities withdrawing less than this amount are having "little to no impact." As the Fact Sheet recounts, estimated entrainment losses at Schiller Station top 740 million organisms every year, even if green crabs are excluded. Fact Sheet at 93-97. The information available to EPA in this proceeding establishes the reasonableness of the Agency's conclusion that entrainment and impingement losses from Schiller Station's current operation constitute adverse environmental impacts. *See* Fact Sheet at 92-97. PSNH's assertions that Schiller "should not be subject to entrainment controls at all because its daily AIF falls well below the 125 MGD compliance threshold EPA established in the final § 316(b) rule," or even that the regulations provide that entrainment controls for facilities that withdraw less than 125 MGD would "be the exception" find no basis in the regulation.[9]

PSNH is correct that the application requirements for facilities larger than 125 MGD include the submission of an Entrainment Characterization Study, a Comprehensive Technical Feasibility

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[8] Moreover, in an ongoing permit proceeding such as this one, the permitting authority's "BTA determination *may* be based *on some* or all of the factors in paragraphs (f)(2) and (3) of this section." 40 C.F.R. § 125.98(g) (emphases added).

[9] Furthermore, PSNH's theory finds no support in the statute. CWA § 316(b) does not exempt from the requirements of § 316(b) CWISs at facilities whose AIF is less than 125 MGD. By the same token, neither the statute nor regulations mandate that particular entrainment reduction technologies be used by facilities withdrawing *more* than 125 MGD of water. Again, the 2014 CWA § 316(b) Final Rule calls for site-specific, case-by-case BTA determinations for entrainment control.

and Cost Evaluation Study, a Benefits Valuation Study, a Non-water Quality Environmental and Other Impacts Study, and a Peer Review of the latter three studies. *See* 40 CFR § 122.21(r)(9) - (13). PSNH neglects to recognize, however, that *all* existing facilities are required to submit a variety of permit application studies, including "studies to describe the source waterbody (§ 122.21(r)(2)), cooling water intake structures (§ 122.21(r)(3)), … the biological community in the vicinity of the cooling water intake structure (§ 122.21(r)(4)), [and the facility's] cooling water system (§ 122.21(r)(5)) and operational status (§ 122.21(r)(8))." 79 Fed. Reg. at 48,361; *see also id.* at 48,309 (all facilities will be required to "submit basic information describing the facility, Source Water Physical Data, Source Water Biological Characterization Data, and Cooling Water Intake System Data."), 48,366 ("EPA envisions the facility would extend the data collection methods and frequency to develop the source water characterization already required by § 122.21(r)(4) to develop the Entrainment Characterization Study."). PSNH comments that Region 1 issued a draft BTA determination without the benefit of any of the information that the Final Rule requires, but this is incorrect. First, the as the Fact Sheet explains, the determination for Schiller Station, which was in development prior to the promulgation of the Final Rule, was made under the "Ongoing permit proceedings" provision of the Final Rule at 40 C.F.R. § 125.98(g). This provision authorizes EPA to make BTA determinations without stopping progress in an ongoing permit proceeding to go back through the full information gathering and submission process newly set out in 40 C.F.R. § 122.21(r). Fact Sheet at 84. *See also* 79 Fed. Reg. 48,358. EPA is authorized to move forward in this manner when it determines that it already has obtained sufficient information in the ongoing permit proceeding. In that case, the new information submission requirements would be applied for the next permit cycle. PSNH's comment fails to take into account that, in preparation for the draft permit determination, EPA requested and received information on Schiller Station's CWISs, including an evaluation of potential technologies to minimize entrainment. In fact, the information already in the administrative record for the permit is substantially similar to the information required in the Final Rule. *See* AR-118, 119, 140, 227, 232. EPA considered whether any of the permit application information specified at 40 C.F.R. § 122.21(r) is necessary to support this permit decision, but determined that the information already submitted by the facility was sufficient. Fact Sheet at 84. The determination for Schiller Station considered the factors specified in the Final Rule at 40 C.F.R. § 125.98(f)(2) and many of the factors at 40 C.F.R. § 125.98(f)(3). *See* Response to Comment V.B.4 for further discussion of the basis of the determination in comparison to the requirements of the Final Rule.

In short, the 2014 CWA § 316(b) Final Rule applies to facilities like Schiller Station withdrawing more than 2 MGD of water, *see also* 2014 CWA § 316(b) Final Rule, Response to Comments at 72 (Entrainment "requirements are applicable to all in-scope facilities (including those with intake flows at or below 125 AIF)."), and it does not establish a 125 MGD "compliance threshold for entrainment." As EPA stated in the Fact Sheet, in response to PSNH's suggestion in the Enercon 2014 Report that Schiller Station was not subject to entrainment controls, both impingement and entrainment requirements of the Final Rule apply "regardless of whether information submission requirements vary under the New CWA § 316(b) Regulations based on whether a facility withdraws more or less than 125 MGD." Fact Sheet at 115. EPA makes clear in both the Fact Sheet and these Responses to Comments that the entrainment of hundreds of millions of eggs and larvae and impingement of thousands of fish and macrocrustaceans at Schiller Station's CWISs annually *are* adverse environmental impacts and that the determination of the BTA for entrainment is consistent with the Final Rule.

PSNH Comment V.B.2.c Entrainment at Schiller Station is *De Minimis*

Region 1's decision that entrainment controls are required at all is puzzling given the negligible potential impact of Schiller Station's CWISs to the robust Piscataqua River. Even without considering the actual waterbody at issue, the AIF for Schiller Station is slight compared to the industry. The data PSNH submitted to Region 1 in the 2014 Enercon Report shows that Schiller Station withdrew an average of 74 MGD AIF during the three-year period of 2011-13.[102] More recent data developed by Enercon and Normandeau shows even less withdrawal (72.4 MGD AIF) over the span of August 2012 to August 2015.[103] These numbers put Schiller Station near the bottom of the spectrum of all facilities within the industry, which Enercon and Normandeau exhibit in detail in their comments to the Draft Permit. [104] Specifically, even if Schiller Station withdrew water at or near its DIF of 125.8 MGD, the facility would still be within the bottom 23 percent of the nationwide average DIF for once-through cooling water intakes. [105] The fact that Schiller Station's AIF is drastically reduced compared to its DIF, whereas data for the rest of the industry shows little difference between facilities' DIFs and average AIFs, further suggests that the facility's water withdrawals and corresponding entrainment is negligible and/or *de minimis*. [106]

With respect to the Piscataqua River, Region 1's own conclusion that Schiller Station withdraws only 0.5 percent of the waterbody's total flow actually overstates the potential impact. [107] In reality, the CWISs at the facility have the design capability to withdraw less than 0.003 percent of the river's total volume and have actually withdrawn more modest volumes of water over the past three years that constitute a mere 0.0018 percent of the peak Piscataqua River withdrawal zone flow during each tidal cycle. [108] Given these miniscule numbers, Schiller Station's actual impact on surrounding aquatic organisms can be nothing beyond *de minimis*.

Notably, PSNH's *de minimis* assertion based on the percentage of water withdrawn by the CWISs at Schiller Station compared to the overall flows of the Piscataqua River is consistent with the specific example EPA included in its final § 316(b) rule for illustrating when impingement impacts from a CWIS governed by the rule are negligible and therefore warrant no further regulation by the agency. EPA specifically provided:

> EPA acknowledges that there may be circumstances where flexibility in the application of the rule may be called for and the rule so provides. For example, some low flow facilities that withdraw a small proportion of the mean annual flow of a river may warrant special consideration by the Director. As an illustration, if a facility withdraws less than 50 mgd AIF, withdraws less than 5 percent of mean annual flow of the river on which it is located (if on a river or stream), and is not co-located with other facilities with CWISs such that it contributes to a larger share of mean annual flow, the Director may determine that the facility is a candidate for consideration under the de minimis provisions contained at § 125.94(c)(11). In the case of facilities on lakes and reservoirs, co-location would be better determined by multiple CWIS facilities on the same waterbody, rather than distance.

> In either case, the flexibilities contained in the rule for the Director to consider the site-specific characteristics of each intake structure within the national standard provide a useful mechanism for facilities with lower intake flows and low impacts to be considered.[109]

The AIF at Schiller Station is slightly higher than the 50 MGD included in EPA's example. Yet, the percentage of water withdrawn by the facility (0.0018 percent) is significantly lower than the five percent discussed by the agency. EPA expressly provides in the excerpt above that its discussion is merely illustrative and does not establish concrete thresholds above which no facility may qualify for the exemption. Therefore, it is safe to assume that EPA would have no issue considering application of the de minimis exception at a facility with a slightly higher AIF that is more than counterbalanced by a comparatively low percentage of the overall waterbody withdrawn, or vice versa. It is the infinitesimal percentage of overall water withdrawn from the Piscataqua River that places the CWIS operations at Schiller Station in proper perspective and clearly demonstrates that the impacts to the source waterbody, if any, are de minimis and warrant no further technologies to address entrainment. Region 1's contrary conclusion that such a negligible impact from entrainment is somehow "adverse"—and thus warranting BTA control—is unsupported by the record and thus arbitrary and capricious.

Further, Region 1 is inconsistent throughout the Fact Sheet in how it evaluates historical entrainment impacts at Schiller Station and the expected performance of various compliance options to further reduce the already de minimis levels of entrainment occurring at the facility. The agency relies upon absolute numbers of fish and macrocrustacean eggs and larvae at certain points in the Fact Sheet,[110] equivalent adult numbers at others,[111] and also improperly compares the numbers of fish and macrocrustaceans from different life stages in other portions of the Fact Sheet.[112] Region 1's inconsistencies in this regard are arbitrary and capricious, conflict with the established practice of EPA and the scientific community of utilizing adult equivalency numbers to properly estimate actual impacts to fish populations and, in turn, evaluate the costs and true relative benefits of the various BTA compliance options,[113] and therefore undercut the agency's ultimate entrainment conclusions for Schiller Station.

Region 1 attempts to justify its uneven analysis of Schiller Station's entrainment impacts by criticizing the equivalency method for supposedly omitting the value fish and ichthyoplankton have in providing a food source to many species within the ecosystem:

> Adult equivalent analyses may be useful when trying to place the loss terms of fish and macrocrustacean eggs and larvae into the context of grown fish and in order to combine entrainment and impingement losses into a single metric. When looking at the efficiencies of any control technologies, however, EPA believes that the actual numbers of eggs and larvae saved or lost provides the more appropriate metric. Eggs and larvae have their own inherent ecological value as important components of the food web. This value is ignored or hidden if losses are only considered in terms of adult equivalents.[114]

Notably, Region 1 cites to no authority to support its "belief." Even if it had, the agency's critiques are unfounded here. The equivalency method Normandeau utilized in its analysis does not omit the value entrained ichthyoplankton and impinged fish may have in providing a food source to many species within the ecosystem. This is true even if 100 percent mortality is assumed for impingement and entrainment [115] because the dead and moribund organisms are discharged back to the source waterbody where they can be consumed by predators or recycled as nutrients. Thus, the biomass and organic carbon of organisms impinged and entrained is not lost to the system and will continue to play a role in the estuarine ecology.

PSNH can only assume Region 1 has chosen to use comparatively high numbers of entrained early-life organisms to rationalize its environmental impact assertions and corresponding BTA determinations. There can be no other reasonable justification for why the agency elects to use these inflated numbers when doing so does not provide a true depiction of what AEI, if any, is actually occurring in a given waterbody. In fact, utilizing absolute numbers skews the evaluation the contribution of different life stages of organisms have on the impacts to a source waterbody, if any .[116] This is especially true for organisms within the Piscataqua River given that such a small fraction of the overall waterbody is withdrawn by operations at Schiller Station and because most of the species at issue exhibit either “periodic” or “opportunistic” life history traits, as explained in the 2016 Enercon-Normandeau Comments as follows:

> From an ecological perspective, periodic species are characterized by high fecundity (i.e., they spawn a large number of eggs), relatively large size, and long life spans during which females may spawn many times. Winter Flounder is an example of a periodic species entrained at the Station. Opportunistic species entrained at the Station are characterized by small body size, short life spans, and the ability to disperse offspring widely throughout the environment. Green Crab is an example of an opportunistic species entrained at the Station. Periodic and opportunistic traits are advantageous to fish or macrocrustacean species that live in unstable or unpredictable environments, such as the north temperate waters of the Gulf of Maine and the Piscataqua River / Great Bay estuary, which experience significant seasonal and between-year variation in environmental conditions (e.g., temperature, storm events, etc.). It is also likely that the opportunistic life history of Green Crabs enabled them to successfully establish abundant populations in Gulf of Maine waters and in the Piscataqua River as an invasive species. The reproductive strategies of these organisms living in these unstable environmental conditions, including the very large numbers of eggs produced, ensure that sufficient offspring will survive to sustain the populations from year-to-year, even in unpredictable environments. [117]

Figure 2-1 in the 2016 Enercon-Normandeau Comments depicts the survivorship curve of the Winter Flounder and puts the above-referenced comments in proper context by demonstrating that a miniscule number of eggs and larvae of organisms subject to entrainment at Schiller Station would survive to adulthood even in the absence of the facility’s CWISs:

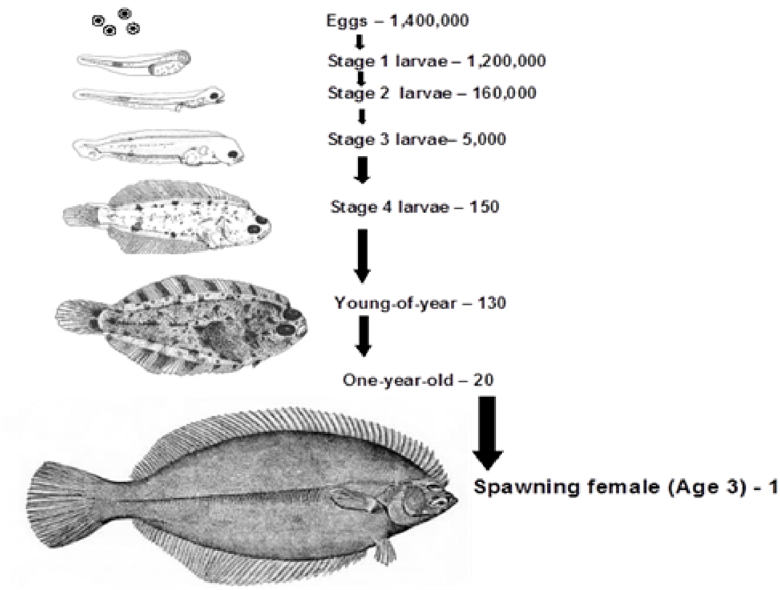

Figure 2-1: Example illustrating the decline in abundance of Winter Flounder life stages from spawning to adulthood based on published life history parameters[3].

Only one out of 1.4 million Winter Flounder eggs is likely to survive in waters similar to the Piscataqua River to become a three-year-old spawning fish—one. [118] Moreover, nearly 99 percent of the eggs die of natural causes within 60 days following spawning. Remarkably, fecundities of other abundant fish and macrocrustacean taxa typically entrained by CWISs at Schiller Station are roughly equivalent to the Winter Flounder and/or are comparatively higher than the median taxa. Furthermore, like the Winter Flounder, early life stages of these other abundant fish and macrocrustacean taxa typically entrained by the facility's CWISs also experience high levels of natural mortality. [119] Enercon and Normandeau aptly provide that it is because of the "exponential decrease in numbers of fish due to natural mortality" that EPA and the scientific community provide "estimates of the life stages of both fish and macrocrustaceans entrained…as both absolute numbers and their equivalent adults" because "counts of total numbers entrained reveal nothing meaningful about the potential adverse impact of…CWISs on the relevant adult populations."[120] "The correct and biologically equitable way for [Region 1] to compare the benefits of different technologies or operational measures that act selectively on the different life stages of fish and macrocrustaceans entrained at [Schiller] Station (such as screening technologies) is by making these comparisons using the equivalent adult values provided in a revised fact sheet."[121]

Inconsistently comparing numbers of different life stages of organisms is not technically and/or biologically correct and skews Region 1's overall analysis of the benefits each compliance option will actually provide. Utilizing equivalency analyses permits the agency to know what truly may be gained by reducing entrainment and allows informed judgments about whether it is worth the adverse impacts of the various alternatives. And, in the present context, adult equivalency numbers put biological losses from operation of Schiller Station's CWISs into proper perspective and demonstrate that such operations result in no environmental impact that is adverse to the aquatic environment of the Piscataqua River.

[102] AR-227 at 21.

[103] 2016 Enercon-Normandeau Comments at 21.

[104] *See id*. at 21-25.

[105] *Id*. at 23.

[106] *See id*. at 24-25. In fact, Region 1 discusses entrainment impacts only in terms of estimates of the "worst case," with Schiller Station operating at or near the DIF for the CWISs. See Fact Sheet at 92-97. This means that the numbers set out in the Fact Sheet are estimates of the maximum number of organisms that could have been impinged and entrained if all three units at Schiller Station had operated year-round at full flow, rather than the number that actually were or are reasonably expected to be impinged and entrained under historical operating conditions. Over the last three years, the capacity factors for Units 4 and 6 at Schiller Station have been around 20 percent and the capacity factor for Unit 5 has been around 85 percent. These operational realities mean considerably fewer organisms have been impinged or entrained than the numbers Region 1 has presented in its Fact Sheet. Region 1's failure to acknowledge these impingement and entrainment decreases is arbitrary and capricious.

[107] *See id*. at 158.

[108] 2016 Enercon-Normandeau Comments at 10.

[109] 79 Fed. Reg. at 48,309 (emphasis added). The fact that EPA primarily discusses the de minimis standard in the context of a river or stream does not mean its application is so limited. EPA's discussion is meant to be illustrative and it makes perfect sense that the agency would address the de minimis standard in the context of a river or stream given that the majority of CWISs subject to the final § 316(b) rule are located along waterbodies of this kind. The agency's subsequent discussion of lakes and reservoirs within this excerpt supports this conclusion. Moreover, EPA concludes its discussion by expressly providing that "the flexibilities contained in the rule for the Director to consider the site-specific characteristics of each intake structure within the national standard provide a useful mechanism for facilities with lower intake flows and low impacts to be considered." Id. (emphasis added). This confirms EPA intended for the de minimis exception to be available to every facility that may potentially qualify—including PSNH's Schiller Station.

[110] *See, e.g.*, Fact Sheet at 150–53 (utilizing absolute entrainment loss values in Tables 10-A and 10-B without addressing the difference in life stage value or the benefit of returned eggs and larvae to the Piscataqua River).

[111] *See, e.g., id*. at 110 (relying upon equivalent adult calculations in Table 9-A to assess efficacy of CWW screens).

[112] *See, e.g., id*. at 134 (utilizing numbers in Table 9-C that include organisms from different life stages in the different months and, therefore, cannot reasonably and fairly be compared without converting these numbers to equivalent adults).

[113] *See, e.g.*, 69 Fed. Reg. 41,576, 41,586 (July 9, 2004) (providing that "expressing impingement mortality and entrainment losses as [adult] equivalents is an accepted method for converting losses of all life stages into individuals of an equivalent age and provides a standard metric for comparing losses among species, years, and facilities").

[114] Fact Sheet at 137; *see also* id. at 115 ("EPA considers adult equivalents, but also focuses on absolute loss numbers of eggs and larvae when making control decisions. Basing decisions solely on adult equivalents would ignore the valuable ecological role eggs and larvae play in the food chain."); id. at 134 ("EPA makes control decisions based on consideration of the absolute numbers of eggs and larvae lost, not necessarily solely on adult equivalents. Basing decisions solely on adult equivalents would ignore the valuable ecological role that eggs and larvae play in the food chain.").

[115] PSNH assumes 100 percent mortality for the sake of argument. In fact, some entrainment survival is likely at Schiller Station given, among other reasons, that a number of species entrained are hardier species.

[116] *See* 2016 Enercon-Normandeau Comments, at 15-16.

[117] Id. at 13-14 (citations omitted).

[118] *Id*. at 15.

[119] *Id*. at 16.

[120] *See* id. at15-16.

[121] *Id*. at 16.

EPA Response to PSNH Comment V.B.2.c:

According to PSNH and Enercon, the design intake flow (DIF) at Schiller Station is 125.8 MGD and the actual intake flow (AIF) based on the operating flows from 2011 through 2014 was 73.7 MGD. Enercon comments that, at various points in the Fact Sheet, EPA had inconsistently presented design and actual intake flow rates. *See* Appendix 2 to Enercon Comments on the Draft Permit p. 2. Throughout this response to comments, EPA refers to the DIF of 125.8 MGD and the AIF of 72.4 MGD based on operating flows between August 2012 and August 2015 as presented in the comment above.

Intake Withdrawal as Percentage of Industry

PSNH and Enercon comment that Schiller Station's AIF is drastically reduced compared to its DIF, whereas data for the rest of the industry show little difference between facilities' DIFs and average AIFs. PSNH then comments that, based on the difference between Schiller Station's DIF and AIF compared to the rest of the industry, the facility's water withdrawal and corresponding entrainment is "negligible and/or *de minimis*."

First, the basic premise of the comment, which attempts to establish a *de minimis* threshold for entrainment based on the intake flow for a particular facility as a percentage of the total cooling water flow for the universe of cooling water intake structures nationally, is not reflected in the Final Rule. For entrainment, the Final Rule does not include any *de minimis* provision or threshold, but rather sets forth a framework for a site-specific analysis that requires the permitting authority to consider a relatively short list of specific factors and provides the permitting authority with the discretion to consider several additional specific factors. Importantly, neither of these lists of required or discretionary factors includes a comparison of a facility's AIF to its DIF, let alone to the ratio of DIF to AIF of some other unrelated, larger facility in the industry. *See* 40 C.F.R. § 125.98(f)(2), (3).

The absence of PSNH's suggested factors from 40 C.F.R. §§ 125.98(f)(2) and (3) makes sense: a facility's AIF:DIF ratio, or its ratio as compared to the AIF:DIF ratios at other facilities on other waterbodies, says little, if anything, about actual entrainment effects at the facility in question. Even a comparison of the facility's recent AIF to its own DIF does not provide a complete picture of entrainment at the facility. At most, these comparisons suggest that entrainment at the facility "could be worse" (*i.e.*, if the AIF is less than the DIF, then the facility could theoretically withdraw more water and entrain more organisms). EPA does not agree that viewing the impacts in this way should determine "the best technology available for minimizing adverse environmental impact," CWA § 316(b), and "the maximum reduction in entrainment warranted," 40 C.F.R. § 125.94(d).

Discussing the decision to establish a framework for making site-specific entrainment requirements at each facility, the preamble to the Final Rule notes that "EPA's data on entrainment at facilities are not sufficient to allow the Agency to categorize facilities requiring no additional controls for entrainment." 79 Fed. Reg. at 48,348. In other words, EPA considered, but rejected, a rule that would establish that facilities with certain characteristics would require no further controls to address entrainment mortality. If the threshold for determining that no additional entrainment controls are warranted were simply a comparison of AIF to DIF, or intake flow as a percentage of nationwide withdrawals, then the information would have been sufficient for EPA to categorize facilities as needing no additional entrainment controls. That EPA specifically did not do so based on the available information demonstrates that the decision to require additional controls for entrainment is not simply a consideration of intake flow, as the comment proposes.[10]

In any event, EPA does not agree that the design volume of cooling water withdrawn at Schiller Station is "essentially negligible in relation to the remainder of the industry," as PSNH opines in an attachment to its comments authored by Enercon. PSNH Comments, Exhibit 1 at 25. According to Enercon, 35 out of a total of 199 facilities have once-through cooling systems and DIFs between 50-250 MGD, including Schiller Station. *Id.* at 24. Also according to Enercon, 150 of those 199 facilities have DIFs greater than 250 MGD. *Id.* Based apparently on this information, Enercon concludes that Schiller Station is "a small water user relative to the electric generating industry average developed by EPA for stations with multiple CWISs." *Id.* at 24 (referencing Exhibit 4-15 from the TDD for the Final Rule (p. 4-12)). Enercon's analysis (referring to TDD Exhibit 4-15), however, is restricted to facilities with multiple cooling water intake structures, which includes only about one-third of the industry and, thus, represents a relatively limited subset of facilities. Among *all* electric generators, 90 facilities have DIFs between 100 and 200 MGD (including Schiller), while 173 generators have smaller DIFs and 409 have larger DIFs. *See* TDD for Final Rule Exhibit 4-3 p. 4-5. Thus, among all electric generators, Schiller Station is smaller than many facilities but not as small as Enercon's analysis of only facilities with multiple intakes suggests. Further, these figures exclude manufacturing facilities, which tend to have lower DIFs than electric generating facilities. Including all facilities subject to site-specific entrainment requirements under the Final Rule, 11% of facilities fall into the same DIF category as Schiller Station and 35% have higher DIFs, whereas 54% of facilities have lower DIFs. *Id*. Therefore, the DIF at Schiller Station is in the upper half of facilities subject to the Final Rule, which does not support the comment that the facility is a small water user relative to the industry.

EPA also disagrees with PSNH's comment that "Schiller Station's AIF is drastically reduced compared to its DIF, whereas data for the rest of the industry shows [sic] little difference between facilities' DIFs and average AIFs." The relative average volume of AIF as a percentage of DIF among all electric generators surveyed is approximately 59%. As a comparison, the relative percentage of AIF to DIF at Schiller Station is 58% (based on an AIF of 72.4 MGD). *See* TDD for the § 316(b) Existing Facilities Rule Exhibit 4-4, p. 4-5. Electric generators with DIFs

[10] In footnote 106 of its comments, PSNH states that, by calculating entrainment losses in Section 8 of the Fact Sheet at DIF, EPA has presented entrainment impacts only as "worst case" (*i.e.*, as if all three units operate year-round at full flow), rather than the number actually entrained based on recent historical operating conditions. PSNH then comments that it was arbitrary and capricious for the Region to "fail to acknowledge" that all three Units have operated at capacity factors less than design over the last three years. EPA calculated entrainment losses at design flow because PSNH indicated in its application for permit renewal that it plans to withdraw cooling water at this rate and requested a permit to authorize such withdrawals. PSNH did not suggest to EPA that it plans to permanently reduce its cooling water withdrawals consistent with operating conditions over the past several years (or that any potential future owner would necessarily do so), nor does the Draft Permit require the facility to do so. For these reasons, EPA presents the maximum number of organisms that may be entrained under the cooling water flow authorized by the Draft Permit. In any event, EPA disagrees that it ignored the recent reductions in cooling water flows in its analysis. EPA plainly included the reduced capacity at Units 4 and 6 in its qualitative evaluation of the costs and benefits of available technologies and, in fact, it was one of the factors that led EPA to conclude that wedgewire screens, not closed-cycle cooling, is the BTA for entrainment at Schiller Station. *See* Fact Sheet at 155, 158, 166.

ranging from 100 to 200 MGD, which includes Schiller Station, had 48% AIF to DIF, which indicates that Schiller Station actually uses a greater percentage of DIF as compared to other facilities of similar size. *Id*. Even the largest facilities (DIF from 500 to 1,000 MGD and DIF > 1,000 MGD) have AIF at 60% of DIF. *Id*. There is little evidence, based on industry data, for PSNH's claim that the data show "little difference" between AIF and DIF at most facilities.

The Enercon attachment also suggests that Schiller Station's DIF (125.8 MGD) is only 23 percent of the nationwide average DIF (555 MGD) for once-through cooling water intake structures, according to Exhibit 4-5 of the TDD. PSNH Comments, Exhibit 1 at 23. Enercon concludes that "given this information, the Station does not constitute a large user of water and should not be subject to the burden of entrainment controls." *Id.* The average DIF of 555 MGD for electrical generators in Exhibit 4-5 of the TDD, however, is an average based on 671 surveyed facilities and may not be reflective of actual industry-wide average design intake flows, as noted in the footnote to the Exhibit. Schiller Station's DIF is 23% of the average DIF of *surveyed* electric generators. Among this subset, the largest 38% of electric generators are responsible for 81% of cooling water withdrawals. In other words, 62% of facilities, including Schiller Station, comprise less than 20% of the DIF. In addition, 87% of manufacturing facilities that are subject to the Final Rule, including the site-specific entrainment requirements, have a DIF less than 100 MGD. *See* TDD for Final Rule Exhibit 4-3 p. 4-5. Schiller Station, rather than having an exceptionally low water use, is representative of the majority of facilities subject to the rule.

Finally, as part of its analysis in the TDD for the § 316(b) Existing Facilities Rule, EPA reviewed the percentage of facilities and the total DIF and AIF that would be addressed by various administrative thresholds regarding flow for the application requirements for additional studies. *See* TDD for Final Rule, Exhibits 5-13 through 5-15. In the Enercon attachment to PSNH's comments, Enercon references Exhibit 5-15 from the TDD, concluding that this threshold "represents a policy decision by EPA to produce the greatest entrainment reduction in a way that affects less than half of the industry." PSNH Comments, Exhibit 1 at 25. This is incorrect. To the extent that Enercon interprets the requirement for additional entrainment-related studies from the largest facilities (above 125 MGD) as an indication that entrainment at facilities below this administrative threshold is *de minimis* or that such facilities are not subject to entrainment controls, EPA disagrees and has discussed the difference between the requirements for additional studies and the requirement to establish a site-specific determination of the BTA for entrainment at all facilities subject to the rule at length in Response to Comment V.B.2.b, above.

Volume of Intake Withdrawal as Percentage of Waterbody

PSNH comments that the relatively "miniscule" percentage of the river's total volume actually withdrawn at Schiller Station (estimated by Enercon to range from 0.0018 to 0.003 percent) supports the argument that the "actual impact on surrounding aquatic organisms can be nothing beyond *de minimis*." PSNH then concludes that "Region 1's contrary conclusion that such a negligible impact from entrainment is somehow 'adverse'—and thus warranting BTA control—is unsupported by the record and thus arbitrary and capricious."

Enercon estimates that the intake represents less than 0.003% of the tidal volume based on a volume of source water equal to 2.72×10^{11} ft^3 flowing by the Station's CWIS during one tidal cycle, which is in turn based on a tidal excursion of 196,000 ft (37 miles) centered on the CWIS and a 12.42-hour tidal period. *See* 2016 Comments on Draft Permit p. 10. The calculation of the tidal excursion appears generally to follow the method outlined in the Phase I Rule, although the exact calculation was not provided. *See* 66 Fed. Reg. 65317 (December 18, 2001). However, the total volume is calculated assuming that the source waterbody falls entirely within the area of a circle (diameter equal to 196,000 ft centered on the CWIS). A circle of this size would extend from the CWIS inland to Barrington, New Hampshire and seaward well past Smuttynose Island. The Phase I Rule specified that the area of the waterbody that falls within the circle must be defined and that, for cooling water intake structures located on estuaries or tidal rivers, the area of the waterbody might be a portion of the circle. *Id. See also* Appendix 3 to Preamble for the Phase I Rule at 66 Fed. Reg. 65,336. In other words, much of the area encompassed by the circle drawn around Schiller Station is land, not water. Thus, the total volume of water is likely significantly overestimated. In 2007, the New Hampshire Estuaries Project completed a study of the hydrologic parameters for New Hampshire's Estuaries (AR-362). In it, the total length of the estuary from the head of the tide to the mouth of Portsmouth Harbor was estimated to be 15.5 miles and the total tidal prism (the difference in the volume from low to high tide) was estimated at 2.79×10^9 ft^3. Thus, the tidal excursion is estimated to be less than half of that calculated by Enercon and Enercon's total volume was two orders of magnitude greater than was estimated. At a total volume of 2.79×10^9 ft^3, the CWISs at Schiller Station are estimated to withdraw about 0.3% of the tidal prism. This estimate is similar to the estimate of 0.5% provided in the Fact Sheet, which EPA characterized as not likely to cause or significantly contribute to declines in local abundance of the affected species of aquatic organisms or to disruptions in the local community or assemblage or organisms in the Piscataqua River. *See* Fact Sheet at 158. Therefore, EPA disagrees with the calculation of tidal prism, and thus the percentage of the waterbody withdrawn, presented in PSNH's comments, but it continues to recognize that the volume of Schiller Station's water withdrawal as a percentage of river flow is relatively minor just as it did when evaluating the relative costs and benefits of technologies in the Fact Sheet. *Id*.

As PSNH points out, the preamble to the Final Rule provides some examples of factors that might be a consideration in the *de minimis* provision at 40 C.F.R. § 125.94(c)(11). For several reasons, however, EPA disagrees with PSNH's suggestion that not invoking the provision here is arbitrary and capricious. First, the preamble excerpt quoted in the comment and the *de minimis* provision itself apply to the BTA determination for *impingement* mortality, not entrainment, a point the comment largely overlooks. *See* 79 Fed. Reg. at 48,322 ("EPA notes that these provisions for impingement mortality [including the § 125.94(c)(11) "*De minimis rate of impingement*" provision] would not apply to entrainment."). So even if, as PSNH claims, "EPA intended for the *de minimis* exception to be available to . . . PSNH's Schiller Station," PSNH Comments at 42 n.109, the comment is irrelevant, because EPA did not intend § 125.94(c)(11) to apply to entrainment. The Final Rule does not include a *de minimis* provision for entrainment because the regulations call for site-specific BTA determinations for entrainment =-control and allow the permitting authority to determine that no additional entrainment controls are warranted based on the facts of the individual case. For example, no entrainment technologies would be required if all were found to have social costs not justified by the social benefits. 40 C.F.R. § 125.98(f)(4); *see* 79 Fed. Reg. at 48,372 ("Since the entrainment requirements are already determined by the Director for each site, EPA concluded that specific regulatory language for de minimis entrainment was unnecessary."). As discussed in the Fact Sheet, and reflected in the Final Permit and this RTC, EPA has determined that for Schiller Station, the social costs of certain entrainment technologies (*i.e.*, wedgewire screens) *are* justified by the social benefits. *See, e.g.*, FS at 157-158.

Second, the *de minimis* provision for impingement control is not automatically applied in any case, but rather, is within a permitting authority's discretion to invoke in any particular instance. 40 C.F.R. § 125.94(c)(11) ("The Director . . . *may* conclude that the documented rate of impingement at the cooling water intake is so low that no additional controls are warranted.") (emphasis added); 79 Fed. Reg. at 48,371 ("The Director *may* want to consider facility withdrawal rates in relation to the mean annual flow of the river and possible co-location with other CWISs when making a de minimis determination.") (emphasis added). Third, EPA has stated that a *de minimis* rate of impingement is to be measured at the organism level, not the population level, *id.* at 48,371-72 ("EPA considers low rates of impingement to be measured as an organism or age-one equivalent count, and not as the effect of impingement on fish populations."), making PSNH's claim that "impacts to the source waterbody" are *de minimis* pursuant to this provision and "warrant no further technologies to address entrainment" additionally misplaced. PSNH Comments at 43.

Finally, the TDD for the Final Rule assessed the relative scale of withdrawals at facilities located on freshwater rivers and streams as a percentage of the mean annual flow. *See* TDD Exhibit 4-7, p. 4-7. The exhibit shows that more than half of electric generators and the majority of manufacturers currently operate CWISs that withdraw less than 5% of mean annual flow. If that were the only criterion to conclude that the effects of the intake are *de minimis*, then most of the facilities subject to the Final Rule would be *de minimis*. Clearly this was not the intent, as EPA plainly states that it expects the *de minimis* provision to be "rarely used." Final Rule RTC at 25 n.4, 42 ("The final rule provides flexibility for the Director to decide not to require impingement controls where rates of impingement *are exceptionally low* as to be de minimis.") (emphasis added), 118 ("EPA did not establish any metrics for what qualifies as 'exceptionally low' impingement rates, as the Agency intends for the *de minimis* provision to be infrequently used"); *see also* 40 C.F.R. § 125.94(c)(11) ("*In limited circumstances*, rates of impingement may be so low at a facility that additional impingement controls may not be justified.") (emphasis added); TDD at 12-3 ("EPA intends that this provision would not be utilized often").

In any event, EPA factored Schiller Station's "relatively small withdrawal relative to the flow in the Piscataqua River" into the entrainment BTA determination (Fact Sheet at 158), and explained the basis for its conclusion that Schiller Station still "entrains and impinges large numbers of fish and macrocrustacean eggs, larvae, juveniles and adults," which losses EPA considers to be adverse environmental impacts (Fact Sheet at 88-97). EPA does not agree that a small withdrawal in comparison to the total flow of the river necessarily equates to an "actual impact on surrounding aquatic organisms [that] can be nothing beyond *de minimis*." PSNH Comments at 41. EPA views the hundreds of millions of eggs and larvae taken from the Piscataqua River ecosystem and killed by the Schiller Station's CWISs as an adverse environmental impact that needs to be addressed under CWA § 316(b). These effects are not, as PSNH describes, *de minimis*. Having no entrainment control technologies at Schiller Station would not satisfy the

BTA standards of CWA § 316(b). Having said that, as EPA has discussed above and elsewhere in this document, the volume of seawater withdrawn by Schiller Station's CWISs is small relative to the tidal prism (0.3%). This fact contributed to EPA's determination, based on the qualitative, quantitative, and monetized costs and benefits of available technologies, that wedgewire screens, and not closed-cycle cooling, are the BTA for entrainment at Schiller Station.

Numbers of organisms entrained

PSNH comments that Region 1 is inconsistent throughout the Fact Sheet in how it evaluates historical entrainment impacts at Schiller Station and the expected performance of various compliance options, relying upon absolute numbers of eggs and larvae at some points and equivalent adult numbers at others, and that EPA improperly compares the numbers of fish and macrocrustaceans from different life stages. PSNH comments that inconsistencies in this regard are arbitrary and capricious, conflict with the established practice of utilizing adult equivalency numbers to properly estimate actual impacts to fish populations and the costs and benefits of various BTA compliance options, and therefore undercut the agency's ultimate entrainment conclusions for Schiller Station.

In Appendix 1 of PSNH's comments on the Draft Permit (at 6-7), Enercon provides a list of instances where it argues that EPA inconsistently used equivalent adult and absolute numbers in the Fact Sheet. Enercon also asserts that impact evaluations and comparisons of technologies for reducing entrainment or impingement that act differentially on different life stages or organisms should all be based on equivalent adults and that conclusions based on the use of absolute numbers need to be revisited to address inconsistencies. EPA disagrees that it has inconsistently evaluated entrainment impacts at Schiller Station. EPA considered both types of metrics (i.e., absolute numbers of eggs and larvae and adult equivalents) in its analysis and did so appropriately and clearly. The Fact Sheet provides entrainment and impingement estimates in terms of absolute numbers of organisms entrained and impinged as well as in adult equivalent numbers at various points in the discussion. As discussed below, however, EPA relied primarily on its analysis of the reduction in entrainment of absolute numbers of eggs and larvae in its comparison of the various technologies.

The tables presented in Section 8.0 of the Fact Sheet (Tables 8-A through 8-D) illustrate the loss of eggs, larvae, juvenile, and adults as raw (absolute) numbers due to impingement and entrainment at Schiller Station's CWIS at DIF.[11] These estimates are provided to illustrate the loss of organisms, and therefore, the adverse environmental impacts, posed by the presence of the Facility's CWISs. EPA has discussed the evaluation of adverse environmental impact at length in response to Comments V.B.2.a and b, above. These responses clarify EPA's position on adverse environmental impact as it relates to population-level impacts and, as such, the analyses presented in Section 8.0 are not presented as adult equivalents, consistent with EPA's

[11] Enercon states that the values in Section 8.0 do not match the 2008 Biological Report submitted by Normandeau (AR-136). The values for entrainment and impingement losses in the tables in Section 8.0 of the Fact Sheet are presented based on DIF. The estimates in the Biological Report are presented on actual intake flows during the impingement monitoring study from October 2006 through September 2007, which were, on average, about 7.3% less than DIF. *See* Fact Sheet p. 93. *See also* Response to PNSH Appendix 1 Comment 15.

long-standing interpretation of adverse environmental impact. The Final Rule does not change EPA's definition or interpretation of adverse environmental impact as it relates to adult equivalent losses.

PNSH also comments that EPA relied on adult equivalents to assess the use of wedgewire screens (Fact Sheet Table 9-A), but later utilized absolute loss values without addressing the difference in life stage value or the benefit of returned eggs and larvae to the Piscataqua River (Tables 10-A and 10-B). The comment misrepresents EPA's use of Table 9-A, which, as stated in the Fact Sheet (at 110), presents *PSNH*'s estimates of impingement mortality and entrainment exclusion for equivalent adult fish and macrocrustaceans using wedgewire screens and was intended to present the company's perspective on the efficacy of the technology. The following section of the Fact Sheet (at 111-118), entitled "EPA's Review" estimates the efficacy of wedgewire screens based on estimated entrainment reductions (as the percentage of eggs and larvae excluded from entrainment, not adult equivalent values) adjusted for the expected survival of eggs and larvae that contact the screens. *See* Fact Sheet at 117-118. EPA uses the estimates based on raw losses of eggs, larvae, adult, and juvenile fish and macrocrustaceans, and not adult equivalents, as PSNH and Enercon suggest, to assess the relative costs and quantified, non-monetized benefits of various technologies in Section 10 of the Fact Sheet. *See* Fact Sheet Tables 10-A (at 151) and 10-B (at 153). In other words, EPA consistently relies on the reduction in raw losses of eggs, larvae, juveniles, and adults to assess the efficacy of each technology in its assessment of the BTA for impingement and entrainment at Schiller Station. The Final Rule at 40 C.F.R. § 125.98(f)(2)(i) specifically *requires* EPA to consider the "numbers and types of organisms entrained" when establishing site-specific entrainment requirements, but does not dictate how EPA should quantify entrainment losses. Put another way, the Final Rule does not restrict EPA to evaluating the potential impacts of entrainment using only an adult equivalent method.

PSNH comments that Region 1 cites to no authority to support its "belief" that the actual numbers of eggs and larvae saved or lost provides the more appropriate metric in comparing the efficiencies of any control technologies. Yet, EPA has explained why it considered absolute number of eggs and larvae entrained. In addition, EPA notes that neither PNSH nor Enercon have cited to any statutory or regulatory authority requiring adult equivalent as the sole metric for comparing the efficiency of control technologies. The Final Rule only specifies that EPA must consider "the numbers and types of organisms entrained" when establishing entrainment requirements. 40 C.F.R. § 125.98(f)(2)(i). EPA has clearly done so. PSNH also discounts EPA's discussion of the shortcomings of the adult equivalency method, claiming that it does not omit the value that entrained ichthyoplankton and impinged fish may have in providing a food source to many species within the ecosystem. The preamble to the Final Rule states that using an A1E (age-one equivalent losses) approach "simplifies a complex ecological situation, because some of the smaller fish would provide an ecological benefit to other species as food even if they would not survive to adulthood." 79 Fed. Reg. at 48,403. PSNH is correct that if entrained and impinged organisms are returned to the source waterbody, even after being killed, then their biomass of organisms would not have been removed from the ecosystem. However, the eggs and larvae that pass through the cooling system may suffer mortality and/or damage and, as a result, may be consumed by a different trophic level (*e.g.*, benthic decomposers) than would have occurred otherwise, which would change their ecological role. Given the complexity of intraestuarine interactions and resource dynamics, valuing individual life stages only in terms of the contribution to the adult population overlooks additional functions of early life stages in supporting growth and survival of juvenile fish within the estuarine system.[12] *See* AR-335. At the same time, EPA acknowledges that the importance of each organism to the system is not necessarily equivalent. For example, a single egg plays a less important role in the ecosystem than a single adult fish of the same species.

PSNH comments that there is no reasonable justification for why the agency elects to use these "inflated numbers when doing so does not provide a true depiction of what AEI, if any, is actually occurring in a given waterbody," other than to "rationalize its environmental impact assertions and corresponding BTA determinations." Once again, the commenter appears to misconstrue "adverse environmental impact" under CWA § 316(b) as being limited to only a demonstrated decline in fish populations in the Piscataqua River. EPA has explained at length in the responses to comments above that a population-level impact is not the sole basis for assessment of adverse environmental impact. In truth, the CWISs at Schiller Station present an additional source of mortality not accounted for by the natural mortality rates and life histories of estuarine fish. That an individual egg or larva killed by entrainment would likely not have survived to adulthood naturally does not excuse Schiller Station from killing hundreds of millions of organisms each year due to the absence of available entrainment control technology at the facility, and it does not establish that the BTA standard is satisfied despite the lack of available technology to reduce these adverse impacts.

EPA, of course, recognizes that adult equivalent fish can be a useful metric to assess the costs and benefits of available technologies for reducing entrainment at CWISs on a site-specific or national basis. For example, for the Final Rule, EPA used several metrics based on estimating losses of age-one equivalents to assess the costs and monetized benefits related to commercial and recreational fishing likely to occur as a result of implementation of the impingement mortality compliance alternatives at 40 C.F.R. § 125.94(c). *See* 79 Fed. Reg. at 48402-3. However, adult equivalent fish is not the only, or even the preferred metric, for assessing adverse impact because, as EPA described, it ignores the substantial non-natural mortality of many millions of organisms as a result of entrainment. Indeed, the Final Rule does not use adult equivalent fish in the context of assessing adverse environmental impact *See*, for example, 79 Fed. Reg. at 48303 ("Aquatic organisms drawn into CWIS are either impinged (I) on components of the intake structure or entrained (E) in the cooling system itself. In CWA section 316(b) and in this rulemaking, these impacts are referred to as *adverse environmental impact* (AEI).")

In sum, EPA disagrees that an adult equivalent metric is the only way to assess biological losses from CWISs as adverse environmental impacts because it assumes that adverse impacts can only be assessed in terms of lost adult fish. EPA has a long-standing record of also considering adverse impacts in terms of eggs and larvae lost. EPA, in this case and in the Final Rule, recognizes that the direct loss of millions of early life stages to entrainment is itself an

[12] Focusing only on adult equivalents would also overlook the role that high numbers of eggs and larvae in providing a "compensatory reserve" for a species that experience high levels of natural mortality. *See* 79 Fed. Reg. 48303, 48318, 48319.

environmental impact that is adverse to the aquatic environment of the Piscataqua River. Having said that, EPA also recognizes that adult equivalent losses may be a useful metric in a benefits analysis, particularly where impingement mortality and entrainment data are collected from multiple facilities using different protocols, methods, equipment, and volume of intake flows. Converting sampling counts to adult equivalents in this case may help to standardize estimates across multiple facilities. *See* 79 Fed. Reg. at 48,402.

PSNH Comment V.B.3 Modified Traveling Water Screens with an Upgraded Fish Return System Constitute BTA for The CWIS's At Schiller Station

Establishing BTA for impingement mortality is what remains following the conclusion that analyses and a BTA determination for entrainment are not required and/or necessary for Schiller Station, for the reasons explained above. It is PSNH's sole decision as to which of the seven pre-approved impingement technology compliance options set out in 40 C.F.R. § 125.94(c) it will install and operate at Schiller Station. [122] Region 1 did not consult with PSNH regarding which of the seven prescribed compliance options the company would utilize at Schiller Station to comply with the impingement mortality standard. Instead, the agency unilaterally determined fine-mesh CWW screens with a design through-screen velocity of 0.5 fps or less would satisfy § 125.94(c)(2) without the benefit of any input from PSNH. [123] Region 1's impingement mortality compliance determination runs counter to the intent of the final § 316(b) rule and is therefore arbitrary and capricious.

Instead of fine-mesh CWW screens, PSNH's choice for compliance with the impingement mortality standards set out in 40 C.F.R. Part 125 would be to install modified traveling water screens and upgraded fish handling systems for its CWISs at Schiller Station. To fulfill this compliance option, PSNH must install and operate infrastructure that Region 1 determines meets the following definition:

> *Modified traveling screen* means a traveling water screen that incorporates measures protective of fish and shellfish, including but not limited to: Screens with collection buckets or equivalent mechanisms designed to minimize turbulence to aquatic life; addition of a guard rail or barrier to prevent loss of fish from the collection system; replacement of screen panel materials with smooth woven mesh, drilled mesh, molded mesh, or similar materials that protect fish from descaling and other abrasive injury; continuous or near-continuous rotation of screens and operation of fish collection equipment to ensure any impinged organisms are recovered as soon as practical; a low pressure wash or gentle vacuum to remove fish prior to any high pressure spray to remove debris from the screens; and a fish handling and return system with sufficient water flow to return the fish directly to the source water in a manner that does not promote predation or re-impingement of the fish, or require a large vertical drop. The Director may approve of fish being returned to water sources other than the original source water, taking into account any recommendations from the Services with respect to endangered or threatened species. Examples of modified traveling screens include, but are not limited to: Modified Ristroph screens with a fish handling and return system, dual flow screens with smooth mesh, and rotary screens with fish returns or vacuum returns. [124]

To ensure this compliance measure is optimized to minimize impingement mortality, PSNH intends to complete the site-specific impingement technology performance optimization study described in 40 C.F.R. § 122.21(r)(6)(i), which includes two years of biological sampling. [125]

PSNH has chosen this impingement compliance method because it involves a relatively quick and straightforward modification to the existing CWISs at Schiller Station that will permit the facility to comply with the final § 316(b) rule within a shorter time period compared to the installation of fine-mesh CWW screens. [126] This is because the CWISs for Units 4, 5, and 6 at Schiller Station currently utilize traveling water screens and a fish handling return system, meaning a retrofit to install the new modified screens and upgrade the existing fish handling systems will not require extensive reconfiguration, design planning, and/or require PSNH to obtain regulatory permits, all of which would have been necessary for installing fine-mesh CWW screens. In addition, pilot testing will not be required prior to the installation of the chosen technologies. Operation and maintenance costs for the modified screens are not expected to be substantially higher than the costs PSNH annually incurs with its existing traveling screens, as well, and the chosen technological option provides an additional advantage inasmuch as employees at Schiller Station are already familiar with the operation and maintenance of screens of this kind.

PSNH has chosen to install modified traveling screens with upgraded fish handling systems at Schiller Station also because the pre-approved compliance option has an established track record of success within the industry. EPA’s Technical Development Document from the final § 316(b) rule accurately captures this reality:

> Modified traveling screens with fish handling systems are among the oldest technologies developed specifically to address impingement and have been widely deployed and studied throughout the United States. Because so many existing facilities already use conventional traveling screens, modified traveling screens are broadly applicable and may not require significant changes to the CWIS to achieve high levels of performance. A successful installation is generally independent of factors such as waterbody type, climate zone, age, fuel type, or intake flow. In other words, a facility that has previously used a conventional traveling screen (nearly all facilities, operating under a wide variety of conditions) should also be able to employ a modified traveling screen.
>
> Compared with other impingement design and construction technologies used as retrofit options, modified traveling screens are relatively easy to install and operate. Changes to the screens themselves are relatively straightforward and, in all but the most unique instances, do not require substantial modification or expansion of the screen houses and can be completed during normal maintenance outages without affecting the facility’s generating schedule. Likewise, because this technology does not alter the cooling water flow per se, the facility’s generating output is unaffected; no energy penalty is incurred save for the small increase in electrical usage due to continual or more frequent screen rotation. [127]

While fine-mesh CWW screens may be technologically feasible for impingement mortality at Schiller Station, unknowns concerning fouling, clogging, icing, and the corresponding need for emergency bypass (all of which are explained in detail below) substantially increases the operational risks associated with deploying this technological option in an estuarine environment. [128] These unknowns are discussed more fully below and in Appendix 2 of the 2016 Enercon-Normandeau Comments, along with an examination of the fact that fine-mesh CWW screens have not been installed at any facility located along an estuary that is ecologically similar to the lower Piscataqua River.[129]

Although no explanations for a chosen impingement mortality compliance method are required by the final § 316(b) rule, the aforementioned analyses provide ample justification for PSNH's determination to install modified traveling screens with upgraded fish handling systems at Schiller Station. PSNH respectfully requests that Region 1 revise the final permit accordingly to reflect the company's chosen impingement mortality compliance method.

[122] 40 C.F.R. § 125.94(c)(1)–(7); *See* also 40 C.F.R. § 122.21(r)(6) (providing that an owner or operator must identify its chosen method of compliance with the impingement mortality standard in its permit application); 79 Fed. Reg. at 48,325 (expressly stating that the decision of which impingement mortality compliance option will be employed is a choice for the facility, by providing "EPA modified the rule language so as to state clearly that a facility with multiple intakes must decide whether it will adopt a single compliance strategy for impingement mortality for the entire facility or adopt an intake-specific compliance strategy at each cooling water intake. Thus, facilities may select different compliance strategies for different intakes, providing flexibility at facilities with multiple intakes. Regardless of which impingement compliance approach a facility chooses…") (emphasis added).

[123] Fact Sheet at 166–67. The October 2008 Enercon-Normandeau Report and October 2014 Enercon Report evaluate the feasibility of a number of impingement mortality compliance standards. *See* generally AR-140; AR-227. However, neither report offers PSNH's preferred compliance method in light of the tenets of EPA's final § 316(b) rule. *See id.*

[124] 40 C.F.R. § 125.92(s)(emphasis in original).

[125] *See* 40 C.F.R. § 122.21(r)(6)(i).

[126] This shorter compliance period means greater environmental improvements will be realized at Schiller Station at an earlier date.

[127] Final 316(b) TDD at 6-31 to 6-32 (emphasis in original).

[128] The fact that CWW screens are located offshore and underwater further compounds these issues and makes identifying and troubleshooting them much more difficult compared to the configuration of the existing intakes at Schiller Station.

[129] *See* 2016 Enercon-Normandeau Comments at Appx. 2.

EPA Response to PSNH Comment V.B.3:

PSNH's comment repeats its view "that analyses and a BTA determination for entrainment are not required" for Schiller Station and states that "[e]stablishing BTA for impingement mortality is what remains." PSNH then comments that the company's "choice for compliance with the impingement mortality standards set out in 40 C.F.R. Part 125 would be to install modified traveling water screens and upgraded fish handling systems." The commenter also states that "[i]t is PSNH's sole decision as to which of the seven pre-approved impingement technology compliance options set out in 40 C.F.R. § 125.94(c) it will install and operate at Schiller Station."

EPA agrees that modified traveling water screens and upgraded fish handling system are one of the methods of reducing impingement mortality specified in the regulations for satisfying the BTA standard. *See* 40 C.F.R. § 125.94(c)(5). EPA also agrees that, in general, a permittee may choose its preferred method of satisfying the regulations' BTA requirements for impingement control. *See* 40 C.F.R. § 122.21(r)(6). A permittee's discretion in this regard is not, however, unlimited.

A permittee's chosen method of compliance generally must comport with one of the options specified in 40 C.F.R. §§ 125.95(c)(1) – (7).[13] For modified traveling water screens, 40 C.F.R. § 125.94(c)(5) dictates that a proposed system must satisfy the criteria spelled out for such systems in 40 C.F.R. § 125.92(s). Furthermore, 40 C.F.R. § 125.94(c)(5) also specifies that a permit applicant proposing to rely on modified traveling water screens must submit an impingement technology performance optimization study in accordance with 40 C.F.R. § 122.21(r)(6)(i) and obtain a determination from the permitting agency that the technology will be the BTA for impingement reduction at that facility

All of this being said, PSNH's comment that all that remains to be addressed is the BTA for impingement mortality reduction is premised on its position that no additional controls are warranted to minimize the adverse environmental impacts of entrainment at Schiller Station. As explained earlier, *see* Responses to Comments V.B.2.a-c, EPA disagrees with this premise and has determined that additional technology for minimizing entrainment *is* needed for Schiller Station.

The interplay of requirements to control entrainment with those for controlling impingement is specifically addressed in the 2014 CWA § 316(b) Final Rule. First, the Final Rule includes a provision entitled, "*Aligning compliance deadlines for impingement mortality and entrainment requirements*," which reads as follows:

> [a]fter issuance of a final permit that establishes the entrainment requirements under §125.94(d), the owner or operator of an existing facility must comply with the impingement mortality standard in §125.94(c) as soon as practicable. The [permitting authority] may establish interim compliance milestones in the permit.

40 C.F.R. § 125.94(b)(1). This provision not only establishes that impingement requirements must be met "as soon as practicable," but also recognizes that the BTA determination for entrainment may drive or otherwise impact the choice of impingement compliance method. As EPA explained in the preamble:

> EPA agrees that facilities required to install both impingement and entrainment compliance technologies will benefit from reduced compliance costs if the compliance scheduling is coordinated. . . . *In some cases, impingement compliance can be attained with entrainment technologies*. For example, the [permitting

[13] The Final Rule does, however, provide for certain exceptions to this general requirement. A facility would need to go beyond the technologies specified in 40 C.F.R. §§ 125.94(c)(1) – (c)(7) if, for example, additional requirements are mandated to minimize losses to shellfish or particularly fragile species of fish. *See* 40 C.F.R. §§ 125.94(c)(8) and (9). *See also* 40 C.F.R. §§ 125.94(g), (i) (additional requirements may be required to protect listed species and comply with state and Tribal law requirements). Conversely, less stringent requirements might be applied if impingement mortality is *de mimimis* or the facility in question has low capacity utilization generation units. *See* 40 C.F.R. §§ 125.94(c)(11) and (12).

> authority] may determine that the installation of modified fine-mesh traveling screens and narrow-slot wedgewire screens will achieve the impingement mortality standard and further, that this same equipment represents, on a site-specific basis, BTA entrainment control. If the compliance schedule is not harmonized, it is possible that a facility could install (at significant cost) coarse-mesh traveling screens that it might have to later retrofit with fine-mesh panels. It is also possible that a facility could make modifications necessary to attain a 0.5- fps through-screen velocity to meet the [impingement mortality] standards and later have closed-cycle cooling identified as BTA for entrainment, thereby making the intake modifications for impingement control unnecessary.
>
> To address this issue in the final rule, EPA revised the compliance requirements so that the [permitting authority] is required first to establish entrainment requirements under § 125.94(b)(1) in the final permit. The facility will then be required to comply with the impingement mortality standard in § 125.94(c) as soon as practicable thereafter.

79 Fed. Reg. at 48,327 (emphasis added). Thus, the Final Rule sequences the entrainment and impingement mortality controls so that facilities select and implement controls for impingement mortality only after the entrainment controls have been determined. *See* 79 Fed. Reg. at 48,358-60. In the preamble to the Final Rule, EPA states that permitting authorities are "encouraged to consider the extent to which those technologies proposed to be implemented to meet the requirements of § 125.94(d) [the BTA standards for entrainment] will be used, or could otherwise affect a facility's choice of technology, to meet the requirements of § 125.94(c) [the BTA standards for impingement mortality]." 79 Fed. Reg. at 48,369. In this way, the facility can take advantage of the potential impingement benefits provided by the required entrainment controls.

Accordingly, the Region recognized in the Fact Sheet for the Draft Permit that:

> [w]hen setting permit limits under CWA §316(b) for controlling entrainment and impingement mortality, there is a relationship or interaction between the technologies selected as the BTA for each of these two problems (*i.e.*, entrainment vs. impingement). In some cases, the same technologies will address both (*e.g.*, closed-cycle cooling), whereas in other cases, different technologies might address the two issues (*e.g.*, flow reductions with variable speed pumps and outages to address entrainment vs. modified screen and fish return systems to address impingement). The New CWA § 316(b) Regulations address the possibility of conflicts between the technologies for addressing entrainment and impingement in 40 C.F.R. § 125.94(b)(1) and (2), essentially by providing that compliance with new impingement mortality requirements must be complied with after a determination of entrainment control requirements.

Fact Sheet at 156. The permit for Schiller Station illustrates the need to align compliance with impingement and entrainment requirements. As stated in the Fact Sheet (at 78-172), EPA determined that fine-mesh wedgewire screens are the BTA for entrainment at Schiller Station. To achieve the estimated entrainment benefits, the screens would be designed with a through-screen velocity of 0.5 fps or less, which EPA noted would also satisfy the BTA standard for impingement mortality. *See* 40 C.F.R. § 125.94(c)(2); Fact Sheet at 152.[14] Thus, the facility would not need to install modified traveling screens to meet the impingement control requirement of the regulations.[15] Moreover, unlike modified traveling screens, this impingement mortality compliance alternative (through-screen velocity of 0.5 fps or less) would neither impose additional costs on top of the expense of the entrainment BTA nor require additional monitoring or study.[16] Thus, using the entrainment reduction technology to comply with the BTA for impingement mortality would be advantageous to the facility, while also satisfying the requirement to "comply with the impingement mortality standard in § 125.94(c) as soon as practicable." 40 C.F.R. § 125.94(b)(1).

For these reasons, and those that follow below, EPA disagrees with PSNH's comment that the BTA determination in the Fact Sheet "runs counter to the intent of the final § 316(b) rule and is therefore arbitrary and capricious." On the contrary, consistent with the provisions of the Final Rule, EPA's BTA determination reasonably and appropriately addresses both entrainment and impingement and harmonizes the approach to both.

Even apart from EPA's determination that wedgewire screens are the BTA to address entrainment under 40 C.F.R. § 125.94(d), EPA would not approve PSNH's proposal to install modified traveling screens under 40 C.F.R. § 125.94(c)(5) to satisfy the BTA standard for impingement control because EPA has determined that additional measures are needed due to the impingement of "fragile species" by Schiller Station. As mentioned above, in order to "protect fragile species," 40 C.F.R. § 125.94(c)(9) authorizes the permitting authority to require additional measures beyond those specified in 40 C.F.R. §§ 125.94(c)(1) – (7). *See* 79 Fed. Reg. at 48,358 (noting that the permitting authority determines whether the proposed impingement controls are "consistent with § 125.94(c)"). In the Fact Sheet, EPA noted the benefits that would likely accrue to fragile species through the use of wedgewire screens as opposed to modified traveling screens. As EPA explained, traveling screens focus on improving fish survival *after* impingement, whereas wedgewire screens are likely to *prevent impingement in the first place.* Fact Sheet at 151-52. "Preventing impingement would be particularly beneficial for Schiller Station because some of the species of fish impinged by Schiller Station have poor survival rates

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[14] By contrast, the comment's current "choice" of modified traveling screens would result in no reduction in entrainment mortality. *See* Fact Sheet at 121.

[15] As EPA stated during the § 316(b) rulemaking proceeding, "EPA expects that the vast majority of facilities that employ wedgewire screens will comply with the standard [for reducing impingement mortality] because the screens will achieve the pre-approved low velocity requirements under the [impingement mortality] standard compliance alternatives at 40 CFR 125.94(c)(2) and (3)." Final Rule RTC at 256. Accordingly, in the present case, PSNH recognized that wedgewire screens at Schiller Station would also satisfy the impingement mortality standard. *See* AR-227 at 5-6, 28; *see also* AR-140 at 91 ("All slot sizes evaluated are based on a maximum through-screen velocity of 0.5 fps. Under the now suspended Phase II Rule, if a facility could reduce its maximum through-screen velocity to 0.5 fps or less, it would be considered to have satisfied the standard for reducing impingement mortality.").

[16] As the comment recognizes, modified traveling screens would require the permittee to fund and conduct a two-year optimization study. *See* 40 C.F.R. §§ 122.21(r)(6)(i), 125.94(c)(5).

once impinged, regardless of the technology used," such as alewife, Atlantic herring, Atlantic menhaden and rainbow smelt. *Id.* at 152. EPA explained that, although both wedgewire screens and modified traveling screens "could potentially meet one or another of the generally applicable impingement mortality reduction criteria in the New CWA § 316(b) Regulations," *id.* (citing 40 C.F.R. § 125.94(c)(2) and (5)), "approximately 24% of the fish impinged by Schiller Station are fragile species" that "would still suffer mortality with [modified traveling screes], whereas they are less likely to with" wedgewire screens, *id.*; *see also id.* at 120-21. EPA concluded that wedgewire screens "should be favored," not only because they would provide entrainment reduction benefits, while modified traveling screens would not, but also because they "would be likely to provide a larger reduction in impingement mortality" because the fragile species are likely to fare better under the lower through-screen velocity conditions associated with the wedgewire screens. *Id.* at 152.

In sum, EPA reasoned that relying on wedgewire screens is a more appropriate impingement mortality compliance method not only because it would avoid the additional expense to the permittee of installing, studying and operating modified traveling screens while meeting BTA requirements for both entrainment and impingement control, but also because modified traveling screens would not adequately protect fragile species and, therefore, they would *not* be the BTA for minimizing impingement mortality under 40 C.F.R. § 125.94(c). Fact Sheet at 166-67. Thus, the comment's suggestion that the facility would experience additional advantages from selecting modified traveling screens as the BTA for impingement control, such as that installing them "involves a relatively quick and straightforward modification to the existing CWISs at Schiller Station," are not persuasive.

The comment also posits that traveling screens will put protections in place for aquatic organisms sooner than EPA's proposed BTA of wedgewire screens and that this "shorter compliance period means greater environmental improvements will be realized at Schiller Station at an earlier date." EPA does not agree, however, that modified traveling screens will satisfy the BTA standard of CWA § 316(b) because they would not satisfy either entrainment control requirements or impingement control requirements, taking fragile species into account. Thus, even if traveling screens could be put in place sooner than wedgewire screens, EPA does not agree that they would equate to "greater environmental improvements" at Schiller Station. As has also already been discussed, the Final Rule directs EPA to align entrainment BTA requirements with impingement mortality requirements such that upgrades made at a facility to comply with the impingement standard are not rendered unnecessary by requirements to comply with the entrainment standard. EPA has followed this approach here and concludes that it appropriately achieves the requirement for the facility first to meet the entrainment control requirements of 40 C.F.R. § 125.94(d) and then to "comply with the impingement mortality standard in § 125.94(c) as soon as practicable" thereafter. 40 C.F.R. § 125.94(b)(1).

In addition, EPA disagrees that PNSH had no opportunity to provide input on the appropriate BTA for impingement mortality. PSNH submitted the Engineering Response Supplement in October 2014 (after promulgation of the Final Rule in August 2014), which, as the Report states "focuses on technological and biological changes that may affect the determination of Best Technology Available (BTA) for Schiller Station under the recent 316(b) rule published in the Code of Federal Regulations." As stated in footnote 123 to the comment, PSNH "evaluate[d] the feasibility of a number of impingement mortality compliance standards." AR-227 at 1. The 2014 Engineering Response was an addendum to the 2008 Response submitted by PSNH at its own behest. In fact, PSNH agreed that wedgewire screens in some form could serve as the impingement mortality compliance method at Schiller Station. The 2014 Engineering Response does not choose a preferred option, but concludes that "[t]here are several likely pathways by which compliance with the new CWA Section 316(b) rule may be achieved." It goes on to describe three possible ways to achieve the most cost-effective solution: (1) reduction of the design through-screen velocity to no more than 0.5 fps using wide slot wedgewire screens or barrier nets; (2) installation of modified Ristroph screens with an upgraded fish return trough; and (3) reduction of the actual through-screen velocity to no more than 0.5 fps by renovating the CWIS for Units 3 and 4. EPA consulted both PSNH submittals extensively, as well as other sources, throughout its analysis of impingement at Schiller Station. While EPA does not disagree that these "pathways" could each potentially satisfy one of the impingement control methods specified in §§ 125.94(c)(1) – (7), EPA has concluded, as explained above, that the modified Ristroph screen options will not sufficiently protect fragile species and additional measures are needed under 40 C.F.R. § 125.94(c)(9).

Finally, PSNH also comments that "[t]o ensure this compliance measure [(*i.e.*, modified traveling screens)] is optimized to minimize impingement mortality, PSNH intends to complete the site-specific impingement technology performance optimization study described in 40 C.F.R. § 122.21(r)(6)(i), which includes two years of biological sampling" (footnote omitted). EPA points out, however, that because the BTA determination for impingement mortality and entrainment at Schiller Station has been made under the provisions for ongoing permit proceedings under 40 C.F.R. § 125.98(g), EPA is not strictly bound by the specific BTA requirements of the Final Rule specified in 40 C.F.R. § 125.94, and does not need to await or require the submission of materials otherwise called for by 40 C.F.R. § 122.21(r). *See also* Fact Sheet at 166. In the case of such ongoing permit proceedings, "whenever the [permitting authority] has determined that the information already submitted by the owner or operator of the facility is sufficient, the [permitting authority] may proceed with a determination of BTA standards *for impingement mortality* and entrainment without requiring the owner or operator of the facility to submit the information required in 40 CFR 122.21(r)." *Id.* (emphasis added). For ongoing permit proceedings like the one for Schiller Station, the Final Rule provides that the permitting authority need not set the clock back on a permitting decision and delay permit decisions in order to require a facility to collect additional information or identify a preferred impingement mortality compliance method where there was already sufficient information to make an appropriate determination. All that being said, EPA has endeavored to ensure that its BTA determination is consistent with the requirements of the Final Rule. The technology chosen to comply with the site-specific standards for entrainment, wedgewire screens, also meets an approved technology as the BTA for impingement mortality. As a result, no additional controls (*i.e.*, beyond the BTA for entrainment – wedgewire screens) are required to comply with the standards for impingement mortality.

PSNH Comment V.B.4 Additional Evaluations and Data Must Be Provided to Region 1 to Adequately Evaluate Entrainment at Schiller Station if the Agency Erroneously Requires Entrainment Compliance

For the reasons set out above, technological installations to address entrainment at Schiller Station are unwarranted and the installation of modified traveling water screens and upgraded fish handling systems for the CWISs at the facility constitute BTA for CWA § 316(b). Should Region 1 improperly reject these well-reasoned conclusions, the agency must allow PSNH to submit additional analyses that will provide Region 1 at least the minimum amount of information the agency would need to make a reasoned and legally defensible BTA entrainment determination. The final § 316(b) rule requires as much: "BTA standards for entrainment…must reflect the [permitting authority's] determination of the maximum reduction in entrainment warranted after consideration of the relevant factors as specified in § 125.98."[130] PSNH has not previously submitted to Region 1 a number of fundamental analyses the agency would need to adequately assess the factors set out in § 125.98 and make a rational BTA determination for entrainment at Schiller Station. These analyses have not previously been completed because Region 1 has not requested them and because they are not mandated by the final § 316(b) rule for facilities with actual intake flows equivalent to those at Schiller Station. [131] Without these essential analyses, Region 1 cannot possibly render a reasonable and rational BTA determination for entrainment. The agency's contrary assertion "that the information already submitted by the Facility is sufficient" [132] to support its permit decision is therefore arbitrary and capricious.

As outlined in the Legal Background section above, the final § 316(b) rule requires operators with CWISs to submit an array of information with their NPDES permit application. [133] Some application requirements apply to "all existing facilities" while others apply only to existing facilities that withdraw greater than 125 MGD AIF of water for cooling purposes. [134] Information that is crucial to rendering an informed decision on entrainment compliance is made applicable to only existing facilities that withdraw greater than 125 MGD AIF of water for cooling purposes, including an Entrainment Characterization Study, Comprehensive Technical Feasibility and Cost Evaluation Study, a Benefits Valuation Study, and a Non-water Quality and Other Environmental Impacts Study. [135] With an average AIF at Schiller Station of 72.4 MGD over the past three years, PSNH was not required to complete and/or submit any of these entrainment analyses with its permit application and Region 1 has not requested these materials in order to properly evaluate entrainment at the facility. The agency should request entrainment analyses of this kind prior to issuing the Draft Permit as final.

It makes practical sense for Region 1 to demand the submission of the entrainment studies required by EPA's final § 316(b) rule—or studies that are substantially equivalent—in order to make a reasoned and legally defensible entrainment determination for Schiller Station. To proceed otherwise defies logic in light of EPA's discussion of the basis of its 125 MGD AIF threshold in the final rule. In that rulemaking, EPA expressly acknowledged that mandating the submission of specific entrainment studies from only those facilities with an AIF exceeding 125 MGD would ensure that 90 percent of the total overall flows for the facilities subject to the final rule [136] with "the highest likelihood of causing adverse impacts" from entrainment [137] would be addressed. Recall this 90 percent of flows is distributed across only 30 percent of the total number of existing facilities subject to the final § 316 rule. [138] This leaves only 10 percent of the remaining overall flows spread across the remaining 70 percent of facilities that are subject to the final § 316 rule. PSNH's Schiller Station is one of the facilities included in this 70 percent.

Given this background, Region 1 arguably needs as much if not more specific and/or detailed information regarding entrainment at Schiller Station because the agency's maximum potential reduction in entrainment impacts is diminutive compared to the maximum potential at facilities with an average AIF of 125 MGD or more—where impacts due to entrainment may more rationally be assumed and corresponding, meaningful reductions in entrainment can therefore be expected. Providing less entrainment-related information to the agency than is required for facilities with an average AIF of 125 MGD or more means Region 1 is forced to make an arguably more difficult and precise determination regarding entrainment compliance with a fraction of the information it will have at its disposal for larger-flow facilities already presumed to have a significant impact due to entrainment. This perverse reality in this permit renewal proceeding cannot be what EPA intended when it crafted the final § 316(b) rule. [139]

The information pertaining to entrainment PSNH has previously submitted to Region 1 does not serve as an adequate surrogate for the Entrainment Characterization Study, Comprehensive Technical Feasibility and Cost Evaluation Study, a Benefits Valuation Study, and a Non-water Quality and Other Environmental Impacts Study facilities with an average AIF of 125 MGD or more are required to submit pursuant to the final § 316(b) rule. [140] PSNH should be permitted to submit analyses of this kind if Region 1 remains determined to require additional technological controls at Schiller Station to address entrainment. These analyses are imperative for the agency to sufficiently evaluate all of the mandatory BTA factors set out in 40 C.F.R. § 125.98(f). Without them, Region 1 cannot and has not rendered a BTA determination that can withstand judicial scrutiny.

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[130] *See* 40 C.F.R. § 125.94(d); *See* also 79 Fed. Reg. at 48,330 ("While site-specific permit requirements are not new, what is different about this approach from the current requirement for permits to include 316(b) conditions is that for the first time, EPA is establishing a detailed specific framework for determining BTA entrainment control requirements. Thus, the rule identifies what information must be submitted in the permit application, prescribes procedures that the Director must follow in decision making and factors that must be considered in determining what entrainment controls and associated requirements are BTA on a site-specific basis.").

[131] 40 C.F.R. § 122.21(r)(1)(ii)(C) provides Region 1 discretionary authority to compel PSNH to submit any additional information the agency determines is necessary for determining permit conditions and requirements. *See id.* § 122.21(r)(1)(ii)(C); *id*. § 125.98(i). Region 1 has made no such requests of PSNH for this permit renewal proceeding.

[132] Fact Sheet at 84.

[133] *See* generally 40 C.F.R. § 122.21(r).

[134] *See*, e.g., *id.* § 122.21(r)(1)(ii)(A), (B).

[135] *See id*. § 122.21(r)(9)–(12).

[136] Final 316(b) TDD at 3-8.

[137] 79 Fed. Reg. at 48,309.

[138] Final 316(b) TDD at 3-8 (providing that the 125 MGD AIF "threshold will capture 90 percent of the actual flows but will apply only to 30 percent of existing facilities").

[139] In fact, it is not and this analysis further supports PSNH's primary argument that requiring technological upgrades at the facility due to entrainment is not necessary given that Schiller Station has an average AIF far below 125 MGD and because entrainment at Schiller Station is de minimis and results in no environmental impact that is adverse to the aquatic ecosystem of the Piscataqua River.

[140] *See* 40 C.F.R. § 122.21(r)(9)–(12).

EPA Response to PSNH Comment V.B.4:

In its comment above, PSNH again urges that Schiller Station should not be required to make any technological upgrades to reduce entrainment because its AIF is less than 125 MGD and its adverse environmental impacts from entrainment are, in the commenter's view, *de minimis*. EPA has already addressed these types of comments in the responses set forth above. First, as explained in these responses, as well as in the Fact Sheet, the 2014 CWA § 316(b) Final Rule neither excuses facilities with an AIF less than 125 MGD from needing to satisfy the BTA standards with regard to entrainment, nor does it create an express exception for *de minimis* entrainment (as it does for *de minimis* impingement effects). *See* Response to Comment V.B.2. *See also* 40 C.F.R. § 125.94(d). 40 C.F.R. § 125.91(a)(2). In addition, EPA has explained that it does not regard Schiller Station's entrainment of hundreds of millions of fish and macrocrustacean eggs and larvae each year from the Piscataqua River estuary, a productive and ecologically sensitive ecosystem, to be *de minimis* environmental effects. Instead, in EPA's view, this entrainment represents adverse environmental impact under CWA § 316(b) to which the BTA standard applies. On the facts of this case, EPA has determined that technological upgrades to reduce entrainment are appropriate at Schiller Station. *See* Fact Sheet at 156-66.

In this case, the Final Permit's site-specific entrainment requirements – the installation and operation of wedgewire screens – will also, without additional modifications or cost, satisfy the BTA standard for controlling impingement mortality at 40 C.F.R. § 125.94(c)(2). For this reason, the Permittee would not also be required to install and operate modified traveling screens to meet the standards for impingement mortality under the Final Rule.

PSNH comments that the Region's permitting action is "arbitrary and capricious" because the Region proceeded with a BTA determination for entrainment without requiring the four studies required for facilities with AIFs greater than 125 MGD. *See* 40 C.F.R. § 122.21(r)(9) - (12). PSNH further comments that the Region should request these studies "prior to issuing the Draft Permit as final," because "[i]t makes practical sense . . . in order to make a reasoned and legally defensible entrainment determination for Schiller Station," and that to proceed with an entrainment determination without these four studies "defies logic in light of EPA's discussion of the basis of its 125 MGD AIF threshold in the final rule." The commenter suggests that the 2014 Final Rule must have intended that "as much if not more" information would be required for facilities with AIFs less than 125 MGD as is required for facilities with AIFs above 125 MGD because the BTA determination will be "arguably more difficult."

EPA disagrees with these comments for several reasons. First, they are controverted by the plain language and structure of the regulations. Indeed, the comment itself acknowledges that the specified studies "are not mandated by the final § 316(b) rule for facilities" like Schiller Station. As explained above, *see* Response to Comment V.B.2.b, EPA's policy decision to require the specified studies only from facilities with AIFs greater than 125 MGD was made in part to reduce the potential burden of the permit application process on smaller facilities. PSNH points to nothing in the Rule to indicate that EPA intended that a permitting authority could not make a BTA determination without the information from those studies. To the contrary, the fact that the Rule only requires larger facilities to submit these studies, *see* 40 C.F.R. § 122.21(r)(1)(ii)(B), while still requiring a permitting authority to make an entrainment BTA determination under the framework of the Final Rule for any facility larger than 2 MGD, *see id.* §§ 125.91(a)(2), 125.94(d), 125.98(f), indicates that that the Rule contemplates BTA determinations for facilities with AIFs below 125 MGD.[17] Under the commenter's approach, facilities with AIFs above 125 MGD would have to submit the studies required by 40 C.F.R. §§ 122.21(r)(9) – (12), but so would facilities with AIFs below 125 MGD. In EPA's view that would make no sense and would eviscerate the potential relief that EPA intended to provide to facilities with relatively lower AIFs. EPA declines the comment's suggestion that it should interpret the additional application requirements in the Final Rule for facilities with AIFs greater than 125 MGD as a requirement that facilities with AIFs greater than *2 MGD* must submit these studies before a permitting authority may make an entrainment BTA determination. Furthermore, the comment provides no specific explanation or site-specific, fact-based information to indicate why these four studies should be required for the Schiller Station permit.[18]

Beyond the specific requirements of 40 C.F.R. § 122.21(r), another reason that EPA has decided to move ahead to finalize its BTA determinations without requiring or awaiting the additional studies now proposed by PSNH is that the Final Rule specifically authorizes EPA to do so in an "ongoing permit proceeding." Specifically, 40 C.F.R. § 125.98(g) 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 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.

See also 79 Fed. Reg. at 48,348-349. Thus, as stated in the Fact Sheet (at 84), for an ongoing permit proceeding, the Final Rule clearly authorizes the permitting authority to proceed with a site-specific BTA for entrainment and impingement mortality without requiring all the reports

[17] Furthermore, the preamble to the Final Rule states "[t]o facilitate the determination of entrainment requirements for facilities below 125 mgd AIF, a [permitting authority] *may* require the owner or operator to submit some or all of the study requirements at § 122.21(r)(9) through (13) *or variations thereof*." 79 Fed. Reg. at 48,378 (emphasis added). Consistent with the intent expressed in the preamble, for the Schiller permit, EPA obtained and used as the basis of its BTA decision information substantially similar to that required from facilities with larger AIFs. *See* Responses to Comments V.B.4.a – d.

[18] To the extent that the commenter is in a new way reiterating its prior suggestion that the Final Rule should be read to create a presumption that facilities with AIFs less than 125 MGD are not causing adverse environmental impacts from entrainment, or should not be required to upgrade their intake structures to reduce entrainment effects, EPA has already explained in other responses above why it disagrees with these arguments. *See* Response to Comment V.B.2.b.

specified in 40 C.F.R. § 122.21(r) if it has otherwise obtained sufficient information to its BTA determinations. EPA does not intend ongoing permit proceedings to be held up to go through the full information gathering process set out by the new regulations for new permit proceedings even if the permitting authority determines that it already has sufficient information to complete its BTA determinations. *See also* 79 Fed. Reg. at 48,358 ("[I]n the case of permit proceedings begun prior to the effective date of today's rule, and issued prior to July 14, 2018, the [permitting authority] should proceed. *See* §§ 125.95(a)(2) and 125.98(g).").

In addition, 40 C.F.R. § 125.98(g) also provides that in an ongoing permit proceeding, the permitting authority *may*, in its discretion, base its site-specific BTA determination for entrainment control on all or some of the factors specified in 40 C.F.R. §§ 125.98(f)(2) and (3), and its site-specific BTA determination for impingement mortality on the standards in 40 C.F.R. § 125.94(c). For permits that do not involve ongoing permit proceedings under 40 C.F.R. § 125.98(g), 40 C.F.R. § 125.98(f) dictates that a permitting authority:

> … must establish site-specific requirements for entrainment … [and that t]hese entrainment requirements must reflect the Director's determination of the maximum reduction in entrainment warranted after consideration of the factors relevant for determining the best technology available for minimizing adverse environmental impact at each facility.

The factors that must be considered are listed at 40 C.F.R. § 125.98(f)(2) and include: (i) the numbers and types of organisms entrained; (ii) impact of changes in particulate emissions or other pollutants; (iii) land availability; (iv) remaining useful plant life; and (v) quantified and qualitative social benefits and costs of available entrainment technologies. The Final Rule indicates that the weight given to each factor is within the permitting authority's discretion and may vary based upon the circumstances at each facility. Additional factors that may be considered, in the permitting authority's discretion, are detailed at 40 C.F.R. § 125.98(f)(3).

The permit proceeding for Schiller Station is an "ongoing permit proceeding" under 40 C.F.R. § 125.98(g). The Facility's existing NPDES permit expired in 1995 and PSNH provided a timely and complete application for permit renewal prior to its expiration. (Schiller Station's existing permit has been administratively extended pursuant to 40 C.F.R. § 122.6(a).) PNSH submitted an updated application for reissuance in September 2010. Region 1 was working on the permit prior to promulgation of the Final Rule in 2014 and had gathered substantial additional information from the Facility through the use of information request letters (sent under CWA § 308(a)) and site visits. In this case, the Region considered whether any of the permit application information specified at 40 C.F.R. § 122.21(r) was necessary to support this permit decision, but determined that the information already submitted by the Facility is sufficient to support the necessary BTA determinations.

Specifically, EPA has considered multiple reports and analyses substantially similar to those required by the Final Rule at 40 C.F.R. § 122.21(r) that have been provided by PSNH to EPA, including, but not limited to, the following:

- 2014 Enercon Engineering Response Supplement to the U.S. EPA CWA § 308 Letter (AR-227);
- 2013 Enercon Response to EPA's Information Request for NPDES Permit Re-issuance (AR-236)
- October 2010 Response to Information Request for permit Re-issuance Tables Containing Operational Data for Three Schiller Station Generating Units (AR-041);
- September 2010 Reapplication for NPDES Permit No. NH0001473 Update to Renewal Application (AR-139);
- October 2008 Response to U.S. EPA CWA § 308 Letter (AR-140);
- October 2008 Normandeau Entrainment and Impingement Studies Performed at Schiller Generating Station from September 2006-September 2007 (AR-136)
- June 1995 Reapplication for NPDES Permit No. NH0001473 (AR-044);

EPA has determined that this information is sufficient to support its BTA determinations for entrainment and impingement consistent with CWA § 316(b) and the BTA standards of the Final Rule, including consideration of the factors specified in 40 C.F.R. § 125.98(f)(2) and (3). As explained above, for ongoing permit proceedings under 40 C.F.R. § 125.98(g), the permitting authority may, but is not required to, consider the factors in 40 C.F.R. § 125.98(f)(2) and (3) and the BTA standards for impingement mortality at § 125.94(c). EPA completed an analysis of the technological and economic feasibility of various technologies for Schiller Station in preparation of the Draft Permit that substantially considered each of the relevant factors specified in 40 C.F.R. § 125.98(f). *See* Fact Sheet Sections 8.2, 9.4, 9.5, and 10.

In the responses to comments below EPA addresses how the available information is substantially similar to the required studies (for facilities with AIFs larger than 125 MGD, which, again, Schiller Station does not have). Contrary to PSNH's comment, EPA maintains it has sufficient information to make a site-specific determination for entrainment without delaying the Final Permit and the environmental improvements that it will engender.[19]

Lastly, the comment states that EPA should "permit the company to submit" the four additional studies. Although, again, these studies are not required for the Region to make a BTA determination, the Region has never prevented PSNH from submitting them.[20] The Region also notes that PSNH did not submit any of the four additional studies in the intervening period between the close of the public comment period in January 2016 and the issuance of the Final Permit. Again, the Region does not agree that the Final Permit either must or should be delayed until PSNH has submitted these studies.

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[19] Notably, EPA actually has more information on which to base its determination than Schiller Station would be required to submit under the Final Rule at 40 C.F.R. § 122.21(r) based on AIF, if this was not an ongoing permit proceeding.

[20] To this point, in October 2014, PSNH submitted a supplemental analysis updating technological and biological information provided in the 2008 Engineering Response (AR-140) that might affect the determination of the BTA for Schiller Station following issuance of the Final Rule in August 2014. *See* AR-227. EPA did not solicit this supplemental information, but when PSNH submitted it, EPA reviewed and considered it in its subsequent draft determination in September 2015.

PSNH Comment V.B.4.a Entrainment Characterization Study

An Entrainment Characterization Study, outlined in 40 C.F.R. § 122.21(r)(9), requires at least two years of entrainment data, identifying and documenting "organisms collected to the lowest taxon possible of all life stages of fish and shellfish that are in the vicinity of the cooling water intake structure(s) and are susceptible to entrainment…"[141] PSNH did submit an impingement and entrainment report performed by Normandeau from August 2006 through September 2007.[142] And, while this report may provide certain information that must be included in the Entrainment Characterization Study prescribed by the rule, it does not include data and analyses from a two-year minimum data collection period that offers the increased likelihood of revealing seasonal variation and/or anomalies that may go undiscovered in smaller data sets. Before Region 1 makes its final BTA determination, PSNH should be allowed to submit additional information that captures at least the minimum two years of entrainment data required by the final § 316(b) rule for facilities with an average AIF of greater than 125 MGD.

[141] *See id.* § 122.21(r)(9).

[142] *See* AR-136.

EPA Response to Comment V.B.4.a:

PSNH comments that it should be allowed to submit additional information capturing at least the minimum two years of entrainment data that would be required in an Entrainment Characterization Study under 40 C.F.R. § 122.21(r)(9) of the Final Rule for facilities with an average AIF of greater than 125 MGD. The commenter also urges that the Final Permit be delayed until the permittee can collect and submit this additional information for EPA's consideration.

EPA does not, however, agree with this comment. As explained in prior responses, not only does the Final Rule only require submission of an Entrainment Characterization Study under 40 C.F.R. § 122.21(r)(9) from facilities with AIFs greater than 125 MGD, but permitting authorities have discretion to complete BTA determinations without any of the information required under 40 C.F.R. § 122.21(r) in the context of ongoing permit proceedings covered by 40 C.F.R. § 125.98(g), if they already have sufficient information. *See, e.g.,* Response to Comment V.B.4.

PSNH's comment provides no fact-specific explanation in the comment why, in the case of Schiller Station, the Entrainment Characterization Study is necessary for a BTA determination. PSNH concedes that it submitted a biological report (AR-136) that "may provide certain information" that is typically included in an Entrainment Characterization Study under 40 C.F.R. § 122.21(r)(9), but nevertheless suggests that its biological report is not sufficiently similar because it does not include a minimum of two years of data collection. The Entrainment Characterization Study under the Final Rule requires a minimum of two years of entrainment data collection and includes the following components: Entrainment Data Collection Method, Biological Entrainment Characterization, and Analysis and Supporting Documentation. The Study must characterize and document entrainment of all life stages of fish, shellfish, and protected species representative of the biological conditions at the site and the operation of the CWIS and must identify the data collection and frequency. *See* 40 C.F.R. § 122.21(r)(9).

The impingement and entrainment studies at Schiller Station in 2006 and 2007 (AR-136) were completed in response to information requirements under the 2004 Phase II CWA § 316(b) Rule, which established standards for BTA at existing electrical generating stations' cooling water intake structures before being suspended in 2007 and eventually replaced by the 2014 Final Rule. *See* 69 Fed. Reg. 41,576; 79 Fed. Reg. 48,300. The Phase II Rule required submission of a Proposal for Information Collection from certain facilities, including Schiller Station. *See* AR-228 and AR-247. When the regulations were suspended in 2007, EPA requested the results of the impingement and entrainment monitoring under the authority of Section 308 of the CWA. The data include the number of eggs and larvae collected during each sampling event, the duration of sampling event, and the location and method. The analysis includes the estimated number of eggs and larvae entrained each month and the number of adult equivalent fish lost due to entrainment, as well as all assumptions, methods, and calculations and a justification that collection of one year of data reflects an appropriate characterization of seasonal and year-to-year variation in entrainment. *See* AR-118 (Attachment B) and AR-136 at 2-3. With the exception of one additional year of data collection, the study conducted by PSNH and the resulting analysis are consistent with the requirements of the Entrainment Characterization Study in § 122.21(r)(9). In fact, the Final Rule presumes that some facilities would use the biological monitoring collected under the Phase II Regulations to comply with the application requirements in the new regulations. *See* 79 Fed. Reg. at 48,359 ("[M]any of the facilities over 125 mgd AIF were subject to the Phase II rule before it was suspended (that is, all electric generators over 125 mgd AFI are also above 50 mgd DIF) and likely need less time for up front planning and/or data collection.").

The comment's primary justification for requiring an Entrainment Characterization Study appears to be that the 2008 Biological Report (AR-136) includes only one year of entrainment monitoring, rather than two, and that "data and analyses from a two-year minimum data collection period . . . offers the increased likelihood of revealing seasonal variation and/or anomalies that may go undiscovered in smaller data sets." As noted above, in response to EPA's request for information under Section 308 (AR-118), Normandeau stated that the comparisons of year-to-year variation over the 5-week period sampled in 2006 and 2007 "provide justification that collection and analysis of one year of entrainment data during the 52 week sampling year from 2 October 2006 to 30 September 2007 reflects an appropriate characterization of overall ichthyoplankton and macrocrustacean entrainment at Schiller Station's CWIS, *including seasonal and year-to-year variation*." AR-136 at 176 (emphasis added). Neither Normandeau nor PSNH provide any information in the comments to explain why the existing entrainment data are no longer sufficient to reveal "seasonal variation and/or anomalies that may go undiscovered in smaller data sets," where they previously considered the data sufficient for this purpose.

In summary, the Final Rule does not require two years of entrainment monitoring for facilities less than 125 MGD AIF in order to establish site-specific entrainment requirements. In addition, EPA maintains that the BTA determination for entrainment for Schiller Station is consistent with the provision allowing EPA to proceed without requiring additional study under the ongoing permit proceedings at 40 C.F.R. § 125.98(g), even in cases where an Entrainment Characterization Study would be required. Finally, EPA believes that the entrainment data available during development of the Draft Permit are sufficient to make a determination of the

BTA for entrainment at Schiller Station, including justification that it is representative of seasonal and year-to-year variation. Furthermore, when the data were submitted, both Normandeau and PSNH also believed that the data were representative of this variation and have provided no evidence in the comment to refute their earlier justification. For these reasons, EPA does not agree that it should delay issuance of the Final Permit to accommodate PSNH's request to gather and submit additional information including at least two years of entrainment data. EPA has reviewed and considered all the information that PSNH has submitted and, all other things being equal, the Agency is generally favors obtaining and reviewing as much valid, relevant data as possible. At the same time, it will always be possible to collect more information and at some point, permitting authorities must move ahead to make permit decisions. This is the case with Schiller Station's permit, which expired and has been administratively continued for many years. This permit addresses many issues in addition to those under CWA § 316(b) and it is important that the permit be updated. Additional information can still be collected after the new permit is issued and it can be submitted for the next permit renewal.

PSNH Comment V.B.4.b Comprehensive Technical Feasibility and Cost Evaluation Study

A high-level analysis of the technological feasibility of various entrainment and impingement technologies was included in the October 2008 Enercon-Normandeau Report [143] PSNH submitted in response to Region 1's CWA § 308 information request and contains some rudimentary information that corresponds with certain data requirements of the Comprehensive Technical Feasibility and Cost Evaluation Study outlined in the final § 316(b) rule. [144] The budgetary estimates provided in the October 2008 Enercon-Normandeau Report simply are not detailed enough to comply with the requirements set out in 40 C.F.R. § 122.21(r)(10), however, and therefore cannot be utilized in a cost evaluation study. And, even if this 2008 information could be deemed sufficient, which it is not, it at a minimum must be updated to: (1) provide more detailed and current cost and schedule estimates for all potentially viable entrainment technologies; (2) ensure any new entrainment technologies that have been developed in the intervening eight years are evaluated and included; and (3) include discussions of the performance of these entrainment technologies that reflect all of the relevant information the industry has learned over the past eight years about the biological and operational efficacy of them. [145] Moreover, submission of the Comprehensive Technical Feasibility and Cost Evaluation Study, or a comparable analysis, would allow Region 1 to assess the amount of time it would take PSNH to implement each of the potentially viable technologies and permit the agency to determine whether the varying implementation timeframes should be considered as part of the BTA determination. This analysis is lacking in Region 1's current BTA determination.

A great deal has in fact been learned about the efficacy of CWW screens in the years that have passed since the submission of the October 2008 Enercon-Normandeau Report. This 2008 report presented reductions in entrainment mortality for CWW screens of various slot widths as a function of physical exclusion alone. [146] In the intervening years, additional research of CWW screens has revealed that at least two additional mechanisms play a key role in achieving entrainment mortality reductions with the technology: hydraulic bypass and larval avoidance. [147] Enercon and Normandeau provide an in-depth discussion of these phenomena in their comments to this Draft Permit. [148] A review of those comments reveals that the data presented in the October 2008 Enercon-Normandeau Report is outdated, underestimates the overall effectiveness of CWW technology, and perhaps overestimates or inflates the role of exclusion (i.e., slot-width) in the overall efficacy of the CWW screens.

As to hydraulic bypass, the Electric Power Research Institute provides:

> Previous studies have shown that the following conditions are important for preventing or reducing entrainment and impingement associated with wedgewire screens (EPRI 1999): (1) a sufficiently small slot size to physically block passage of the smallest life stages to be protected; (2) low through-slot velocity (i.e., the water velocity between the wedgewire slots) to minimize the hydraulic zone of influence in which passive or weak swimming organisms can become entrained; and (3) an adequate ambient velocity (i.e., "sweeping" velocity) passing across a screen to carry organisms and debris along and away from the screen. When all of these factors exist, it is expected that the biological effectiveness of wedgewire screens will be high. However, large reductions in entrainment and impingement may occur when sub-sets of these conditions exist. For example, low through-slot velocities and high approach velocities may reduce entrainment and impingement to acceptable levels, even when aquatic organisms are physically capable of passing through slots. [149]

This ratio of a sweeping velocity to the through-slot velocity plays a significant role in the effectiveness of CWW screens in a given waterbody. The faster the sweeping velocity, the more it is likely that inertia will simply carry otherwise entrainable organisms right past CWW screens—irrespective of the slot-width of the screens—without issue. Correctly aligning the slot openings of the screens relative to the sweeping flow direction(s) can also have a major impact on the amount of aquatic organisms that become entrained versus those that are simply carried right past the CWW screens due to hydraulic bypass. [150]

The sweeping velocity of the Piscataqua River is one of the fastest in the northeastern United States within the vicinity of Schiller Station. [151] This means the effectiveness of any CWW screens installed at the facility may very well be less of a function of the slot-width of the screens and instead more dependent upon correctly aligning the openings in the screens within the waterbody to take advantage of the hydraulic bypass that will occur due to the swift currents. [152] Information provided to Region 1 in the October 2008 Enercon-Normandeau Report does not account for this now-known reality for evaluating the effectiveness of CWW screens. This 2008 information is therefore outdated and cannot be relied upon to support a BTA determination.

Larval avoidance is a phenomenon unique to CWW screens due to their contrasting design and geometry compared to conventional CWISs. It stems from the understanding that fish larvae are capable of swimming fast in short bursts. [153] CWW screens have a relatively small "zone of hydraulic influence," the scope of which varies depending upon the length of the screen, the through-slot velocity and the sweeping flow. This zone has an inverse relationship with sweeping flow, meaning as the sweeping flow increases, the zone of hydraulic influence will decrease. [154] Within the zone of hydraulic influence, flow streamlines curve inward as the cooling water enters the screens making organisms more susceptible to entrainment. [155] Outside of this zone, sweeping flows allow aquatic organisms to carry past the CWW screens unimpeded. [156] A single short and fast swimming burst is all fish larva often need to escape the zone of hydraulic influence and avoid becoming entrained by the CWW screens.

As mentioned above, the sweeping velocity of the Piscataqua River is incredibly fast within the vicinity of Schiller Station, meaning a thorough explanation and evaluation of larval avoidance is necessary to properly evaluate the effectiveness of any CWW screens installed at the facility. Like hydraulic bypass, the larval avoidance phenomenon demonstrates yet again that the efficacy of CWW screens is less of a function of the slot-width of the screens and instead more dependent upon other factors unique to the waterbody at issue, including the swiftness of its currents. The information provided to Region 1 in the October 2008 Enercon-Normandeau Report does not account for this ecological discovery that, for the reasons articulated above, will impact the evaluation of the effectiveness of CWW screens. The information included in this 2008 report is therefore outdated and cannot be relied upon by Region 1 to support a BTA determination.

The aforementioned discussions clearly demonstrate that PSNH should be permitted to submit a detailed analysis comparable to the Comprehensive Technical Feasibility and Cost Evaluation Study delineated in the final § 316(b) rule prior to Region 1 rendering its final BTA determination for the facility. Enercon and Normandeau have done a commendable job within the time allotted for comments to the Draft Permit of collecting and discussing some of the key information Region 1 must evaluate as part of a reasoned BTA determination. More is available and/or could be generated, however. Thus, while PSNH contends technologies to address entrainment at Schiller Station are unwarranted, Region 1 must allow PSNH to submit a detailed analysis comparable to the Comprehensive Technical Feasibility and Cost Evaluation Study so the agency can adequately assess the mandatory factors set out in 40 C.F.R. § 125.98(f) if it continues to believe such compliance controls may be necessary at the facility.

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[143] *See* AR-140.

[144] *See* 40 C.F.R. § 122.21(r)(10).

[145] The estimates for CWW screens included in the 2014 Enercon Report are likewise immaterial because they outlined costs for 9.5 mm slot-width screens chosen to minimize impingement at the facility, only capture the cost of major items, and do not take into account any contingencies or other allowances. *See* AR-227 at 38–39 (Region 1 has been provided unredacted versions of the cost estimates included on these pages). The cost to install CWW screens with slot-widths less than 9.5 mm would be greater. *See* 2016 Enercon-Normandeau Report at 31.

[146] *See* AR-140 at 85.

[147] These mechanisms had been mentioned in scientific literature prior to 2008. Sufficient testing had not yet been performed on the phenomena, however, meaning the scientific community was unable to quantify the extent of the role hydraulic bypass and larval avoidance contributed to the efficacy of CWW screens at the time Enercon and Normandeau provided their joint report to PSNH in 2008.

[148] *See* 2016 Enercon-Normandeau Comments at 19-20, Appx. 2 & 3. These phenomena have been discussed and analyzed at length in the ongoing NPDES permit proceeding for the Indian Point Energy Center, as well. A February 12, 2010 report (attached hereto as Exhibit 2) prepared by Enercon, with assistance from a number of biologists including Normandeau, presents data that accounts for entrainment reductions due to hydraulic bypass and larval avoidance and reveals that the difference in the percent reduction in impingement and entrainment losses among CWW screens with slot-widths ranging in size from 1.0 to 9.0 mm is essentially negligible. *See* Exhibit 2 at 62 (Table 4.4). Attachment 6 to this February 12, 2010 report outlines the underlying data, research, modeling, and analyses employed to generate the information set out in Table 4.4.

PSNH has been unable to locate a copy of Attachment 6 to the report through publicly available resources despite knowledge or at least belief that the complete February 12, 2010 report was at one time available to the public via the Internet. Nevertheless, PSNH respectfully requests that Attachment 6 to the February 12, 2010 report be included in the Administrative Record for the Schiller Station NPDES permit renewal proceeding.

The relevant studies and modeling outlined in this February 12, 2010 report pertaining to the Indian Point Energy Center were updated in 2011, according to Normandeau. *See* 2016 Enercon-Normandeau Comments at Appx. 3, pp.4-5. These updated analyses are not publicly available, however, and PSNH was not able to otherwise obtain a copy of them. *See id*. The company will submit them to the agency for consideration if a copy becomes available at a later date.

[149] EPRI Technical Report 1010112, Field Evaluation of Wedgewire Screens for Protecting Early Life Stages of Fish at Cooling Water Intakes Structures at 1-1 (May 2005).

[150] *See* 2016 Enercon-Normandeau Comments at 20.

[151] *See* US Army Corps of Engineers, Portsmouth Harbor and Piscataqua River Navigation Project, http://www.nae.usace.army.mil/Missions/CivilWorks/Navigation/NewHampshire/Portsmouth.aspx. (last visited Jan. 26, 2016) ("The swift currents of the Piscataqua River make Portsmouth Harbor one of the fastest flowing commercial port waterways in the northeastern United States.").

[152] *See* 2016 Enercon-Normandeau Comments at 20-21.

[153] *See id*. at Appx. 2, pp. 2-5.

[154] *See id*. at 3.

[155] *See id*.

[156] *See id*.

EPA Response to PSNH Comment V.B.4.b:

PSNH comments that the Schiller Station permit and BTA determinations should be delayed until it can prepare and submit to EPA a detailed analysis comparable to the Comprehensive Technical Feasibility and Cost Evaluation Study now required by 40 C.F.R. § 122.21(r)(10) to support BTA determinations for new permits for facilities with AIFs greater than 125 MGD. PSNH also comments that although the information contained in the 2008 Engineering Response (AR-140) "corresponds with certain data requirements of the Comprehensive Technical Feasibility and Cost Evaluation Study," that report is nonetheless outdated and "rudimentary" (particularly as it relates to cost and schedules) and that EPA must account for new understanding of the efficacy of certain intake technologies since that Response was submitted (particularly with regard to wedgewire screens).

EPA again does not agree that the Schiller Station permit should be further delayed to await development, submission and review of the new report proposed by the commenter. The Schiller Station permit should not be delayed to allow PSNH to submit additional information that it suggests would be consistent with what would be required in a Comprehensive Technical Feasibility and Cost Evaluation Study under 40 C.F.R. § 122.21(r)(10) because the 2014 Final Rule does not require such a submission from Schiller Station because it has an AIF below the threshold of 125 MGD. The Final Rule provides that permitting authorities may determine site-specific BTAs for entrainment for facilities with AIFs less than 125 MGD without this particular submittal. *See* Response to Comment V.B.4. Furthermore, as discussed in prior responses, this permit proceeding is an "ongoing permit proceeding" under 40 C.F.R. § 125.98(g) and, as such, even if a Comprehensive Technical Feasibility and Cost Evaluation Study was otherwise required for Schiller Station, which it is not, EPA has the discretion to complete its BTA determinations without awaiting such a report.

Furthermore, while PSNH suggests that EPA should further delay the permit until is given an opportunity to update information that it submitted in 2008, EPA notes that PSNH has clearly already had such an opportunity. For example, after EPA promulgated the new CWA § 316(b) Final Rule in August 2014, PSNH submitted the 2014 Supplemental Engineering Response (AR-227), which included additional information on, among other things, wedgewire screen technology. EPA has considered this report in its development of the Final Permit. Furthermore, PSNH submitted its comments on the 2015 Draft Permit on January 27, 2016 (AR 313), the day the comment period closed. Thus, PSNH has had the opportunity to submit to EPA any updated information that it felt the Agency should consider, and EPA has, of course, carefully considered that information, including PSNH's 2016 comments.

EPA also does not agree that the permit should be delayed to await the suggested additional information because in EPA's view, the 2008 Engineering Response (AR-140) provides information substantially similar to what would be required for a Comprehensive Technical Feasibility and Cost Evaluation Study under 40 C.F.R. § 122.21(r)(10). For example, under 40 C.F.R. § 122.21(r)(10)(i), facilities with AIFs greater than 125 MGD must evaluate the technical feasibility of closed-cycle recirculating systems, fine-mesh screens with a mesh size of 2 mm or smaller, and water reuse or alternate sources of cooling water. In its 2008 Engineering Response (AR-140), PSNH evaluated the feasibility of closed-cycle cooling, narrow-slot cylindrical wedgewire (CWW) screens, fine-mesh modified traveling screens, aquatic microfiltration barriers, behavioral barriers, alternative intake location, flow reductions, and seasonal outage timing to reduce entrainment at Schiller Station. PSNH also provided a discussion of land availability, *see* 40 C.F.R. § 122.21(r)(10)(i)(B), alternative cooling water sources, *see* 40 C.F.R. § 122.21(r)(10)(i)(C), and, where applicable, documentation of factors other than cost that made technologies infeasible or impractical for further evaluation (*e.g.*, space limitations for aquatic microfiltration barriers). *See* 40 C.F.R. § 122.21(r)(10)(i)(D). Furthermore, for select technologies, PSNH provided cost estimates that included capital costs, annual operation and maintenance costs, the cost of construction outage, auxiliary energy costs, and energy penalty costs, and which included multipliers for contingency and overhead. While these cost estimates are not presented in a manner identical to the presentation of social costs in terms of net present value and corresponding annualized values that would be required in a report submitted under 40 C.F.R. § 122.21(r)(10)(iii), the cost estimates provided were more detailed than would have been required for Schiller Station under the Final Rule because given its AIF, it would not have been required to submit a Study under 40 C.F.R. § 122.21(r)(10).

After considering PSNH's comment and all the information before the Agency, EPA has once again determined that this information is sufficient to support a sound assessment of BTA alternatives for Schiller Station. PSNH has already submitted an evaluation of the feasibility of various entrainment control technologies sufficient to support this permit decision and, as EPA has stated, this information goes beyond what the Final Rule would require for a new permit proceeding for a facility with an AIF less than 125 MGD, like Schiller Station. Thus, EPA does not agree that a Comprehensive Technical Feasibility and Cost Evaluation Study under 40 C.F.R. § 122.21(r)(10) is needed before a BTA determination may be made for Schiller Station.

PSNH comments that the 2008 Engineering Response should be updated to provide more current and detailed cost and schedule estimates, to evaluate any new technologies that have emerged since 2008, to discuss technology performance in light of the most recent evaluations of their efficacy, and to allow EPA to take implementation schedules into account when making its BTA determination. EPA does not, however, agree that the Schiller Station permit should be held up to await such updating of PSNH's informational submissions. EPA is not aware of any new technologies for entrainment reduction not addressed in the existing information and PSNH has not proposed any such new technologies in its comments. The suite of technologies that PSNH evaluated in 2008 is substantially similar to the group of technologies discussed in the Final Rule and its supporting Technical Development Document (*see* Chapter 6). PSNH's comments focus primarily on wedgewire screen technology, but this technology is already addressed in detail in PSNH's past submissions of information to EPA, and EPA carefully evaluated this technology for both the Draft Permit and the Final Permit. PSNH has not provided any additional material on cost or new technologies to suggest that the BTA determination would be altered if the permit was delayed for submission of a Comprehensive Technical Feasibility and Cost Evaluation Study under 40 C.F.R. § 122.21(r)(10).

Regarding implementation schedules, PSNH commented on the compliance schedule for wedgewire screens at Schiller Station in the Draft Permit. *See* PSNH Comment V.B.8. It is unclear in what other context PSNH means EPA to consider varying timeframes in its BTA determination. Under the Final Rule, the BTA for entrainment is to reflect the permitting authority's determination of the maximum reduction in entrainment warranted after consideration of the factors relevant to making a BTA determination. *See* 40 C.F.R. § 125.98(f). The Final Rule at 40 C.F.R. § 125.98(f)(2) and (3) lists a number of factors that EPA must or may consider when establishing site-specific entrainment requirements. (As mentioned previously, for an ongoing permit proceeding, permitting authorities may but are not required to consider the factors detailed at 40 C.F.R. § 125.98(f)(2) and (3).) The implementation timeline is not, however, one of these factors. Under 40 C.F.R. § 125.98(c), the permitting authority should consider measures to maintain adequate energy reliability and reserve capacity during any facility outage when setting compliance schedules, but the Final Rule does not suggest that the varying timelines of potential technologies would be a factor in determining the BTA. Perhaps, in the specific case of two or more technologies with similar costs and benefits, EPA might consider the timeline in determining which of the technologies is the BTA to accelerate environmental benefits, but that is not the case here. Therefore, EPA does not agree that PSNH must update the construction schedules in the Engineering Response to make a BTA determination at Schiller Station.

Enercon (at 30-31) indicates that a new design would be required to determine a cost estimate for wedgewire screens with a slot size of 2 mm or greater. In Appendix 4 to PSNH's 2016 comments (at 2-3), Enercon indicates that the costs it provided were "budgetary in nature and did not contain the level of detail or rigor necessary to meet the requirements of the comprehensive technical feasibility and cost evaluation study required by § 122.21(r)(10)." According to Enercon, the initial cost estimate of $2,476,700 (in 2008 dollars) for CWW screens was not based on a preliminary design, did not include plant-specific conditions, and did not consider permitting costs. As a result, any site-specific design of narrow slot CWW screens at Schiller Station would exceed this cost estimate. Enercon (at 30-31 and Appendix 4) acknowledges, however, that its 2014 Supplemental Engineering Response (AR-227), which proposed a preliminary design for 9.5-mm CWW screens to reduce impingement mortality, included a cost estimate of $5,690,000 (in 2014 dollars), including costs for expected materials, equipment, labor, and permitting. An additional engineering budget of $490,000 was recommended.[21]

[21] PSNH originally claimed that the cost information in the 2014 Supplemental Engineering Response (AR-227) was confidential business information and redacted those portions of the report. PSNH provided the cost estimates in the

Enercon notes that one of the factors in the design was the shallow bedrock at the site, which makes underwater pipe burial more difficult and favors a half-screen design which allows piping to be installed on-grade. Enercon maintains that these design details were not apparent during the high-level assessment performed in 2008 and result in a more accurate cost estimate relative to the 2008 Response. While a Comprehensive Technical Feasibility and Cost Evaluation Study under 40 C.F.R. § 122.21(r)(10) would not be required for Schiller Station under the Final Rule, EPA agrees that PSNH's 2014 Supplemental Engineering Response includes a more detailed cost estimate and EPA has relied on the 2014 CWW cost estimates in its evaluation of technologies in response to comments on the Draft Permit.[22] *See* Response to Sierra Club Comment IV.B.6.

PSNH has not provided any reason why the closed-cycle cooling cost estimates initially provided as confidential business information ("CBI") (later withdrawn) cannot be used to evaluate the cost for Schiller Station. While these estimates may not reflect the final design and engineering assessment, they appear to consider major categories of compliance costs and contingencies and, for the most part, are reasonable approximations of cost for considering the relative costs and benefits of available technologies.[23] Regarding these costs, Enercon's 2008 Response states:

> [a]n accurate assessment of the capital costs associated with the closed-loop cooling conversion…is a critical goal of this Report. Minimizing assumptions and relying instead on well-developed, detailed conceptual designs greatly increases the accuracy of the ensuing estimates. In broad terms, conceptual design engineering outlines system scope definition, evaluates detailed layout and equipment specification/criteria, and assists in gathering site-specific historical data. Attachment 2 to this Report includes some of the conceptual drawings utilized for subsequent construction estimates…The estimating basis relies on cost factoring and solicitation from various assets capable of providing real world solutions. Vendors were contacted for quotations on various equipment and material components, while established construction cost estimating tools were utilized in developing the labor, equipment, and scheduling requirements.

AR-140 at 55-56. As Enercon suggests, the capital costs in the 2008 Response appear to represent, at a minimum, an accurate preliminary estimate for converting Schiller Station to closed-cycle cooling. Indeed, these cost estimates were provided to the New Hampshire Public

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Enercon Exhibit to PSNH's 2016 Comments on the Draft Permit (AR-313), however, and the claim of CBI was withdrawn. *See* Response to Sierra Club Comment IV.A.2.b. Consequently, EPA uses the cost figures provided in the Enercon Exhibit in this response.

[22] Even as EPA relies on the more detailed cost estimate provided in the 2014 Response, it recognizes that this estimate was prepared for 9.5 mm screens and that PSNH and Enercon add that a design for smaller slot screens (e.g., 2 mm) was not performed but is expected to increase total costs above what is provided.

[23] PSNH's cost estimates for capital expenses and auxiliary energy demands (*i.e.*, parasitic losses) are fairly consistent with EPA's assessment of the cost of closed-cycle cooling in the Final Rule. *See* TDD Chapter X. EPA disagrees, however, with the estimate in the 2008 Response for annual revenue losses due to reduced turbine efficiency (*i.e.*, energy penalty) and one-time outage costs. *See* Response to Sierra Club Comment IV.A.2.b.

Utilities Commission (NHPUC) for its review of environmental conditions for PSNH's generating assets, including known environmental matters that could lead to expenditures for future compliance. *See* Memorandum from Steve Wood to Dick Hahn, ESS Group, (Mar. 31, 2014) (AR-353). Thus, EPA cannot agree with the comment that the 2008 Response provided only "rudimentary" information related to the feasibility and cost of entrainment technologies, including closed-cycle cooling.

Finally, PSNH comments that it must update the 2008 Engineering Response to reflect all of the relevant information the industry has learned over the past eight years about the biological and operational efficacy of available entrainment technologies, particularly as it relates to CWW screens.[24] In support of its comment, PSNH, Enercon, and Normandeau provide a review of new information on the efficacy of CWW screens that has emerged since the submission of the 2008 Response. Closed-cycle cooling and CWW screens were the only two technologies identified in the draft BTA determination with the potential to minimize entrainment at Schiller Station. Because the entrainment reduction performance of closed-cycle cooling is tied to its intake flow reductions, EPA does not expect changes to the efficacy of this technology in the intervening years since the 2008 Response. PSNH offers no analysis to suggest that new information exists about the efficacy of any other entrainment technologies or any new technologies that EPA has not considered. Therefore, in this response, EPA focuses on the new information pertaining to the effectiveness of CWW screens to reduce entrainment.

As PSNH states, the 2008 Engineering Response presented reductions in entrainment mortality for CWW screens of various slot widths primarily as a function of physical exclusion alone; since 2008, Normandeau and others have performed laboratory studies, field studies, and modeling work attempting to quantify the role of two additional mechanisms in achieving entrainment mortality reductions with wedgewire screens: hydraulic bypass and larval avoidance. According to PSNH, based on the supporting material submitted by Enercon and Normandeau, the data presented in the 2008 Engineering Response are outdated, underestimate the overall effectiveness of CWW technology, and may overstate the role of physical exclusion (*i.e.*, slot-width size relative to the size of the relevant aquatic organisms) in the overall efficacy of the CWW screens.

The calculation of the effectiveness of CWW screens in the Fact Sheet was, as the comment indicates, based solely on physical exclusion following the approach of PSNH's consultant Normandeau (AR-140, at 85 and Attachment 6), with an additional factor based on EPA's assessment of the likelihood that organisms would survive contact with the screens. *See* Fact Sheet at 115-118. EPA assumed that CWW screens would be less effective than Normandeau's assessment because Normandeau assumed all eggs and larvae that would be excluded would survive, while EPA conservatively concluded that after contact with the screens most of the excluded larvae would die due to their fragility. Even given this conservative approach, EPA concluded that CWW screens would achieve substantial entrainment mortality reductions and concluded that narrow-slot CWW screens should be the BTA for Schiller Station. In part, EPA

[24] The 2008 Engineering Response (AR-140) as well as the Fact Sheet refer to cylindrical wedgewire screens (CWW), while PSNH's updated design in the 2014 Supplemental Response (AR-227) proposed a half-cylinder screen design. In this Response to Comment EPA uses the terms "CWW" and "wedgewire" to refer to either design.

expects that wedgewire screens to be sufficiently effective even if larval survival is only minimally increased over prior assessments because more than half of the organisms entrained annually at Schiller Station are eggs, which are more likely to survive contact with the screens. At the same time, EPA's Fact Sheet, recognized the new avenues of research on CWW screens that PSNH refers to in its comment, including the potential that hydraulic bypass and larval avoidance play a role in screen performance, stating the following (at 153):

> …wedgewire screens operate with low through-screen velocities which may enable later stage larvae with swimming ability to avoid contact with the wedgewire screens. Furthermore, low through-screen velocity combined with strong sweeping currents in the source water body, and the design of the wedgewire screens, may cause organisms to be swept past the screens without contacting them. *See, e.g.*, 79 Fed. Reg. 48331 ('Limited evidence also suggests that extremely low intake velocity can allow some egg and larval life stages to avoid the intake because of hydrodynamic influences of the crossflow.') EPRI (2003).

Therefore, the assessment in the Fact Sheet, which led to a determination of CWW screens as the BTA at Schiller Station, was conservatively based on physical exclusion while acknowledging that some avoidance of the screens is likely to occur. *See* Fact Sheet at 154.

Comments submitted by PSNH, Enercon, and Normandeau on the Draft Permit indicate that hydraulic bypass and larval avoidance of the CWW screens are likely to occur and that, given these phenomena, the screens are likely to be even more effective at Schiller Station than EPA estimated. If this is the case, performance of the BTA at Schiller Station will be *better* than estimated in the draft determination, which only strengthens the conclusion that wedgewire screens are the BTA for this facility. Because the new supportive information does not alter the BTA determination, EPA concludes that the Permittee should proceed with piloting the CWW technology to finalize the design and slot size rather than delay environmental improvements to further review and evaluate recent data. Moreover, the studies on larval avoidance and hydraulic bypass referenced in the comment were conducted in 2010 through 2012, yet Normandeau does not include this most recent data in its analysis of the effectiveness of wedgewire screens at Schiller Station. Normandeau (AR-313, Appendix 3 to Attachment 1 at 4-5) states that "we were unable to secure permission to apply these latest entrainment reduction performance models to Schiller Station to functionally evaluate the effectiveness of narrow slot CWW screens if installed there." In other words, although the "new" information has existed for some time prior to issuance of the Draft Permit and the public notice period, neither PSNH nor its consultants included the recent studies in its analysis of the biological performance of CWW screens due to the proprietary nature of the data.[25] Instead, Normandeau has submitted the same analysis of larval avoidance that it submitted in 2009 to support a BTA determination for Merrimack Station. *See* AR-246. This analysis is primarily based on data collected in 1978, 1987, and 2003. *See* PSNH Comments Appendix 3 to Exhibit 1 at 13-15 (AR-313). *See also* Response to PSNH Comment V.B.5. EPA sees no reason to delay a BTA determination for an indeterminate period of time until Normandeau can secure permission to incorporate proprietary data into a model

[25] PSNH has likewise not provided the data to EPA in the intervening time between the close of the comment period and the issuance of the Final Permit.

that, in the end, will likely only provide further support for the existing determination that wedgewire screens are the BTA at Schiller Station because incorporating larval bypass and avoidance of screens into the analysis will result in estimates of improved screen effectiveness screens as compared to the analysis in the Fact Sheet.

PSNH Comment V.B.4.c Benefits Valuation Study[26]

> 40 C.F.R. § 125.98(f)(4) provides:
>
> If all technologies considered have social costs not justified by the social benefits, or have unacceptable adverse impacts that cannot be mitigated, the Director may determine that no additional control requirements are necessary beyond what the facility is already doing. The Director may reject an otherwise available technology as a BTA standard for entrainment if the social costs are not justified by the social benefits. [157]

Region 1 did not generate a quantitative evaluation of the benefits yield expected if fine-mesh CWW screens are implemented at Schiller Station. [158] Instead, the agency prepared only a high-level qualitative evaluation of the social benefits and utilized the costs of potentially feasible entrainment technologies set out in the October 2008 Enercon-Normandeau Report. This analysis would be feeble, at best, were it based on current and more detailed information; but it is rendered wholly ineffectual by the fact that it relies upon cost estimates that are both out of date and too generalized and benefits analyses so generic that they lack the requisite "rigor" to allow the agency to make an informed determination of BTA at Schiller Station. [159]

PSNH has had no opportunity to submit analyses quantifying the precise social costs and relative benefits of any entrainment technology that could feasibly be installed at Schiller Station. Had it known Region 1 intended to seek to impose technologies at Schiller Station due to entrainment impacts, the company would have commenced such analyses months ago, including but not limited to perhaps the Benefits Valuation Study described in 40 C.F.R. § 122.21(r)(11).[160] The reality is, for the reasons presented above regarding the established 125 MGD AIF threshold, PSNH, Enercon, and Normandeau did not believe entrainment at Schiller Station would be heavily scrutinized by the agency and Region 1 never communicated its intent to do so to anyone within the company.

Once the Draft Permit was issued, PSNH attempted to formulate a benefits valuation study to enable the company to "[q]uantif[y]…social benefits and costs of available entrainment technologies" with "sufficient rigor" [161] within the time allotted for comments to the Draft Permit. The ultimate goal of this benefits valuation study PSNH commenced is to determine if any entrainment controls are in fact warranted. PSNH was unfortunately not able to complete its analysis within the time allotted for comments. [162]

PSNH's other comments to the BTA determinations set out in the Draft Permit should cause Region 1 to revisit its proposed technological requirements for the CWISs at Schiller Station.

[26] PSNH's comment letter includes two separate headings identified as V.B.4.a. For clarity, EPA has designated this particular comment as Comment V.B.4.c in this Response to Comments document.

Should the agency not do so, however, PSNH respectfully requests additional time to develop and complete the benefits valuation study it has commenced and provide it to Region 1 in a timely manner. PSNH should be afforded this opportunity before Region 1 makes its final BTA determination, given that most if not all other operators within the industry subject to the final § 316(b) rule will be compelled, or at least have adequate time and the option, to submit an analysis of this kind so that the threshold question of whether technological controls for entrainment are necessary at their respective facilities may be answered in accordance with the tenets of the final rule.

[157] *See* 40 C.F.R. § 125.98(f)(4).

[158] *See*, e.g., Fact Sheet at 160–61 ("EPA did not attempt to develop a monetized estimate of the full benefits that would accrue to society from the above-discussed impingement mortality and entrainment reductions from the preferred BTA – such as by undertaking a stated preference study or a benefits transfer analysis to estimate non-use benefits for this case – because EPA decided that doing so would be prohibitively difficult, time-consuming and expensive for this permit. No such complete monetized estimate is readily available and it would take many months and substantial cost to attempt to develop such an estimate.") (footnotes and citations omitted).

[159] *See* 40 C.F.R. § 125.98(f)(2)(v).

[160] *See id*. § 122.21(r)(11).

[161] *Id*. § 125.98(f)(2)(v).

[162] This is not surprising given that Region 1 acknowledges in its Fact Sheet that developing a benefits study of this kind "would take many months and substantial cost" to develop. Fact Sheet at 161.

EPA Response to PSNH Comment V.B.4.c

PSNH comments that it has had no opportunity to submit a cost-benefit analysis pertaining to decisions about the BTA for entrainment at Schiller Station and requests that the permit be delayed to allow it to develop such an analysis if the permit will require entrainment controls. EPA does not agree with these comments: PSNH could have submitted cost-benefit information with its permit application, with its comments on the Draft Permit, or sometime thereafter. It did not, however, submit such information. EPA does not agree that it should further delay the new Final Permit to await the possible development of such an analysis. EPA has sufficient information to support its analysis and conclusions and, as discussed in other responses, EPA has many reasons for moving ahead to finalize the permit.

PSNH provides several reasons for its decision not to submit a cost-benefit assessment previously. First, PSNH suggests that it did not think Schiller Station would be subject to entrainment control requirements under the 2014 CWA § 316(b) Final Rule because its AIF is less than 125 MGD. As EPA has explained in prior responses to comments, however, this is plainly an incorrect reading of the regulations, which obviously require facilities with AIFs above 2 MGD, such as Schiller Station, to meet the entrainment BTA standards of 40 C.F.R. § 125.94(d). See 40 C.F.R. § 125.94(a).

Second, PSNH states that Region 1 never informed PSNH that it would "heavily scrutinize" the facility's entrainment. Yet, not only does the permitting authority not have an obligation to provide that sort of notice, PSNH should have been well on notice that EPA would be considering the entrainment issue for the Schiller Station permit. Section 316(b) of the CWA requires that the "location, design, construction, and capacity of cooling water intake structures reflect the best technology available for minimizing adverse environmental impact." 33 U.S.C. §

1326(b). EPA's consistent, longstanding regulatory approach under Section 316(b) has interpreted "adverse environmental impact" to include mortality caused by impingement and entrainment. *See, e.g.*, EPA's 1977 Draft Guidance for Evaluating the Adverse Impact of Cooling Water Intake Structures on the Aquatic Environment, the 2001 Phase I Rule (66 Fed. Reg. 65,255), the 2004 Phase II Rule (withdrawn) (69 Fed. Reg. 41,575), the 2006 Phase III Rule (71 Fed. Reg. 35,005), and the 2014 Final Rule (79 Fed. Reg. 48,299). As noted above, the 2014 Final Rule requires that all facilities subject to the Rule, which includes Schiller Station, must comply with site-specific BTA standards for entrainment. *See* 40 C.F.R. §§ 125.94(a), 125.94(d).

Furthermore, PSNH also should have been aware that EPA would, or at least might, be carefully scrutinizing entrainment impacts. During the permit development process, which occurred over a number of years, EPA sent PSNH several CWA § 308 information request letters asking the facility to evaluate the feasibility and biological effectiveness of various available entrainment technologies. *See* AR-118. *See also* AR-011, AR-013, AR-015, AR-016, and AR-017. Specifically, EPA's information request letters in 2004 and 2008 (after the Phase II Rule was remanded) both made clear that the Agency was considering technologies for minimizing entrainment at Schiller Station. *See* AR-118 and AR-119. In 2004, PSNH submitted a response to EPA's request that evaluated CWIS technologies and operational measures and ranked them "according to their estimated ability to provide the greatest reductions in entrainment and impingement for the least associated initial capital and ongoing annual operating costs." AR-140 at 4. In other words, PSNH developed quantitative information on the relative costs and benefits of various entrainment control technologies and provided this information to EPA. PSNH determined that "[a]lthough conversion to closed loop cooling has the potential to reduce entrainment and impingement mortality from baseline by 100% or 96.9%, depending on the use of grey water or seawater for make-up water, the fine wedgewire screens have to [*sic*] potential to provide comparable biological benefits for significantly less cost." *Id.*, at vi. PSNH's submission did not include the sort of detail that would be included in a Benefits Valuation Study required under 40 C.F.R. § 122.21(r)(11), but that regulation was not in effect in 2004, not to mention that even under the 2014 Final Rule, Schiller Station is not subject to the requirements of 40 C.F.R. § 122.21(r)(11) because its AIF is less than 125 MGD.

PSNH is correct that, in certain cases, a permitting authority may determine that no additional requirements beyond what the facility is already doing for entrainment are necessary if the social costs of entrainment controls are not justified by the social benefits (both monetized and non-monetized). *See* 40 C.F.R. § 125.98(f)(4); *see also* 79 Fed. Reg. at 48,352. There is no reasonable basis on which to conclude, however, that based on the preamble to the Final Rule, in the supporting documents to the Rule, or through correspondence with Region 1, that the facility would be exempt from entrainment control technologies at the outset. This is especially so given that PSNH's proposed its reading of the 125 MGD AIF administrative threshold in comments submitted during EPA's rulemaking process, but EPA rejected this interpretation more than a year before the Draft Permit was issued. *See, e.g.*, Responses to Comments V.B.2.a, Furthermore, during development of this Draft Permit, EPA had already proposed the need for entrainment control technologies in a draft permit for PSNH's Merrimack Station, which also has an AIF less than 125 MGD. *See* AR-371 (Merrimack Station Draft Permit) and AR-372 (Fact Sheet Attachment D: Determination Document).

In sum, PSNH has not presented a reasonable basis for its comment that it had no opportunity to submit a cost-benefit analysis to EPA, or that it reasonably believed that EPA would not closely consider whether to require controls to minimize entrainment at Schiller Station.[27]

PSNH comments that EPA did not complete a "quantitative evaluation" of the benefits of fine-mesh CWW screens and that the cost data presented in the 2008 and 2014 Responses to EPA's 308 Requests (AR-140 and AR-227), and which were used in the qualitative analysis in the Fact Sheet, are outdated and lack the requisite "rigor" to allow the agency to make an informed determination. EPA disagrees on both counts. EPA compared the cost and *quantified* entrainment reduction estimates for closed-cycle cooling, wedgewire screens with four slot sizes, and Ristroph screens. Fact Sheet at 153-55. EPA also qualitatively evaluated the benefits of reducing entrainment at Schiller Station, including, but not limited to, benefits to species that have experienced recent regional population declines (*e.g.*, rainbow smelt, herring), benefits to recreationally important species, and the value of enhancing protection for Great Bay Estuary. *Id.* at 159-65. In its analysis of costs for this Response to Comments, EPA has converted all cost estimates to 2016 dollars adjusting for inflation using the Construction Cost Index. In addition, EPA used the higher cost estimates for wedgewire screens provided in the 2014 Response (and referenced in Appendix 4 to Exhibit 1 of PSNH's comments) with an additional adjustment to account for a smaller slot size. *See also* Response to Sierra Club Comment IV.B.6. PSNH has yet to provide any specific reason why the estimates from prior 308 Response would be "outdated."

The Final Rule establishes a framework for the Director to determine entrainment requirements on a site-specific basis using information submitted by a facility on a variety of factors, including costs and benefits (taking into account both quantified and qualitative, non-quantified benefits). The outcome of this process results in a determination that either a facility must install additional control measures to reduce entrainment or that the current, existing technology for entrainment achieves the entrainment BTA requirements.[28] *See* 79 Fed. Reg. at 48,350. To the extent PSNH suggests that the Benefits Valuation Study described in 40 C.F.R. § 122.21(r)(11) requires a monetized benefits analysis from facilities with greater than 125 MGD AIF, it mischaracterizes the regulations. In fact, this study must describe each category of benefits narratively and, *when possible*, benefits should be quantified in physical or biological units and monetized using appropriate economic valuation methods. *See* 40 C.F.R. § 122.21(r)(11). In its comment and in footnote 158, PSNH appears to equate "quantitative" analysis with a monetized cost-benefit analysis. The commenter also suggests that only such an analysis would provide sufficient "rigor" to support a determination of the BTA for entrainment under the Final Rule. Yet, the

[27] PSNH also comments that it "commenced" a benefits valuation study following issuance of the Draft Permit, but was unable to complete it within the public comment period, and that it "should be afforded th[e] opportunity" to do so and provide it to EPA. EPA is unaware whether PSNH continued and ultimately completed the study. In any event, PSNH has had ample time to complete the study and EPA has not received it.

[28] EPA notes that neither the current, existing technology employed at Schiller Station (coarse-mesh traveling screens) nor the upgrades to this technology proposed by PSNH in its comments effectively reduce entrainment. Relative to design flow, the current AIFs resulting from the power plant's current operating capacity do result in less entrainment than when the facility operated more frequently. EPA has not designed permit conditions based on these reduced intake flows, however, because PSNH requested permit conditions based on full-scale operations and has not indicated a willingness to accept a lower flow limit that would ensure that current entrainment reductions via capacity reductions will be maintained in the future.

Final Rule makes clear that the benefits analysis may include monetized, quantitative, and/or qualitative benefits, and that the consideration of all benefits (both monetized and non-monetized) is consistent with the history of considering costs and benefits under Section 316(b) and with Executive Order 13563. *See* 79 Fed. Reg. at 48,352, 48,371.

Moreover, the qualitative evaluation of benefits in the Fact Sheet at 153-55, 159-64, is consistent with the Final Rule's prescription for considering benefits in the absence of monetized values. The preamble explains:

> [i]n assessing the benefits of entrainment technology installation, the Director would assess the value to society from the reductions in impingement mortality and entrainment that would result from installation of a closed-cycle cooling system, fine mesh screens, or other entrainment technologies. All benefits, including monetized, quantified and qualitative benefits, should be considered in this assessment. The benefits assessment would typically look at a range of potential benefit categories, including increased harvest for commercial fisheries, increased use values for recreational fisheries, and nonuse values (existence and bequest values). The latter may be difficult to quantify or monetize. If appropriate data are available from benefits transfer or conducting stated preference studies or other sources that can be applied to the site being evaluated, these should be used to monetize nonuse values. Otherwise, nonuse values should be evaluated quantitatively and/or qualitatively. Quantitative analysis, even without monetization, can be quite useful in evaluating nonuse benefits. For example, quantifying impacts to forage and threatened and endangered species, and other indirect impacts on the aquatic environment, might allow the Director to derive a much more complete understanding of benefits as compared to a qualitative narrative, even if not directly comparable to monetary costs.

79 Fed. Reg. at 48,371. While the comment above suggests that, without monetized benefits estimates, an evaluation will necessarily lack sufficient rigor to support a BTA determination for entrainment control and, therefore, EPA would be unable to make such a determination. Yet, the absence of calculated monetized benefits does not mean that substantial benefits necessarily do not exist. An analysis that only considers monetized costs and benefits likely poses an incomplete evaluation of the full range of costs and benefits. *See*, *e.g.*, 79 Fed. Reg. at 48,351 ("Merely because it is difficult to put a price tag on those benefits does not mean that they are not valuable and should not be included at least qualitatively in any assessment"). Many of the potential benefits fall under the category of "non-use" benefits, which include existence and bequest values, and are challenging to monetize or even quantify.[29] Even more rigorous benefits evaluations, such as that performed for impingement mortality under the Final Rule (which included monetization based on commercial and recreational value), will not capture all, or even most, of the benefits. EPA may proceed with a determination of the BTA for entrainment even with incomplete economic data, and in such a case the permitting authority may choose how to

[29] Non-use benefits include the value individuals place on improved environmental quality without any past, present, or anticipated future use of the resource in question. Existence value is the value of simply knowing a resource exists while bequest value is the value knowing that a resource is available for others to use now and in the future. *See* Benefits Analysis for the Final 316(b) Existing Facilities Rule at 4-2 (AR-338).

consider cost-benefit and what weight to afford it in determining entrainment standards. *See* Final Rule RTC at 94.

EPA considered relative costs and benefits, including qualitative benefits, in its determination for Schiller Station:

> Neither statute, nor regulations, nor guidance document dictate precisely how such cost/benefit evaluations should be conducted. The regulations do, however, indicate that social costs and benefits should be considered and that costs and benefits should be considered both qualitatively and, if possible, quantitatively. *See also* 40 C.F.R. §§ 125.92(x) and (y)[;] 122.21(r)(11). EPA makes reasonable efforts to make as complete an assessment as it can of the costs and benefits at issue, so that it can factor them into its evaluation. As part of a qualitative evaluation, EPA seeks to compare the cost of BTA options with "the magnitude of the estimated environmental gains (including attainment of the objectives of the Act and § 316(b)) to be derived from the modifications." *Id.* at 225 (quoting, *Central Hudson*, Decision of the General Counsel, No. 63, at p. 381). The relevant "objectives of the Act and § 316(b)," as referred to in *Central Hudson*, include minimizing adverse environmental impacts resulting from the operation of CWISs, 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).

Fact Sheet at 159. In its comments, PSNH requests additional time to develop and complete its benefits valuation study. In support of its request, PSNH comments that "most" facilities will submit this information and suggests that the benefits valuation study is critical to the "threshold question of whether technological controls for entrainment are necessary." EPA disagrees. First, only facilities greater than 125 MGD AIF are required to submit a benefits valuation study under 40 C.F.R. § 122.21(r)(11). 40 C.F.R. § 122.21(r)(6). Given the cost and level of effort required to complete such an analysis, and the fact that it is not required by regulation, it remains to be seen whether "most" facilities with less than 125 MGD AIF will submit this information. Second, EPA disagrees that the Benefits Valuation Study under 40 C.F.R. § 122.21(r)(11) is critical to determining whether technological controls for entrainment are warranted at Schiller Station. Under 40 C.F.R. § 125.94(d), the permitting authority must establish BTA standards for entrainment for each intake on a site-specific basis and these standards "must reflect the [permitting authority's] determination of the maximum reduction in entrainment warranted after consideration of the relevant factors as specified in § 125.98." The Final Rule directs the permitting authority to make this determination for all facilities, even though facilities with AIF less than 125 MGD are not required to complete a benefits evaluation. The determination of the "maximum reduction" warranted is based on all of the factors at § 125.98(f)(2) and the relevant factors at § 125.98(f)(3) – only one of which is social costs and benefits – and the weight given to each factor is left to the discretion of the permitting authority. Therefore, the Final Rule does not make completion of a Benefits Valuation Study a prerequisite to developing the BTA for all facilities. In this case, EPA relied on the information that was available (that is, among other factors, the monetized cost estimates provided by PSNH, the quantified entrainment reductions of the available technologies, and an assessment of the qualitative benefits of entrainment controls) to proceed with a determination of the BTA for entrainment that is consistent with the terms of the Final Rule.

PSNH Comment V.B.4.d Non-water Quality and Other Environmental Impacts Study[30]

Nothing remotely comparable to the Non-water Quality and Other Environmental Impacts Study described in 40 C.F.R. § 122.21(r)(12) has been completed and submitted to Region 1 by PSNH. [163] Studies of this kind typically are generated only after the above-referenced Comprehensive Technical Feasibility and Cost Evaluation Study has been performed. The Non-water Quality and Other Environmental Impacts Study evaluates an array of potential impacts associated with technologies deemed potentially viable following the technological and cost evaluation study, including but not limited to issues of energy consumption, air pollutant emissions, noise, safety, grid and facility reliability, and consumptive water use .[164] Evaluation of these concerns puts § 316(b) technological options being considered into proper perspective by quantifying the totality of environmental impacts expected if ultimately implemented at a given facility.

The entirety of Region 1's evaluation of the non-water quality impacts associated with the installation of fine-mesh CWW screens at Schiller Station consists of the following conclusory statement: "EPA does not expect any impacts in energy consumption, water quantities in the affected water bodies, air emissions, noise, and visual impacts with these technologies." [165] More is required to satisfy the tenets of the final § 316(b) rule, meaning Region 1's superficial statements are arbitrary and capricious and do not provide adequate support for the agency's ultimate BTA determination. Prior to rendering its final BTA determination, Region 1 should permit PSNH to submit an evaluation of these non-water quality impacts so the agency can adequately evaluate and explain this mandatory aspect of its BTA analysis.

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The status of Region 1's current justification for fine-mesh CWW screens at Schiller Station to address entrainment impacts is summed up best in the 2016 Enercon-Normandeau Comments: "[Region 1's] BTA determination is both uninformed (based on inadequate information) and misinformed (based on outdated information)."[166] More is needed to enable the agency to develop and support a BTA determination that can withstand judicial scrutiny. PSNH therefore respectfully requests that Region 1 permit the company to submit additional analyses that "will provide the [agency] with adequate information for decision making" if the agency remains steadfast in its position that entrainment controls may be warranted at Schiller Station following review of these and other comments submitted regarding the Draft Permit. [167]

[163] *See* 40 C.F.R. § 122.21(r)(12).

[164] *See id*.

[165] Fact Sheet at 164.

[166] 2016 Enercon-Normandeau Comments at 19 (emphasis in original).

[30] PSNH's comment letter includes two separate headings identified as V.B.4.b. For clarity, EPA has designated this particular comment as Comment V.B.4.d in this Response to Comments document.

[167] 79 Fed. Reg. at 48,348.

EPA Response to PSNH Comment V.B.4.d

PSNH comments that it has not provided information about the potential non-water quality environmental and energy impacts of available cooling water intake technologies and that an evaluation of the non-water quality impacts of CWW screens must be submitted so the agency can adequately consider these impacts in its BTA determination. More specifically, PSNH notes that it has not submitted a Non-Water Quality and Other Environmental Impacts Study, as described in 40 C.F.R. § 122.21(r)(12). The commenter suggests that this study is typically only submitted after engineering and cost studies are submitted and potentially viable alternatives are identified. The commenter also refers to EPA's assessment of non-water quality and energy effects and criticizes it as superficial and inadequate. Finally, PSNH requests that delay issuance of the final permit until PSNH has had the opportunity to develop and submit an evaluation of non-water quality and other environmental impacts for EPA's consideration.

EPA does not agree with this comment. The Final Rule only requires a Non-Water Quality and Other Environmental Impacts Study, as specified in 40 C.F.R. § 122.21(r)(12) for facilities larger than 125 MGD AIF, which, again, does not include Schiller Station. *See also* 79 Fed. Reg. at 48,368. In addition, even if Schiller Station did withdraw more than 125 MGD of water, the permittee would not be required to submit a Non-Water Quality and Other Environmental Impacts Study in accordance with 40 C.F.R. § 122.21(r)(12) because this permit proceeding is an "ongoing permit proceeding" under 40 C.F.R. § 125.98(g), under which the permitting authority has the discretion to render its BTA determination without first obtaining the information reports specified in 40 C.F.R. § 122.21 if it otherwise has sufficient information.

The Final Rule provides examples of potential non-water quality and other impacts, including energy consumption, air pollutant emissions, noise, safety concerns, grid reliability, changes to capacity or operations, consumptive water use, and impacts to production or generating capacity. 79 Fed. Reg. at 48,368. In the TDD for the Final Rule, EPA explains that requiring facilities to retrofit to closed-cycle cooling may incur additional non-water quality impacts that are not insignificant; the potential for non-water quality impacts contributed to the Agency's decision not to identify closed-cycle cooling as the BTA for all facilities under the rule. *See* TDD for the Final Rule at 5-27 (AR-182); *see also* 79 Fed. Reg. at 48,342. In its discussion of the non-water quality impacts, the TDD focuses again on those associated with the conversion to closed-cycle cooling: increased air emissions, vapor plumes, noise, salt or mineral drift, water consumption, and solid waste generation as a result of cooling tower blowdown. *See* Chapter 10 of the TDD for the Final Rule. These impacts are similar to those identified in the description of the "Non-Water Quality Environmental and Other Impacts Assessment" in 40 C.F.R. § 122.21(r)(12). The discussion of non-water quality impacts in the Final Rule and in the TDD suggests that EPA expects most of these potential impacts to be associated with closed-cycle cooling. As EPA has determined that closed-cycle cooling is not the BTA for Schiller Station, analysis of the impacts resulting from retrofitting that technology is not required for this determination.

EPA's 2007 request for supplemental information required PSNH to "describe in detail the non-water quality environmental impacts (including energy, air pollution, noise, public safety), if any, that you have determined will occur from the use of each technology." AR-118 at 7. In response, Section 5.3 of the 2008 Engineering Response (AR-140), prepared by Enercon, presented PSNH's predictions of the environmental impacts that would be associated with retrofitting mechanical draft cooling towers at Schiller Station. This analysis discussed potential impacts from the cooling tower's vapor emissions plume (*e.g.*, air emissions, visual impacts, public safety hazards), noise emissions, aesthetic effects, construction impacts, and energy penalties as a result of reduced condenser efficiency and auxiliary power losses to operate the tower. Additional analysis of possible non-water quality impacts from cooling towers, including predictions of impacts from salt drift (from air emissions and the use of salt water makeup), were provided by PNSH in 2014. *See* AR-227 at 24-27.

PSNH's submissions identified no significant non-water quality impacts associated with the use of any other technology, including CWW screens. Although EPA had requested that PSNH identify potential non-water quality impacts from each technology evaluated, the permittee only identified concern about potential impacts from converting to closed-cycle cooling. PSNH comments that the "[e]valuation of these [non-water quality] concerns puts § 316(b) technological options being considered into proper perspective by quantifying the totality of environmental impacts expected if ultimately implemented at a given facility." With regard to CWW screens, however, PSNH did not indicate concerns about non-water quality impacts.

This is consistent with EPA's assessment. Wedgewire screens change the physical process of withdrawing cooling water (as compared to the existing intake bay and screening system) but do not change the facility's condenser cooling process or its process for generating electricity. The screens also do not result in significant changes to water consumption or usage of electricity, as compared to the existing system. For this reason, no significant effect on condenser efficiency or plant output or reliability are expected. Using an airburst system to keep the screens clear will create an auxiliary power demand, but EPA expects this effect to be minimal. PSNH did not provide an estimate of energy use by an airburst system at Schiller Station, but to get an idea of what would be involved, EPA looked to PSNH's 2012 comments on the Merrimack Station Draft Permit. These comments discussed, among other things, the option of using CWW screens at that facility and estimated both that CWW screens would not cause operational efficiency losses and that auxiliary power use for the airburst system would be only about 202 megawatt-hours (MWh) per year. This estimate assumed seasonal use of the screens, with the airburst motors running 24-hours a day from April through July and 4-hours per week from August through March. In addition, some of the identified energy usage was due to operation of the traveling screens and fish return system, rather than operation of the CWW screens. *See* Enercon 2012 Comments on Merrimack Station Draft Permit at 6 (AR-373). Assuming all of 202 MWh of power per year is used for the CWW screens, and extrapolating from the seasonal operational profile at Merrimack Station to 24-hour, year-round use of the airburst motors at Schiller Station, the total energy use at Schiller Station would be about 613 MWh per year, which is a loss of only 0.12% of the average annual generating capacity at the Station.[31] This minimal increase in energy usage could result in a slight increase in air emissions if the Station has to burn additional

[31] Energy Information Administration Electricity Data Browser Net Generation at Schiller Station from January 2013 to December 2015.

fuel to recover the loss of energy, but given the miniscule increase relative to the plant's output, any impacts would not be enough to trigger reconsideration of wedgewire screens as the BTA.

EPA also considered other types of possible energy effects of using a CWW screen system. First, EPA expects that any facility outage that might be required during screen installation would be relatively limited (less than four weeks). Given that two of Schiller Station's generating units already operate at very reduced capacity much of the year, and that all of the generating units are relatively small, impacts to electric system reliability during the installation period are unlikely. In other words, any plant outage necessitated by screen installation can be scheduled during a time of lesser power plant operations and easily accommodated by the electric system. Second, authorizing Schiller Station to bypass the wedgewire screens in case of a major screen failure will further ensure that relying on a CWW screening system does not affect facility condenser operation or electric system reliability. *See* Response to PSNH Comment V.B.7.

Beyond possible energy effects, EPA also considered other potential non-water quality effects from using CWA screens. There could be some noise emissions associated with the airburst system, but any noise would likely be intermittent and for short durations (*i.e.*, limited to times when the airburst system operates). Any such noise in unlikely to be out of character with a busy and productive shipping channel. Finally, Part I.A.11(a)(1) of the Draft Permit requires that the screens be placed as close to the west bank of the Piscataqua River and the CWIS as possible, which will ensure that the installation is well away from the navigation channel. A simple marker would suffice to alert any smaller vessels to the location of the screens. As the screens are located under water, the only visible impact to aesthetics would be the markers, which also would not be out of character with the river. The airburst system would cause some bubbling at the surface, but the duration would be limited (*i.e.*, a few minutes) and the bubbling would look similar to the wake of a boat. For these reasons, wedgewire screens are not expected to impact aesthetics.

Again, the comment provides no additional information to establish, or even suggest, that non-water quality impacts from the screens would be other than as described above. Furthermore, as discussed above, EPA has no reason to expect that the potential impacts of CWW screens on air emissions, energy reliability, or water consumption – the non-water quality environmental factors that EPA must (or may) consider when establishing site-specific entrainment requirements under 40 C.F.R. § 125.98(f)(2) and (3) – would affect EPA's decision on the appropriate entrainment controls for Schiller Station. Enercon similarly concluded that the installation of CWW screens would not significantly impact the overall operation of Merrimack Station and neither Enercon nor PSNH have explained how Schiller Station differs from Merrimack Station such that one might expect significant non-water quality impacts from CWW screens at the former, but not the latter. Because EPA is not mandated by the Final Rule to require submission of the Non-water Quality Environmental and Other Impacts Assessment for Schiller Station – both because this determination is an ongoing permit proceeding under 40 C.F.R. § 125.98(g), and because the Station's AIF is less than 125 MGD – and because EPA does not expect significant non-water quality impacts from CWW screens based on an understanding of the operation of the technology, a consideration of Enercon's analysis of CWW screen impacts for Merrimack Station, and PSNH's apparent belief in 2008 that non-water quality impacts would not occur from CWW, EPA does not agree that submission of an additional study of non-water quality impacts is necessary prior to making a permit determination.

PSNH Comment V.B.5. At the Very Least, Region 1 Must Permit PSNH to Evaluate CWW Screens with Larger Slot Widths to Reflect Current Research and Understanding About the Effectiveness of Those Screens

The comments set out herein demonstrate technologies to address entrainment are not warranted at Schiller Station. Should Region 1 erroneously disagree, it must allow PSNH to test screens for the CWW system with a larger slot-width than 0.8 mm. Specifically, the company requests the right to also test the biological effectiveness of CWW screens with slot-widths of 2.0 mm, 3.0 mm, and above. There is no drawback to the agency permitting PSNH to do so. The company will still complete all pilot testing within the time frame it would need to complete testing of screens of 0.8 mm or less. Furthermore, allowing this additional testing will provide PSNH and the agency valuable data regarding the efficacy of a larger array of smaller-sized slot-width CWW screens in an estuarine environment, including but not limited to learning whether these larger slot-width screens are equally if not more effective than their finer-mesh counterparts in a waterbody with swift sweeping flows due to the newly discovered hydraulic bypass and larval avoidance phenomena. [168]

Currently, there is a dearth of information regarding the effectiveness of finer-mesh CWW screens in coastal and brackish water ecosystem—like the Piscataqua River—subject to extremely aggressive marine life fouling. [169] And, PSNH, Enercon, Normandeau, and others have serious concerns that CWW screens with a slot-width of 0.8 mm or less in the Piscataqua River will experience frequent and potentially catastrophic biofouling, debris fouling, clogging, and frazil ice issues that could impact the reliability of Schiller Station.

Concerns regarding biofouling and clogging associated with CWW screens are not limited to Schiller Station. EPA and EPRI have expressed industry-wide concerns regarding biofouling issues with CWW systems with small slot-widths. Specifically, in its Technical Development Document that accompanied the 2006 Effluent Guidelines Program Plan, EPA provided:

The Agency is not aware of any fine-mesh wedgewire screens that have been installed at power plants with high intake flows (>100 MGD). However, they have been used at some power plants with lower intake flow requirements (25-50 MGD) that would be comparable to a large power plant with a closed-cycle cooling system. With the exception of Logan, the Agency has not identified any full-scale performance data for these systems. They would be even more susceptible to clogging than wide-mesh wedgewire screens (especially in marine environments). It is unclear whether this simply would necessitate more intensive maintenance or preclude their day-to-day use at many sites. Their successful application at Logan and Cope and the historic test data from Florida, Maryland, and Delaware at least suggests promise for addressing both fish impingement and entrainment of eggs and larvae. However, based on the fine-mesh screen experience at Big Bend Units 3 and 4, it is clear that frequent maintenance would be required. [170]

EPRI has also noted these issues:

> Several full-scale CWIS applications of cylindrical wedge-wire continue to perform satisfactorily. However, these applications employ coarse bar spacings (10 mm). Therefore, other than the existence of encouraging data from small-scale laboratory and pilot field facilities, there is still little information on the use for this technology for protecting early life stages. The potential use of 0.5- to 2.0 mm bar spacing to protect early life stages of fish (particularly eggs and early larvae) has not been evaluated at a CWIS. Therefore, larger-scale pilot studies are needed to identify the full biological potential of these screens. Also, there is a need for further research into biofouling control before the potential applicability of wedge-wire screens can be fully assessed. Biofouling, particularly on internal surfaces that are not readily accessible, remains a concern with both large and small slot sizes. Results of small-scale field studies conducted primarily in the 1970's and 1980's have shown that substantial fouling can occur over time in all types of water. [171]

Barnacles and numerous species of mollusks can rapidly colonize on numerous functional parts of CWW systems. When they do, the passage of cooling water flow is impeded and cleaning and operation of the intake screening equipment itself may be interrupted. [172] Some mesh openings actually become blocked, thereby restricting the flow of water through the screen and increasing the velocity through the unblocked portions of the screen. Less open screen area also results in a higher pressure drop through the screens, which can impair the performance of a facility's circulating water pumps and reduce fish protection. [173]

The slot-width of the CWW screens is a key variable in the potential risk of biofouling at a facility. [174] This is so because biofouling organisms first attach to a solid piece of screen and, as the organisms grow, the thickness of the biolayer decreases the open portion of the screen. A screen with a greater percentage of solid wire (i.e., one with smaller percent open area) thus will provide space for a greater number of organisms to attach themselves, meaning the resulting biolayer will obstruct the open area of the screen at a faster rate. [175] Biofouling organisms can also bridge the gap between solid portions of the screen to block flow completely. In marine environments, testing of traveling water screens has revealed that the hydraulic performance of larger mesh screens (about 2 mm x 70 mm) compared to smaller mesh screens (about 1 mm x 15 mm) is better due to decreased ability of the dominant amphipods to bridge the larger openings and restrict flow in the larger mesh screens. [176]

At Schiller Station, the presence of calcareous algae in the brackish water of the Piscataqua River presents a significant biofouling concern. Calcareous algae are encrusting algae that can coat inert surfaces. They colonize clean, hard substrates and then attract an entire biofouling community including macroscopic algae, barnacles, and mussels. [177] Different CWW screen materials (e.g. metal alloys) have been used to successfully limit biofouling. However, it is not currently known whether any materials could be used to limit the growth of algae on CWW screens at Schiller Station, especially screens with a slot-width of 0.8 mm or less.

[168] The results from the Indian Point analysis included in Exhibit 2 provide proof that it is possible for larger size slot-widths to be equally effective at reducing entrainment.

Notably, Enercon never stated in its 2008 report that a "mesh size no greater than 1.0 mm is necessary to effectively screen most fish eggs and larvae," as Region 1 asserts in its Fact Sheet. See Fact Sheet at 107 (citing AR-140 at 80); see also id. at 114 (Region 1 "agrees with PSNH that a slot size of 0.6 mm to 0.8 mm will likely be needed to maximize entrainment reductions at Schiller Station"). 1.0 mm slot-width screens were simply the largest ones evaluated as part of that report. And, the discovery in recent years of how hydraulic bypass and larval avoidance impact the efficacy of CWW screens mean it is reasonable to assume screens with slot-widths greater than 1.0 mm may be equally effective at reducing entrainment. Region 1's repeated statements regarding the efficacy of CWW screens with slot-widths of 1.0 mm or less are therefore inaccurate and based on outdated information.

Distinctly, PSNH takes issue with the values set out in Tables 10-A and 10-B within the Fact Sheet that purport to represent the estimated impingement and entrainment reductions, respectively, that would occur at Schiller Station depending upon the technology installed for the CWISs. See Fact Sheet at 151, 153. Region 1 provides that some of the values contained in Table 10-A, and presumably in Table 10-B, came from P. Colarusso at EPA via email correspondence with Ms. Sharon DeMeo dated July 18, 2014. See Fact Sheet at 151. One of the spreadsheets supposedly transmitted with this July 18, 2014 email correspondence is included in the Administrative Record for the permit in ".pdf" format. See AR-244. However, the actual email correspondence and any other attachments to it are not. The spreadsheet is impossible to decipher (especially as a static ".pdf" document) without any context or knowledge regarding the methodologies employed by P. Colarusso or others at EPA to generate the values. PSNH therefore is unable to verify the veracity of the values included in AR-244 and/or Tables 10-A and 10-B and therefore objects to the use of them by Region 1 to make BTA determinations for Schiller Station.

[169] *See* generally 2016 Enercon-Normandeau Comments at Appx. 2.

[170] EPA Technical Development Document for the Final Regulations Addressing Cooling Water Intake Structures for New Facilities at 5-7 (Nov. 2001) (emphasis added).

[171] 2016 Enercon-Normandeau Comments at Appx. 2, pp. 10-11 (quoting EPRI Technical Report 1010112, "Field Evaluation of Wedgewire Screens for Protecting Early Life Stages of Fish at Cooling Water Intakes." (May2005)).

[172] 2016 Enercon-Normandeau Comments at Appx. 2, p. 3.

[173] *Id*. at Appx. 2, p. 6.

[174] *Id*. at Appx. 2, p. 11.

[175] *Id*. (citing Fedorenko, A.Y. Guidelines for minimizing entrainment and impingement of aquatic organisms at marine intakes in British Columbia. Canadian Manuscript Report of Fisheries and Aquatic Sciences. No. 2098 (1991)).

[176] *See id*.

[177] *Id*. at Appx. 2, p. 3.

EPA Response to PSNH Comment V.B.5

PSNH comments that EPA should allow it to test the biological effectiveness of CWW screens with a larger slot-width than 0.8 mm, specifically, slot-widths of 2.0 mm, 3.0 mm, and above. Nothing in the permit, however, prevents the Permittee from doing so. Part I.A.13.a.1 of the Draft Permit specified that the BTA for entrainment is a fine-mesh wedgewire screen intake system, defining "fine-mesh" as "a screen with a slot or mesh size no greater than 0.8 mm, *unless the permittee can demonstrate through a site-specific study that a larger slot size is equally or more effective for reducing entrainment mortality as a 0.8 mm slot or mesh size*." Draft Permit at 15 (emphasis added). The Draft Permit also provided 12 months for a pilot study, which includes testing various slot sizes and determining the optimal size for Schiller Station. *Id.* at 16-17. These provisions have been retained in the Final Permit unchanged. Thus, the permit does not restrict the Permittee from, and no additional authorization from EPA is required to allow, testing slot sizes of 2 or 3 mm (or greater) at Schiller Station.

PSNH additionally comments (in footnote 168) that the Fact Sheet (at 107) erroneously asserts that the 2008 Engineering Response stated that a "mesh size no greater than 1.0 mm is necessary to effectively screen most fish eggs and larvae" (citing AR-140 at 86), and that, rather than indicating that a slot size no greater than 1.0 mm would be needed to maximize entrainment reductions at Schiller Station, the 1.0 mm slot-width screens were simply the largest ones evaluated as part of that response. *See also* PSNH Comments, Exhibit 1, Appendix 1 at 3 ("This was not stated directly by ENERCON/Normandeau ... [and] EPA should examine the considerable new evidence obtained since 2008 … which support[s] effective performance at slot widths greater than 1.0 mm."). Yet, the 2008 Response (at 86) states the following:

> [f]irst, the slot size must be small enough to physically prevent the organisms from passing through the screen. Tables 6-19 through 6-30 in Attachment 6 assess the potential reduction in entrainment according to the slot size of the proposed wedgewire screens. Per Normandeau, the measurements of limiting dimensions of fish eggs, larvae and macrocrustacean larvae taken from published drawings were used to establish the relationship between slot opening and reduction in entrainment abundance based on the actual species composition and life stages of organisms observed to be present in sampling from Schiller Station. The slot sizes evaluated were 1, 0.8, 0.69, and 0.6 mm.

Thus, the 1.0 mm slot screen, the largest slot size evaluated, was not chosen randomly but was based on an evaluation of the limiting dimensions of fish eggs, larvae, and macrocrustacean larvae taken from the literature. At the time of the report, Normandeau considered physical exclusion as the primary mechanism by which CWW screens could prevent entrainment. EPA disagrees that the Fact Sheet misrepresented the 2008 Response. Rather, EPA fairly and reasonably responded to the analysis provided by PSNH's consultant suggesting that slot sizes of 0.8 mm or less would most effectively reduce entrainment based on physical exclusion.

That being said, Normandeau, in its 2016 comments on the Draft Permit, indicates that *new information* supports the idea that hydraulic bypass and larval avoidance also contribute to entrainment reductions and that these phenomena do not rely on screen slot size. EPA has carefully considered the new information on the potential effectiveness of different slot sizes submitted with PSNH's comments. In the text below, the Agency responds to this new information.

PSNH comments that allowing a pilot study of multiple slot widths will provide valuable data on the biological effectiveness of CWW screens in an estuarine environment, including whether larger slots are at least as effective as narrow-slot screens in a waterbody with swift sweeping flows due to the "newly discovered" hydraulic bypass and larval avoidance phenomena. As "proof" that larger slot screens can be equally effective at reducing entrainment, the comment references (at footnote 168), Enercon's analysis of CWW screens for the Indian Point Energy Center (IPEC) on the Hudson River (Exhibit 2 to PSNH's comments). PSNH did not, however, include Attachment 6 to Enercon's IPEC Evaluation, which is the analysis of biological effectiveness. Instead, the Enercon analysis only includes a summary of the estimated annual reduction in adult equivalent losses, which precludes any review sufficient to determine "proof." PSNH's comments include Normandeau's analysis of the biological effectiveness of CWW screens for Schiller Station, which, based on the timeframe and the summary provided is likely similar to the biological evaluation in the IPEC study, and in which Normandeau suggests that larger slot sizes may be effective to reduce entrainment at Schiller Station due to hydraulic bypass and larval avoidance. EPA reviews Normandeau's 2016 evaluation of the biological efficacy of wedgewire screens, including the potential for larval avoidance to increase entrainment reductions, below.

The Draft Permit proposes CWW screens with a maximum slot width of 0.8 mm based on the information available at the time and Normandeau's assessment of effectiveness in the 2008 Response. In its comments on the Draft Permit, PSNH includes a report by Normandeau titled "Potential Entrainment Reduction for Cylindrical Wedgewire Screens at Schiller Station, Incorporating a Length-based Wedgewire Avoidance Model" as Appendix 3 to Exhibit 1 (provided by Enercon). This report provides PSNH's updated assessment of the effectiveness of CWW intake screens since the 2008 Response was written and proposes new estimates for the potential effectiveness of various slot sizes at Schiller Station. The new estimates factor in not only physical exclusion, as the 2008 Response did, but also larval avoidance. The model used in this report takes into account evidence that larval fish can avoid entrainment by actively swimming away from the screens and/or through hydraulic bypass.

Laboratory and field evaluations of CWW screens since the late 1970's through as recently as 2012 suggest that, in addition to physical exclusion, CWW screens with slot sizes typically ranging from 1.0 to 3.0 mm may also reduce entrainment through some combination of hydraulic bypass and active larval avoidance. *See* review in AR-335 Chapter 5 (EPRI 2013). Various studies either report direct observations of larval fish escaping impingement and entrainment on narrow-slot wedgewire screens, or report observations of entrainment being reduced for larval fish at screens with slots wider than greatest body depths (*i.e.*, which arguably cannot be explained by physical exclusion alone). *See* AR-391 (Heuer and Tomljanovich 1978), AR-209 (EPRI 2003), AR-302 (EPRI 2005), AR-028 (EPRI 2006), AR-027 (Weisberg et al. 1987). The most recent studies, conducted by Alden Research Laboratory for Entergy's Indian Point Energy Center, suggest that the efficacy of CWW screens is likely related to the ambient current velocity and generally increases as ambient velocity increases. In addition, larval length is also an important factor in determining avoidance capability (longer larvae have greater avoidance capability). *See* AR-334 at 5-25 to 26 (EPRI 2013). More recently, research has focused on quantifying the contribution of hydraulic bypass and/or active swimming in terms of site-specific effectiveness. See AR-397 (Mattson et al. 2014). EPA notes that the maximum slot size for the laboratory and field evaluations cited in Normandeau's comments, with one exception, is 3.0 mm.

Normandeau uses quantitative results from striped bass tests performed by Heuer and Tomljanovich (1978) (AR-374) and EPRI (2003) (AR-209), and bay anchovy tests performed by Weisberg et al. (1987) (AR-027), to derive a wedgewire avoidance factor. It then uses this factor to estimate the potential effectiveness of CWW screens at Schiller Station taking into account not only physical exclusion but also hydraulic bypass and active swimming avoidance. Normandeau used 19 values derived from three studies of two species to fit a generalized exponential equation for estimating a wedgewire avoidance factor (P_a) as a function of length (L) applicable to all species in the Schiller Station analysis. This factor is defined as

$$P_a = 1 - e^{[-0.275(L-4)]}$$

The model used by Normandeau, however, is based on a relatively small body of research (most of which was performed in the early 1980s) and limited to two species (striped bass and bay anchovy), neither of which are entrained at Schiller Station. Normandeau also does not provide for EPA's review the calculations that support the avoidance factor for each of the three data sets. The majority of values (15 of 19) were derived from a single study of bay anchovy (Weisberg et al. 1987). EPA has not evaluated the model at length and has not sent follow-up requests for the underlying calculations, nor does EPA mean to imply that the model is necessarily deficient or otherwise inapplicable to Schiller Station, as EPA explains below. EPA only points out here that, while the commenter encourages EPA to evaluate and make decisions based on new information relevant to larval avoidance, Normandeau's model is based on a small subset of early studies and includes data for just two species not typically entrained by Schiller Station, even though additional species were also tested.

Under its most conservative assumption (based on physical exclusion only, with no larval avoidance), Normandeau estimates the reduction in the numbers of entrained fish eggs and larvae ranges from zero at a slot width of 2.0 mm or 3.0 mm to 97% at a slot width of 0.6 mm (see Table 1, below). Normandeau estimates that exclusion of eggs and larvae with 1.0 mm slot will result in a 15% entrainment reduction, which is only slightly higher than its estimate of 11.5% for the same slot size in the 2008 Response. One reason for the slight difference is that the 2016 estimates are based on actual intake flows from August 2012 through August 2015 whereas the 2008 Response estimates (in Table 6-19) were based on design flow.

Normandeau also estimates that early stages of macrocrustaceans (zoeae and megalops[32]) commonly entrained at Schiller Station have body length (zoeae) or depth (meglaops) between 1.0 and 2.0 mm (see Table 6-25 in 2008 Response). The relatively large size of macrocrustacean larvae, compared to the slot sizes evaluated in the 2008 Response (1.0 mm maximum) was largely why EPA and PSNH expected that CWW screens would eliminate entrainment of macrocrustaceans in the Fact Sheet.

Table 1. Estimated reduction in entrainment for various slot sizes based on physical exclusion (P_e) or exclusion plus active larval avoidance (P_a) expressed as percent reduction in entrainment of eggs and larvae (Raw) and as adult equivalent fish (AEQ). Values obtained from Tables 3 and 5 of Appendix 3to Exhibit 1 of PSNH's Comments.

% Reduction	0.6 mm	0.69 mm	0.8 mm	1.0 mm	2.0 mm	3.0 mm
P_e Raw	97	83	80	15	0	0
P_e AEQ	>99	98	96	92	0	0
P_a Raw	98	91	89	33	26	26
P_a AEQ	>99	99	98	95	78	78

Normandeau (at 17) states that the difference in predicted performance between 1.0 mm and 2.0 mm slot screens is because "almost no ichthyoplankton entrained at Schiller Station during the 2006-2007 study would be physically excluded by a 2.0 mm-slot width but most would be

[32] Zoeae is the planktonic larval stage of the crab species most commonly entrained at Schiller Station. Zoea metamorphose into the megalops stage (which has some swimming ability) before settling and developing into a juvenile crab.

excluded by a 1.0-mm slot width." EPA disagrees that "most" would be excluded with a 1.0 mm slot screen, as is evident from the Normandeau report's the estimate that, based solely on physical exclusion, about 85% of eggs and larvae will still be entrained with 1.0 mm slots. See Table 1, above. The statement appears to be based on the entrainment reduction expressed as equivalent adult values, where Normandeau estimates that 1.0 mm slot screens would result in a 92% reduction in entrainment of adult equivalent fish.

According to Normandeau, presenting estimates of CWW screen performance in terms of adult equivalents provides a consistent and biologically meaningful way to interpret counts of fish eggs, larvae, and juveniles entrained at power plants. However, as EPA has discussed in detail in Response to Comments V.B.1 and V.B.4, the statute requires that the permittee "minimize adverse environmental impact," which EPA has long interpreted to include the loss of all life stages of aquatic organisms through impingement and entrainment. Requiring a BTA to minimize entrainment, or, as directed by the Final Rule, selecting the technology that achieves the "maximum reduction in entrainment warranted" (40 C.F.R. § 125.98(f)) based solely on equivalent adult fish essentially discounts the mortality of millions of early life stages that contribute relatively less to the adult population than older life stages. This is particularly relevant to Schiller Station, where fish eggs make up more than half of the early life stages of fish entrained. In determining BTA, the permitting authority may consider entrainment reductions as adult equivalent fish, but should not also ignore the mortality of many millions of early life stage organisms. Just because most eggs and larvae do not directly add to the adult population does not mean that these individuals do not play an important role in the ecosystem or that killing hundreds of millions of individuals should be allowed when technologies to minimize these losses, as directed by the CWA, are available.

Normandeau provides a new estimate of the effectiveness of CWW screens at slot sizes up to 3.0 mm that incorporates estimates of avoidance via hydraulic bypass and active swimming, which may enable larvae to avoid entrainment even at slot sizes where they would be entrained based solely on physical exclusion. Normandeau estimates that, if larval avoidance is accounted for using a length-based avoidance model (described above), entrainment reductions would range from 26% at a slot width of 2.0 mm or 3.0 mm to 98% at a slot width of 0.6 mm (See Table 1, above). Normandeau's model assumes that the slot width of a narrow-slot CWW screen does not have a significant influence on avoidance for the range of slot widths tested (*e.g.*, there is no difference in effectiveness of 2.0 mm or 3.0 mm CWW screens). This is not surprising because the model, which was based on studies with a range of slot sizes from 1.0 to 3.0 mm, assumes that larvae of a certain size will avoid entrainment even where the slot size is greater than the greatest body depth, regardless of the slot size of the screen (see equation for P_a above). While Normandeau and PSNH further suggest that one could extrapolate to slot widths greater than 3.0 mm (*e.g.*, 6.0 mm or 9.0 mm) with no change in effectiveness, even Normandeau (p. 19) acknowledges that there is little empirical evidence to support this assertion.

Incorporating information about larval avoidance when assessing the effectiveness of screens at Schiller Station results in relatively little change for the smallest slot size evaluated (0.6 mm) and improves effectiveness for 0.69 mm and 0.8 mm screens by less than 10%, because these slot sizes already exclude many of the organisms entrained (Table 1). At Schiller Station, larval American sand lance, cunner, fourbeard rockling, and rainbow smelt have body depths less than

1.0 mm, which is why CWW screens with slot sizes of 1.0 mm are not predicted to be very effective for these individuals based only on physical exclusion. However, even assuming larval avoidance increases as a function of larval length (as in Normandeau's model), slot sizes of 1.0 mm or more will only result in a 26% to 33% predicted reduction in entrainment of eggs and larvae, as compared to an 89% reduction with 0.8 mm slot screens. In other words, slot sizes of 1.0 mm or greater are expected to reduce entrainment far less than even the 0.8 mm screens. This is because 1.0 mm screens are not expected to exclude many organisms and because larger larvae, which have the highest probability of larval avoidance, account for proportionally less entrainment at Schiller Station.[33] In addition, eggs comprise nearly 58% of the annual entrainment at Schiller Station (based on 2006-2007 entrainment study). Of the eggs entrained at Schiller Station, only Atlantic mackerel eggs are likely to be 1.0 mm or greater in diameter. Because eggs behave as passive particles and have no ability to actively avoid the screens, entrainment reductions for eggs are estimated solely due to physical exclusion. Hydraulic bypass may also assist in the reduction of egg entrainment to the extent that eggs avoid encountering the screens due to the mechanics of flow around the screens, but Normandeau's model only incorporates avoidance, including bypass, for larvae, not for eggs.

If the entrainment reductions factoring in larval avoidance are presented as adult equivalent fish, the effectiveness of the larger slot sizes dramatically increases because the group of organisms with the highest wedgewire avoidance factor (*i.e.*, larger larvae) is the same group that contributes proportionally more to the adult population in the adult equivalent modeling approach. Normandeau estimates that a slot width of 1.0 mm will reduce equivalent adult losses by 95% due to the combination of physical exclusion and the wedgewire avoidance factor, while a slot size of 2.0 mm or greater is expected to reduce equivalent adult losses by 78%. As described above and in other responses to comments herein, in EPA's view, the determination of the BTA may include consideration of entrainment reductions as adult equivalent fish, but should not ignore the mortality of many millions of early life stages.

In summary, EPA agrees with Normandeau that the body of research on CWW screens indicates that their performance is likely achieved through a combination of physical exclusion of organisms that are too large to fit through narrow slot widths, hydraulic bypass, and active larval swimming. The length-based wedgewire model proposed by Normandeau suggests that reductions in entrainment of larvae may be achieved at slot sizes of 1.0 mm or more, though EPA has questions and concerns about the underlying assumptions of the model and its application to Schiller Station, as noted above. Still, even the proposed model suggests that, due to the collection of life stages, species, and sizes entrained at Schiller Station, the smaller slot screens are likely to be substantially more effective to minimize entrainment. In any case, the results of the pilot study required by the Final Permit, which authorizes the permittee to test larger slot sizes, will ultimately determine the slot size that best minimizes entrainment at this location.

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[33] Figure 3-1 and Table 3-7 in the 2008 Biological Report (AR-136) is a length frequency distribution for larval fish enumerated in entrainment samples during the 2006-2007 study. Over 65% of larval fish entrained were less than 10 mm, 45% were less than 6 mm, and nearly 17% were 4 mm or less. Normandeau's model (at 15) defines avoidance for larvae as a function of length, with avoidance for individuals ≤ 4 mm equal to zero and nearly doubling between 6 mm and 10 mm lengths. In other words, avoidance increases substantially for larvae larger than 10 mm, which account for less than 35% of entrainment at Schiller Station.

In addition to maximizing effectiveness of the screens for entrainment, an appropriate design (including slot size) must ensure proper operation of the screens. PSNH comments that there is limited experience using fine-mesh CWW screens in estuarine and marine environments and that screen fouling, particularly by calcareous algae, may be an issue, particularly for screens with smaller slot sizes (*e.g.*, 0.8 mm or less). In the Fact Sheet, EPA also recognized the potential for clogging of wedgewire screens, but also discussed several measures to address it that the comment either does not consider or concedes may be successful. *See* Fact Sheet at 108, 115. The pressurized air burst system, which is required by the Final Permit, is designed to assist in preventing algae and other colonizing organisms from growing on the screens. *See* Fact Sheet at 168. In addition, there have been successful pilot tests and installations of CWW screens in salt water environments and anti-fouling coatings have proven effective at minimizing growth on the screens.[34] One goal of the pilot study at Schiller Station should be to determine the optimal screen material, slot size, and use of the pressurized air burst system to reduce the potential for biofouling. *See also* Fact Sheet at 167, 169. The controlled use of biocides and periodic manual cleaning of the screens also may be required as part of the facility's operation and maintenance program. Fact Sheet at 108, 115. PSNH's review of narrow-slot wedgewire screens also recommended all of these measures to minimize and otherwise address biofouling of fine-mesh CWW screens. S*ee* PSNH 2008 Engineering Response (AR-140) at 87-90 [35]; Fact Sheet at 109-10. EPA agreed these measures would be reasonable and, therefore, included them in the Draft Permit and has retained them in the Final Permit.

Finally, as per PSNH's request, the Final Permit allows the use of an emergency intake to provide cooling water in the event of an operational failure of the wedgewire screens, such as if biofouling of the screens prevented the facility from getting an adequate volume of water through the screens for cooling purposes and continued use of the screens would result in loss of life, personal injury, or severe property damage. Where catastrophic biofouling is likely to cause the screens to fail and result in damage to the cooling system, the Final Permit will allow PSNH to use an emergency intake system as outlined in Part I.A.11.a.4 of the Final Permit. This provision also requires that the permittee notify EPA within twenty-four hours of beginning to

[34] As the comment recognizes, different screen materials "have been used to successfully limit biofouling." *See also* PSNH 2014 Engineering Response (AR-227) (discussing copper-nickel alloy "shown to substantially reduce bio-fouling"); PSNH 2008 Engineering Response (AR-140) at 89 ("The most effective method to address this [bio-fouling] problem would be prevention through either (1) the regular application/injection of biocides, or (2) screen material selection."). In Appendix 2 to Exhibit 1 of PSNH's comments (at 7-8), Enercon provides examples of wedgewire screen installations on the Hudson and East Rivers in New York. A 2016 saltwater biofouling study for the West Basin Municipal Water District in Southern California found that 2-mm wedgewire screen samples made of copper-nickel alloys or utilizing an antifouling coating successfully prevented fouling as compared to uncoated stainless samples after one year of exposure. *See* AR-413. As this study points out, one tradeoff of specialized alloys is that they tend to corrode more quickly than stainless steel.

[35] *See also* PSNH 2008 Engineering Response (AR-140) at 90 (recommending "a one year pilot study" to evaluate multiple alloys "to assess the bio-fouling rates and bio-fouling resistance of the equipment, [which] would allow the Station to assess the proper material and design of the equipment"). The West Basin study observed that specialized alloys tend to corrode more quickly than stainless steel. *See* AR-413. The pilot study for Schiller Station should include an evaluation of the trade-offs between corrosion and fouling as well as the balance between a slot size small enough to minimize entrainment but which will not become fouled to the extent that frequent operational failure and bypass would occur.

use the emergency intake. In addition, the permittee must take steps to correct the problem that necessitated use of the emergency intake and to resume full operation of the wedgewire screens as soon as possible. See Response to Comment V.B.7 for further discussion of the emergency intake provision.

PSNH Comment V.B.6 The Draft Permit's June Outage Requirement for Unit 5 is Arbitrary and Capricious

Scheduling an annual outage in June for Unit 5 is not feasible. PSNH previously communicated this fact to Region 1 and the agency expressly acknowledged it in its Fact Sheet. [178] Including such a requirement as part of the § 316(b) BTA determination at Schiller Station is therefore arbitrary and capricious, especially since Region 1 does not even dispute the fact that "power pool demands preclude scheduled outages during peak seasons (i.e. high use winter and summer months[)]."[179] Even if it were possible, such a requirement is not necessary given the aforementioned comments, which clearly establish that the installation of modified traveling water screens with upgraded fish return systems satisfies the CWA § 316(b) BTA requirements for the CWISs at Schiller Station. Proposing to require a June annual outage is also not economical and/or cost effective inasmuch as it will cost PSNH's customers thousands of dollars due to incremental energy costs and may not lead to any net environmental benefit given that Region 1 failed to even consider, much less evaluate, the fact that replacement power will need to be provided to the grid and may very well be provided by a facility with a rate of impingement and/or entrainment that far exceeds that of Schiller Station.

Unit 5 at Schiller Station was repowered to a biomass unit in 2006. Since this conversion, the unit has been in operation nearly all the time, which means that it operates at or near full capacity, year-round. The only periods during which it typically will not operate are during times when the unit is on an annual, planned maintenance outage or a forced outage attributable to some mechanical and/or operational issue. The annual planned outage for Unit 5 at Schiller Station takes place each year during the month of April. This outage period was not chosen at random. Instead, the outage is scheduled during this month to coincide with the expected reduction in available clean wood-chip fuel due to what is commonly referred to as "mud season" within the region.

Recall that PSNH obtains the overwhelming majority of its wood for fuel from sources within 50 miles of Schiller Station. This is economically prudent for the company and has the additional benefit of sustaining 150-200 local, forestry-related jobs. It is therefore critical that a controlled and managed procurement plan be maintained at all times during the year to assure that the approximate 500,000 tons of wood required can be timely and economically delivered to the facility since Unit 5 is totally dependent on freshly-forested green wood chips for the fuel supply. Mud season occurs in April when spring thaws begin causing subsurface land to thaw and become soft due to the melted ice in the soil. This natural, annual process creates incredibly soft conditions. These conditions preclude trucks, chippers, and other heavy forest clearing equipment from safe and reliable access to forest floors. Due to these realities, the entire area from which wood is procured within the region is subject to logging restrictions, posted road load limits, and inaccessibility to certain work areas during the mud season. Significant damage to forestry lands that can occur and be extreme is avoided due to the aforementioned access limitations. Precluded access also prevents equipment from continually becoming stuck with resultant uneconomic harvesting and unsafe condition risks. Without the established strategy of bringing Unit 5 offline in April to coincide with the mud season and corresponding reductions in wood chip availability within the region, the unit would be in high risk of running out of fuel, causing PSNH's customers to lose possibly tens of thousands of Renewable Energy Certificate ("REC") revenue dollars each and every day. [180]

Even setting aside the April mud season issues, an annual June outage for Unit 5 is not possible because the timing of annual overhauls must be scheduled and approved by the New England Independent Systems Operator ("ISO-NE") to avoid exposure to potential penalties and the organization has historically been very reluctant to approve in advance any planned outages between June and September because this timeframe is the expected high summer peak demand period. Specifically, to comply with the requirements of its Operating Procedure No. 5, ISO-NE typically denies any request for a planned outage within this window of time of high energy demand to ensure capacity and operating reserve requirements will be met under expected and/or worst-case scenarios. ISO-NE will entertain requests for "short term" outages approximately two weeks in advance of the requested outage just before and during the annual June to September window. This is due to the fact that the load forecast upon which ISO-NE relies to make outage determinations is more realistic and can better reflect and/or anticipate what capacity and reserve requirements will be needed 14 days in advance, as opposed to months and/or years in advance.

Annually relying upon approval for a short term outage two weeks before the actual outage will take place is not an acceptable or economic method for PSNH to plan for work to be completed during the outage. The company would be unable to schedule and/or secure critically skilled and capable vendors, materials, and man-power within that two-week timeframe and could not make arrangements for the work beyond this two-week lead time due to the fact that it would not yet know whether a short term outage would actually occur until it is approved by ISO-NE.

Furthermore, if a generator like PSNH attempted to schedule an outage between June and September without first obtaining ISO-NE approval, the generator would be at risk of incurring extremely high penalties should a "shortage event" occur. Shortage events occur on the ISO-NE system due to operating constraints which result in a shortage of operating reserves for thirty minutes or more, and there is a much higher likelihood of shortage events occurring during this calendar period. For instance, the current minimum penalty when a unit is unavailable during a "shortage event" is five percent of its "annualized" monthly capacity revenue, with increasing penalties for events that last longer than five hours. For Unit 5 at Schiller Station, the Capacity Supply Obligation ("CSO")—which is the amount of energy the unit is obligated to be able to provide, the ability for which it is paid on a monthly basis—is 43.1 MW or 43,100 KW. Assuming a rate of $3.434/KW-month, the current "annualized" monthly capacity revenue for Unit 5 is $1.8 million. [181] Therefore, the minimum penalty for each "shortage event" that occurred during a full outage at Schiller Station that was not approved by ISO-NE would be $90,000.[182] PSNH's customers would ultimately carry the financial burden of these penalties.

The "Pay-for-performance" program (a new paradigm of revised FCM rules) is also set to begin in June 2018. The implementation of this program means the introduction of "scarcity events," which will replace the aforementioned "shortage events" and associated penalties. The fines associated with penalties that occur during these "scarcity events" are more severe and PSNH's exposure to potential penalties would therefore be greater if the company were to annually schedule a June outage at Unit 5 during a peak period. Based on a historical review of ISO-NE provided data from October, 2006 thru September, 2015 a scarcity event is more than three times as likely to occur in June as it is in April. A "scarcity event" is defined similar to a "shortage event" in that it represents a shortage of operating reserves, but the thirty-minute minimum becomes a five-minute minimum, meaning scarcity events will occur with greater regularity, as well. Based on the same historical review of ISO-NE data from October, 2006 thru September, 2015 scarcity events would have occurred 189 times, compared to 64 times for shortage events. Under the new "pay-for-performance" program, units will need to be online or providing reserves, rather than simply being available, in order to avoid penalties. The penalty rate for those units not online or providing reserves during a scarcity event will be $2,000/MWH. So, for a 3-hour "scarcity event" that occurs on a peak day when Unit 5 at Schiller Station is not available due to an unapproved outage, PSNH would be subject to a $258,600 penalty. The $2,000/MWH penalty rate increases to $3,500/MWH in 2021.

And, the likely financial impacts do not end there. Energy market prices have historically been higher in June as compared to April because customer usage and therefore energy prices are higher. It is because of this higher demand that ISO-NE will not provide advance approval within this summer timeframe (June to September). For every $1/MWh that the cost of energy is higher in June than in April, PSNH's customers would lose the benefit of $1,000 per day in revenue by moving its existing annual April outage to June (43.1 MW x 24 Hrs. x $1/MWh). Thus, if the energy market cost averages $5/MWh per day higher in June for a typical 21-day outage, PSNH's customers would lose over $100,000 in cost benefit (43.1 MW x 24 Hrs. x 21 Days x $5/MWh).

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[178] *See* AR-140 at 100–01; Fact Sheet at 133

[179] Fact Sheet at 133.

[180] An annual outage in June, coupled with an inability to work in April due to the mud season, could also place greater economic hardship on local wood suppliers that depend upon the operation of Unit 5 at Schiller Station to buoy consumer demand.

[181] 43,100 KW x $3.434/KW-month x 12 = $1.8 million.

[182] $1.8 million x 5% = $90,000. This penalty or take-back of CSO revenues is justified because a unit does not meet its "obligation

EPA Response to PSNH Comment V.B.6

In the Draft Permit, EPA proposed shifting the annual outage for Unit 5 from April to June as a component of BTA in order to achieve greater reductions in entrainment. PSNH and Enercon commented that the required shift in the Unit 5 outage is at odds with the seasonal cycle of fuel accessibility and would result in steep economic impacts on Schiller Station and on its customers. PSNH also comments that it previously communicated that scheduling an annual outage in June for Unit 5 is not feasible and that the agency expressly acknowledged this in its Fact Sheet.

PSNH"s 2008 Engineering Response stated that Schiller Station would be penalized if a peak season outage were allowed by ISO New England, and that the benefits of shifting the outage timing would be minimal, but it did not state that such a shift would be infeasible. *See* AR-140 at

106-09. EPA notes that PSNH also did not provide any information about the magnitude of any penalties that it might incur for scheduling its annual outage during peak season. *Id*. The Fact Sheet states that because a 3-to 4-week outage would not cover the entire period when fish eggs and larvae are present in the source water, and would not address impingement for the other 11 months of the year, scheduled outages alone is not the BTA under CWA § 316(b) at Schiller Station. Fact Sheet at 133. Nevertheless, EPA also indicated that scheduling outages to reduce entrainment during peak spawning periods could be a component of the overall BTA for the facility in combination with other measures. *Id*.

EPA disagrees with the comment that shifting the seasonal outage to correspond with peak entrainment is not necessary because installing modified traveling water screens with an upgraded fish return system satisfies the CWA § 316(b) BTA requirements for the CWISs at Schiller Station. For the reasons described in the Fact Sheet and the response to Comment V.B.2 presented above, EPA concludes that entrainment at Schiller Station constitutes an adverse environmental impact on the Piscataqua River and that additional entrainment controls are necessary and warranted to minimize that impact consistent with the BTA standard of CWA § 316(b) and the 2014 CWA § 316(b) Final Rule. That being said, EPA has reconsidered the Draft Permit's proposed seasonal outage requirement in light of other issues raised in the comment.

Schiller Station schedules 3-to-4-week maintenance outages for Units 4 and 6 every 18 months, and for Unit 5 every year. At Schiller Station, on-site wood storage holds about fourteen days of inventory, while the typical maintenance outage lasts about 21 days.[36] PSNH comments that the annual planned outage for Unit 5 at Schiller Station, which typically takes place during the month of April, coincides with the expected reduction in available clean wood-chip fuel due to "mud season" within the region, a time in the early spring when snows melt and frost in the ground thaws, making roads, trails, and forest soils more susceptible to compaction and damage by heavy equipment and vehicle use. According to PSNH, the local area from which wood is procured is subject to logging restrictions, posted road load limits, and inaccessibility to certain work areas during the mud season. PSNH indicates that logging during the mud season is neither economical nor safe and can result in equipment becoming stuck and/or could cause damage to forest lands. The 2004 Best Management Practices for Erosion Control on Timber Harvesting Operations in New Hampshire recommends restricting vehicle traffic on soft roads during Spring and Fall mud seasons. *See* AR-403 at 16. Logging during mud season could also damage forest habitat and negatively impact resident organisms.

During development of the Draft Permit, PSNH did not provide this information explaining why the outage at Unit 5 typically occurs in April. The permittee has, however, provided this information now in its comments on the Draft Permit. EPA has considered this comment and is persuaded that there are practical and ecological benefits to maintaining a spring outage for wood-burning Unit 5.

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36 R.E. Peltier. 2007. PSNH's Northern Wood Power Project repowers coal-fired plant with new fluidized bed combustor. Power Magazine. August 15, 2007. http://www.powermag.com/psnhs-northern-wood-power-project-repowers-coal-fired-plant-with-new-fluidized-bed-combustor/?pagenum=1

Entrainment data from 2006 and 2007 indicate that the highest density of eggs and larvae occurs in June. EPA compared the number of eggs and larvae lost to entrainment in April and June and determined that shifting the outage to June would result in a 4% reduction in fish entrainment (over 11 million fewer fish eggs and larvae entrained) and 7% reduction in macrocrustacean entrainment (91 million fewer macrocrustacean larvae entrained). *See* Fact Sheet at 134. At the time of the Draft Permit, EPA was not aware of the constraints on scheduling a regular June outage that are presented in PSNH's comment. Therefore, EPA concluded that the biological benefits of shifting the outage to June warranted making it part of the BTA.

Given the new information about the practical and ecological reasons for scheduling the Unit 5 outage during the spring mud season, however, EPA has changed its conclusion. While a June outage has the important potential benefit of a 4% reduction in entrainment of fish eggs and larvae, substituting a June outage for the current April outage could also lead to negative ecological impacts by prompting additional logging during mud season. Such additional logging during mud season could also lead to logistical problems and hazardous conditions for workers. At the same time, PSNH indicates that it could incur significant penalties if it is unable to supply electricity during June. In addition, biological benefits also accrue to aquatic ecosystems from scheduling the outage during April. While the Fact Sheet correctly concludes that June is the single month with the highest density of early life stages – more than 96% of organisms entrained in June were cunner/yellowtail flounder eggs or Atlantic mackerel eggs – in April, more than 76% of the total density is post-yolk sac larvae (PYSL). While less numerous than eggs, PYSL can contribute significantly to the local population because PYSL are more likely than eggs to survive to adulthood. Rock gunnel and grubby PYSL are present in the highest densities in April. March experiences higher densities of PYSL than April, particularly for American sand lance, which is an important forage species. PSNH, in its 2008 Engineering Response, estimated that shifting the outage to March could reduce entrainment of fish eggs and larvae by 2.2%, resulting in a 24% entrainment reduction measured as adult equivalents. *See* AR-136 at 72-3 and Appendix B. PSNH currently schedules rotating maintenance outages for Units 4 and 6 during the spring and fall. *See* AR-140 at 106. A spring outage for either Unit during March, which falls between the higher use winter and summer periods, would likely provide biological benefits in addition to operation of the wedgewire screens. Moreover, Units 4 and 6 are not biomass units and, therefore, any outages thereof need not necessarily coincide with mud season. Maintenance outages are scheduled in advance and are subject to ISO New England approval. Therefore, the spring maintenance outages for Units 4 and 6 could be scheduled during the month of March. However, given that Units 4 and 6 run inconsistently and at low capacity during spring, the Final Permit does not specify that the outages be scheduled during any particular month. *See* Response to Sierra Club Comment IV.B.3.

After weighing the potential reductions in entrainment from shifting the outage from April to June against the ecological benefits of maintaining the outage during mud season, EPA has determined that the BTA for Schiller Station should not include a requirement to schedule the regular maintenance outage for Unit 5 outage in June. *See* 40 C.F.R. § 125.98(f). In addition to the practical and ecological reasons for scheduling the Unit 5 outage during mud season, there are biological benefits gained from the reduction in entrainment of PYSL stages of grubby, rock gunnel, and American sand lance during spring outages. *See* AR-140 at 107-09. The Final Permit at Part I.A.11.a has been changed to eliminate the requirement to schedule the annual Unit 5 outage during June.

PSNH Comment V.B.7 An Emergency Bypass for the Fine-Mesh CWW Screens is Imperative If PSNH is Ultimately Compelled to Install the Technology at Schiller Station

On page 115 of the Fact Sheet, Region 1 expresses its doubt regarding the need for an emergency bypass mechanism for the fine-mesh CWW screens it seeks to impose upon Schiller Station but "welcomes comment and more information on this design feature." [183] For the reasons articulated above, the installation of fine-mesh CWW screens at Schiller Station is unwarranted. Should Region 1 erroneously disagree with PSNH on this issue, the company must be allowed to install and operate as necessary an emergency bypass mechanism in the event of a significant blockage or damage to the fine-mesh CWW screens installed at Schiller Station. A bypass feature of this kind is consistent with sound engineering practices and, when put in use, would protect and prevent harm to valuable infrastructure at the facility by providing the necessary flow of water to cool plant processes, which sustains on-line operations and reduces risks of large equipment thermal transients, incremental wear and damage, and other adverse conditions. [184] Conversely, eliminating the bypass feature would result in added direct costs and reduced reliability at Schiller Station—both of which negatively impact customer benefits—because the aforementioned conditions would occur more frequently than if a bypass feature were installed for the CWW technology. [185]

Enercon and Normandeau have outlined additional bases for why an emergency bypass mechanism for fine-mesh CWW screens would be necessary at Schiller Station:

> The primary reason that the bypass system was included is to ensure that a continuous supply of cooling water is always available to the Station. The expected frequency of a clogging event is unknown until a pilot study is conducted, and clogging of the CWWSs would serve to reduce the water level within the screen houses. At a certain point, the pumps would become damaged due to air intrusion and vortex formation unless the pumps were tripped or another source of water was made available (i.e., the bypass system). The tripping of the pumps would result in the tripping of the Station. This would result in lost generating capacity for the Station and loss of cooling to equipment within the plant. As discussed in Appendix 2, bypass systems are common and have been installed at other power plants to ensure operational reliability. The continuous supply of cooling water helps maintain power generation, but is also critical for maintaining the safety and reliability of plant equipment, as will be discussed below.
>
> In addition to loss of cooling to the condenser for power generation, as discussed in the 2008 Response there are other pumps and systems that support equipment cooling for the Station. Unit 4 contains one salt water cooling pump, which provides water to the salt water heat exchangers. For Units 5 and 6, the circulating water pumps provide water to the salt water heat exchangers, which provide equipment cooling to the plant. The interruption of cooling water to these systems would create a sudden loss of cooling, which in turn could create a transient or thermal shock to the salt water heat exchangers.

> The Tubular Exchanger Manufacturer's Association (TEMA) is the governing authority on heat exchanger design and construction in the industry. The "Standards of the Tubular Exchanger Manufacturers Association" (TEMA Standards) are utilized throughout the industry as a guide to size, design, operate, and maintain heat exchangers. Paragraph E-3 titled "Operation of Heat Exchangers" provides guidelines for operating heat exchangers in a way that ensures safety and reliability. Paragraph E-3.23 states "Exchangers normally should not be subjected to abrupt temperature fluctuations." Paragraph E-4 is titled "Maintenance of Heat Exchangers" and provides guidelines for maintaining acceptable operation of the heat exchangers. Paragraph E-4.1 states that "neglect in keeping the tubes clean may result in complete stoppage of flow through some tubes which could cause severe thermal strains, leaking tube joints, or structural damage to other components." While clogging of the heat exchangers is not of concern with regard to the bypass system, the resulting thermal strain and/or thermal shock that may occur due to abrupt interruption of flow may result in similar consequences. Therefore, given that the salt water heat exchangers were not originally designed for regular/frequent transients, they should be avoided and a continuous supply of cooling water should be made available to the salt water heat exchangers. If CWWSs were to be installed at the Station, the most effective way to ensure a continuous supply of cooling water would be to install a bypass system as described in the 2014 report. [186]

An inability to bypass clogged and/or damaged fine-mesh CWW screens at Schiller Station will have a sizeable economic impact on PSNH and its customers, as well. Unit 5 at Schiller Station qualifies to sell RECs in Massachusetts, Connecticut, Rhode Island, and New Hampshire due to its biomass fuel, boiler design and very low emissions profile. These markets provide a revenue stream to PSNH and, in turn, its customers. One REC is created whenever one megawatt hour of energy is generated. Thus, reductions in energy production due to load drops or outages cause additional loss of this very valuable revenue stream.

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[183] Fact Sheet at 115.

[184] Installation of a bypass feature is also prudent due to the greater likelihood of damage or destruction to any CWW screens installed for Schiller Station compared to other CWA § 316(b) technological options due to the fact that the CWW screens would be installed offshore within the volatile Piscataqua River. Notably, emergency bypass features have been implemented at the Oak Creek Power Plant in Milwaukee, Wisconsin, and the IBM facility in Poughkeepsie, New York, due to these and other concerns. *See* 2016 Enercon-Normandeau Comments at 7, 9.

[185] The Unit 5 boiler has a fluidized bed type design which, when cycled on load or cycled off line, has a propensity to incur incremental fouling. More load fluctuations and/or forced outages necessarily means the boiler will need to be brought offline more frequently to clean plugged equipment. Thermal transients due to load drops and off-line cycling create this pluggage, which when bad enough, can cause an expansive, 5-6 day forced outage.

[186] *See* 2016 Enercon-Normandeau Comments at 32-33 (references omitted).

EPA Response to PSNH Comment V.B.7

As the comment indicates, EPA invited comment on the need for emergency intake capability for the wedgewire screen installation at Schiller Station due to the potential for fouling and clogging. *See* Fact Sheet at 115. In its comments, PSNH, with supplemental information from Enercon, provides analysis of the potential consequences to the Station should the CWW screens become fouled or clogged to the point of inoperability.

As discussed in Response to PSNH Comment V.B.5, wedgewire screens with narrow slot sizes potentially achieve greater reductions in entrainment, particularly for the smaller, floating life stages, like eggs, which have no ability to swim away from the screens. As Enercon notes, finer mesh screens are also more likely to be susceptible to clogging, especially in marine environments prone to high algal growth and colonizing organisms. *See* Appendix 2 to Exhibit 1 of PSNH's comments at 11. *See also* AR-359 at 16-17. EPA has reviewed the comments by PSNH and Enercon and agrees that, given the risk that fouling and clogging could have serious negative consequences to the cooling water pumps, heat exchangers, and associated equipment, an emergency intake is a reasonable countermeasure to prevent the catastrophic loss of equipment in the event of a sudden, unanticipated blockage.

EPA is persuaded that incorporating an emergency intake into the design of the BTA for entrainment is justified given the risk that clogging could result in operational problems that lead to damaged equipment and render the plant inoperable. However, the emergency intake cannot take the place of proper operation and maintenance of the screens, including operation of the airburst system, visual inspections, and manual cleaning. *See* 40 C.F.R. § 122.41(e). In addition, the pilot study should investigate certain features designed to reduce the potential for clogging, such as selecting the optimal slot size, the use of antifouling coatings and biofouling-resistant alloys, and the potential for backwashing the screens. To allow additional flexibility to address operational issues related to icing or fouling, the prohibition on thermal backwash at Part I.A.16.d of the Draft Permit has been removed. EPA also continues to recommend the possible use of deflecting structures, such as debris-deflecting nose cones, to eliminate the risk associated with free-floating debris contacting and damaging the screens. Finally, the permittee can also investigate addressing these problems through screen redundancy, such as by using additional or larger screens.

As Enercon notes, the expected frequency of clogging events is unknown until the pilot study is conducted.[37] To this end, and at PSNH's request, the final compliance schedule includes additional time to design and procure equipment for the pilot study and to assess the results following its completion. *See* Response to PSNH Comment V.B.8.

PSNH and Enercon propose use of an emergency intake to prevent catastrophic damage to equipment, including cooling water pumps and heat exchangers, if an unanticipated blockage causes the water level in the intake structure bay of the screen house to approach a minimum level that would cause vortexing or air intrusion at the circulating water pumps. *See* AR-227 at 36-7. In other words, the emergency intake is intended to be used as a last resort (following proper design, operation, and maintenance) when, due to factors beyond the reasonable control of the permittee, continuing to withdraw cooling water through the wedgewire screens would result in loss of human life, personal injury, or severe property damage. The emergency intake is included as a safety feature of the wedgewire screen installation—the technology that, after consideration of the factors relevant to this determination, EPA concluded is the BTA for

[37] Recognizing the need to evaluate biofouling in its review of the issue as it pertains to wedgewire screens, Enercon states "consideration of CWWSs with small slot dimensions for CWIS application should include prototype scale studies to determine potential biological effectiveness and identify the ability to control clogging and fouling in a way that does not impact station operation." Appendix 2 to Exhibit 1 of PSNH's comments at 12.

entrainment—in that it reduces the risk of equipment damage due to blockages. When the emergency intake is in use, however, there will be no technology operating to reduce entrainment at the CWISs. For this reason, Part I.A.11.a.4 of the Final Permit requires the permittee to minimize use of the emergency intake system to the greatest extent possible. Further, it requires the permittee to notify EPA (within twenty-four hours of initiating any use of the emergency intake system) of the reason that the wedgewire screens were taken off-line and identify all actions taken or to be taken to address the cause, and minimize the use, of the emergency intake.

The Final Permit includes a condition that allows limited operation of an emergency intake and requires notification of the cause of its use and the steps being taken to address the issue and minimize use of the emergency intake. The Final Permit also requires that the permittee notify EPA within twenty-four hours of the resumption of full operation of the wedgewire screens. The notification requirements will enable EPA to evaluate the use of the emergency system and to revisit the permit conditions if frequent operation occurs.

PSNH Comment V.B.8 The Design, Permitting, and Construction Requirements of Region 1's Flawed BTA Determination Are Not Reasonable

CWW screens are not needed at Schiller Station for the reasons articulated in these comments. A schedule for their installation at the facility like the one Region 1 sets out in the Fact Sheet is therefore not necessary. If Region 1 erroneously includes such a requirement in the final permit for the facility, however, the schedule for the design, permitting, and construction of fine-mesh CWW screens at Schiller Station must also be revised. [187]

The proposed schedule set out in the Fact Sheet includes the following key deadlines:

> Pilot testing: Complete within 12 months of the effective date of the final permit.
>
> Permits and approvals: Commence the process of obtaining necessary permits and approvals within four (4) months of the completion of pilot testing and complete submission of all necessary permit applications and notices within eight (8) months from the commencement of the permitting process.
>
> Construction contract: Execute an engineering, procurement, and construction agreement with a contractor within 12 months of completion of the pilot testing.
>
> Site preparation: Complete within nine (9) months after obtaining all necessary permits and approvals.
>
> Commissioning of fine-mesh CWW screens: Complete installation, operational modifications, testing, startup, and commissioning of the technology for the CWISs of Units 4, 5, and 6 within 20 months of obtaining all necessary permits and approvals. [188]

PSNH takes issue with these proposed deadlines. Region 1's attempt to require PSNH to enter into any construction contract exceeds the scope of the agency's authority under the CWA and is illegal per se. The site preparation deadline is likewise improper. At most, Region 1 may set a deadline by which the company must have the CWIS technology in operation. How PSNH elects to ensure it will meet that deadline is left entirely to its discretion and the agency's attempt to insert itself in the managerial and/or operational functions of the company is inappropriate.

Separately, PSNH cannot and will not enter into any construction contract prior to obtaining all of the permits and approvals it will need to install the CWW screens at Schiller Station. It would be imprudent to do otherwise given the possibility that PSNH may ultimately not be able to obtain all of the necessary regulatory authorizations. Therefore, this deadline—if not deleted for the reasons articulated above—should be tied to the date on which PSNH obtains the necessary permits and approvals it needs to commence construction.

Other deadlines Region 1 has proposed are patently unreasonable or are tied to or triggered by events or occurrences that should be adjusted. The following is a schedule and timeline that is sensible and would be reasonable if PSNH is ultimately forced to install the entrainment technology at Schiller Station:

EVENT	TIME[189]
Permit Issuance	0 mo
Engineering for Pilot Testing: Time to consider design of system to be utilized for pilot testing and to select the equipment required	1 mo
Procurement for Pilot Testing: Time necessary to actually obtain and install the equipment required for the pilot testing.	5 mo
Pilot Testing: A complete 12-month time period within which to conduct the pilot testing of the parameters Region 1 has set out in its Fact Sheet.	18 mo
Data Analysis: Time to collect and analyze data generated from the pilot testing and develop conclusions based on said data.	20 mo
Pilot Test Report: Time to generate and provide written reports of findings to Region 1.	21 mo
Other Data Collection: Time to collection additional data Region 1 has delineated in the Fact Sheet, including but not limited to topographic and bathymetric surveys, geotechnical exploration, and other design and marine construction variables.	22 mo
Final Design Submission: Time to generate and provide a final design for the CWW screens at Schiller Station based on all data collected.	24 mo

These are the only dates Region 1 can definitively establish in the final permit for Schiller Station. The remainder of the deadlines must be tied to or triggered by Region 1's approval of the final design for the CWW screens at Schiller Station and the date on which PSNH obtains all of the necessary permits and approvals to construct the technology at the facility. Thus, the remainder of the schedule should be set out in the following manner:

EVENT	TIME
Permits and Approvals: Complete submission of all necessary permit applications and notices required to install the CWW screens at Schiller Station.	8 mo after Region 1

EVENT	TIME
	approves final design
Commissioning of fine-mesh CWW Screens: Complete installation, operational modifications, testing, start-up, and commissioning of the technology for the CWIS of Units 4, 5, and 6	20 mo after obtaining all necessary permits and approvals

The schedule PSNH has set out above is well-reasoned and includes the minimum amount of time the company would need to properly test, design, and install the new technology at Schiller Station. Thus, if Region 1 requires PSNH to install fine-mesh CWW screens at Schiller Station, the agency must substantially revise its proposed compliance schedule and craft one that is reasonable and will offer PSNH sufficient time to comply with the permit requirement.

[187] *See* Fact Sheet at 170-71.

[188] *See id.*

EPA Response to PSNH Comment V.B.8

First, EPA has reviewed the determination for the BTA in the Draft Permit in light of the comments received and maintains that controls to reduce entrainment are warranted at Schiller Station based on the numbers of organisms entrained, as well as the feasibility, costs, and benefits of the proposed technology. EPA concludes that the BTA for entrainment at Schiller Station is fine-mesh wedgewire screens. *See* Responses to PSNH Comments V.B.2 and V.B.5 above. Meeting the requirements of the Final Permit for Schiller Station will require certain improvements to the Facility's CWISs and time will be needed to plan and install the equipment needed to achieve compliance.

As the Fact Sheet explains, EPA has long understood that when new permit conditions require new equipment that will reasonably take some time to install, a compliance schedule of some kind will typically be appropriate to provide a clear, enforceable timeline for achieving permit compliance. *See* Fact Sheet at 169-170. 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. In that case, a compliance schedule can be included in an administrative compliance order or some other enforceable instrument.

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). In the past, EPA interpreted CWA § 316(b) to incorporate the compliance deadlines from CWA § 301(b)(2) and, as a result, any compliance schedule would have been handled outside an NPDES permit. *See, e.g.*, *Cronin v. Browner*, 898 F.Supp. 1,052 (S.D.N.Y. 1995); *EPA General Counsel's Opinion No. 41* (1976). *See also* EPA Region 1, "Responses to Comments, Public Review of Brayton Point Station NPDES Permit MA0003654"

(Oct. 3, 2003), p. I-6 (AR-183). However, in the 2014 CWA § 316(b) Final Rule, EPA revised its legal interpretation and has decided that because there is no stated compliance deadline within the "four corners" of CWA § 316(b), compliance with the BTA standard is due *as soon as practicable*. *See* 79 Fed. Reg. at 48,359. 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. at 48,433, 48,438; 40 C.F.R. §§ 125.94(b)(1) and (2) ("The [permitting authority] may establish interim compliance milestones in the permit."), 125.98(c).

In this case, the Draft Permit includes a proposed compliance schedule by which the permittee is to achieve compliance with the Final Permit's requirements under CWA § 316(b). PSNH provides comments on this schedule and proposes a modified schedule for installation of wedgewire screens. The Permittee's proposed schedule provides for an additional 6 months for design and procurement of the pilot study and an additional 2 months for preparation of results from the pilot study and submission of the final design. The pilot study, during which the permittee will evaluate the effectiveness of various slot sizes, including consideration of site-specific hydrodynamics, biofouling, and clogging, will inform the final design to optimize the use of the technology to reduce entrainment at Schiller Station. Allowing additional time during the design of the pilot study will allow the Permittee to work with its consultants and, if necessary, with EPA, to ensure that all factors that may influence the system's effectiveness are considered. Additional time to complete the final report will also allow the Permittee to alter the design based on any recommendations that EPA may provide. Given the importance of the pilot study to the final, site-specific installation, EPA concludes that the investment of the additional 8 months is justified to help produce the optimal design to reduce entrainment to the smallest amount reasonably possible for this site. The Final Permit also adds an additional 2 months for EPA's review of the pilot study demonstration and selection of slot size.

While accepting PSNH's proposed schedule, EPA disagrees with several aspects of the permittee's comment. According to the comment:

> [a]t most, Region 1 may set a deadline by which the company must have the CWIS technology in operation. How PSNH elects to ensure it will meet that deadline is left entirely to its discretion and the agency's attempt to insert itself in the managerial and/or operational functions of the company is inappropriate.

The comment provides no authority or explanation for this statement. The Clean Water Act defines "schedule of compliance" to mean "*a schedule of remedial measures* including an enforceable *sequence of actions or operations leading to compliance* with an effluent limitation, other limitation, prohibition, or standard." 33 U.S.C. § 1362(17) (emphases added). EPA regulations similarly define the term as "*a schedule of remedial measures* included in a 'permit,' including an enforceable *sequence of interim requirements* (for example, actions, operations, or milestone events) *leading to compliance* with the CWA and regulations." 40 C.F.R. § 122.2 (emphases added). Furthermore, pursuant to 40 C.F.R. § 122.47(a), a NPDES "permit may, when appropriate, specify a schedule of compliance leading to compliance with CWA and regulations." 40 C.F.R. § 122.47(a). The existence of § 122.47(a) and the statutory and regulatory definitions contradicts the notion that the only "deadline" that EPA is authorized to set is the date for final compliance. If that were true, there would be no need to define a "schedule for compliance" and 40 C.F.R. § 122.47(a) would simply not exist in its current form. Instead, 40 C.F.R. § 122.47(a) would likely only provide that EPA may set the time for final compliance.[38]

In addition, 40 C.F.R. § 122.47 further provides that EPA may set "interim" requirements and dates (*i.e.*, more than just the final requirement and date). *Id.* § 122.47(a)(3) (where "a permit establishes a schedule of compliance which exceeds 1 year from the date of permit issuance, the schedule shall set forth interim requirements and the dates for their achievement"). The regulation even requires EPA in certain instances to set not just interim requirements and dates, but also "dates for the submission of reports of progress *toward completion of the interim requirements*." *Id.* § 122.47(a)(3)(ii) (emphasis added). Finally, the regulation provides several examples of interim requirements that may be in a schedule of compliance, which "include: (a) Submit a complete Step 1 construction grant (for POTWs); (b) let a contract for construction of required facilities; (c) commence construction of required facilities; and (d) complete construction of required facilities." *Id.* § 122.47(a)(3) note.

The regulation stipulates that EPA may specify a schedule leading to compliance with the CWA and its implementing regulations, and neither restricts the steps that may be in the schedule nor limits the schedule to only a final deadline for compliance. The provision regarding interim requirements and dates is a particularly clear indication that the schedule may, and in some cases must, include steps towards compliance with the permit requirement and not just a "deadline by which the company must have the CWIS technology in operation." In addition, the note to 40 C.F.R. § 122.47(a)(3)(ii) quoted above plainly describes an example schedule in which a permittee must submit a construction grant, enter into a contract, commence construction, and complete installation of the technology. In short, the regulations contradict the comment that EPA may not establish a schedule including anything other than a deadline for the operation of the technology and that the schedule may not include a requirement to enter into a construction contract.

PSNH also comments that including requirements related to site preparation are improper. Site preparation is a necessary step towards installation of the technology and compliance with the requirements of the permit. As such, the inclusion of a milestone for site preparation, as with contract requirement milestones, in a schedule of compliance is neither improper nor outside EPA's authority under the CWA. In PSNH's proposed compliance schedule, the final compliance date (commissioning of fine-mesh wedgewire screens) is 20 months from the previous date (obtaining all necessary permits and approvals). Under 40 C.F.R. § 122.47(a)(3)(i), the time between interim compliance dates must not exceed one year. In other words, if both the contract and site preparation interim steps are eliminated, as the comment proposes, the

[38] Numerous specifics of these provisions also support EPA's reading. For instance, the word "sequence" in each definition reinforces that a schedule of compliance will include more than just the final date for compliance, because a "sequence" includes more than just one item, by definition. Further, the words "measures," "actions," "operations," and "events" in the definitions are plural, where under the commenter's theory, they would be singular or would not exist in the regulation at all. Furthermore, each of these provisions indicates that the sequence of requirements in a schedule will lead to compliance with the CWA and implementing regulations, whereas, under the theory presented in the comment, they would simply set a date for final compliance, not a path or series of milestones leading to compliance.

compliance schedule will not be consistent with the requirements at 40 C.F.R. § 122.47(a)(3)(i). As a result, in EPA's view, one or both of these interim steps must be included in the compliance schedule because more than 1 year elapses between compliance dates.

EPA acknowledges the complexities involved in installing and commissioning a new technology at this facility, particularly in a dynamic, valuable environment such as the Piscataqua River, and which will require authorizations from local, state, and federal agencies. The comment that the interim steps for contracting and site preparation should be tied back to obtaining necessary permits and approvals is reasonable and the compliance schedule at Part I.A.11.b of the Final Permit reflects this change. In addition, the compliance schedule offers additional flexibility to the Permittee by offering an alternative route to comply with the contract compliance deadline (*e.g.*, if a such an agreement is not necessary) and for the Permittee to determine the most appropriate steps to demonstrate compliance with the deadline to "complete site preparation." As such, EPA has retained both the contract and the site preparation interim steps but has changed the compliance deadlines to tie back to obtaining all necessary permits and approvals in Part I.A.11.b.3 of the Final Permit. The compliance schedule in the Final Permit has extended the final compliance deadline from 48 months to 54 months. As stated above, this relatively small extension in time is justified in order to ensure that the pilot study and subsequent wedgewire screen design will reduce entrainment to the smallest amount reasonably possible for this site.

PSNH Comment V.C Region 1's Proposed Regulation of Nonchemical Metal Cleaning Wastes is Arbitrary and Capricious and Ignores the Requirements of EPA's Final NELGs

Each unit at Schiller Station has historically, and continues to, treat NCMCWs as a low volume waste exempted from any iron and copper effluent limitations. This is true despite the fact that iron and copper limits apply to the outfall through which this wastewater discharges (Outfall 016: WWTP #2) in the current NPDES permit for the facility. As explained in detail below, the iron and copper effluent limitations applicable to Outfall 016 exist solely to detect chemical metal cleaning wastewater that is also routed to WWTP #2 due to the fact that such wastewaters may be retained within the treatment system for extended periods after the chemical cleaning is completed. NCMCWs should continue to be classified as a low volume waste in the new final permit for Schiller Station. Indeed, this continued classification is mandatory based on the historical permitting record for the facility, as well as the contents of Region 1's administrative record for this permit renewal proceeding.

Classifying and treating NCMCWs as a low volume waste exempt from any iron and copper effluent limitations, as Schiller Station does, is standard practice for most of the industry and is also consistent with long-standing EPA guidance set forth in what is commonly referred to as the "Jordan Memorandum." [190] Region 1 fails to reference the Jordan Memorandum even once in its 212-page Fact Sheet for the Draft Permit. Given that EPA (with input and assistance from Region 1) specifically determined only a few years ago that the Jordan Memorandum applies to NCMCWs generated at Schiller Station makes Region 1's failure to even mention the Jordan Memorandum in its Fact Sheet for the Draft Permit even more suspect. Region 1 has seemingly overlooked or chosen to ignore the aforementioned determination from the latest ELG rulemaking in this permit renewal proceeding. By doing so, Region 1 has ostensibly simplified its ultimate objective of saddling NCMCW discharges with iron and copper effluent limitations at the facility in the new final permit. This failure to adequately consider the historical permitting record at Schiller Station is arbitrary, capricious, and at odds with EPA's directives set out in the final NELGs.

Region 1's BAT analysis for determining iron and copper effluent limitations for NCMCWs in the Draft Permit is arbitrary and capricious, as well. Upon information and belief, the agency has no data of isolated NCMCW discharges generated at Schiller Station that would allow it to competently complete the required BAT determination. There is certainly no such data in the administrative record Region 1 has compiled for the Draft Permit. Moreover, EPA just recently declined to establish NCMCW effluent limitations for the entire industry due, at least in part, to the fact there has never been defensible data on the constituents found in NCMCW discharges that are representative of the industry or on the cost industry would incur if more stringent effluent limitations were established for this waste stream. Region 1's BAT analysis is further flawed inasmuch as it inadequately evaluates and grossly underestimates the significant costs and/or logistical problems that regulation of NCMCWs in this manner would present at Schiller Station. Section 304(b)(2)(B) of the CWA and EPA's own regulations require Region 1 to take these and other factors into consideration when adopting site-specific effluent limitations. Each of these issues is discussed in detail below.

[190] *See* Memorandum from J. William Jordan, Chemical Engineer, Permit Assistance & Evaluation Section, Office of Enforcement, EPA Headquarters, to Bruce P. Smith, Biologist, Enforcement Division, EPA Region III (June 17, 1975) ("Jordan Memorandum"). A copy of the Jordan Memorandum is attached hereto as Exhibit 3.

EPA Response to PSNH Comment V.C:

Each of these issues is addressed by EPA in the relevant, more detailed comments below.

PSNH Comment V.C.1 Relevant Legal Background

The effluent guidelines and standards for the steam electric industry are set out in 40 C.F.R. Part 423. They were promulgated in 1974, revised in 1982, and reasserted by the agency on November 3, 2015.[191] They contain BPT limits for the generically referenced "metal cleaning wastes," BAT and NSPS limits for "chemical metal cleaning wastes," and include a holding place for future BAT limits on NCMCWs. This "holding place" remains even after the promulgation of EPA's latest NELGs on November 3, 2015, within which the agency once again elected to "reserve" BAT for NCMCWs due to the fact that the agency:

> does not have sufficient information on the extent to which discharges of non-chemical metal cleaning wastes occur…the ways that industry manages their non-chemical metal cleaning wastes[,]…[the] potential best available technologies or best available demonstrated control technologies, or the potential costs to industry to comply with any new requirements. [192]

The term "metal cleaning waste" is defined as "any wastewater resulting from cleaning [with or without chemical cleaning compounds] any metal process equipment including, but not limited to, boiler tube cleaning, boiler fireside cleaning, and air preheater cleaning." [193] "Chemical metal cleaning waste" is defined as "any wastewater resulting from the cleaning of any metal process equipment with chemical compounds, including, but not limited to, boiler tube cleaning." [194] "Nonchemical metal cleaning waste" is not expressly defined in the regulations despite the fact that the term is used in 40 C.F.R. § 423.13(f). Nevertheless, the agency has repeatedly attempted to establish a working definition of NCMCWs based on a comparison of the two aforementioned terms defined in 40 C.F.R. Part 423: "any wastewater resulting from the cleaning of metal process equipment without using chemical cleaning compounds of any metal process equipment." [195]

The BPT limits for the generically defined "metal cleaning wastes" include iron and copper limits (1.0 mg/L) and TSS and oil and grease limits. [196] BAT limitations for "chemical metal cleaning wastes" are the same as the BPT iron and copper limits for "metal cleaning wastes" (i.e., 1.0 mg/L).[197] As mentioned above, there are no current BAT requirements for NCMCWs due to a lack of data regarding this waste stream. [198]

Impacting the application of these effluent limitations to the various "metal cleaning" waste streams generated by facilities within the industry is a June 17, 1975 document commonly referred to as the "Jordan Memorandum." [199] EPA used the Jordan Memorandum to clarify the limits for "metal cleaning wastes" applied only to <u>chemical</u> cleaning wastes, explaining that use of the term "metal cleaning wastes" in 40 C.F.R. Part 423 actually meant <u>chemical</u> cleaning wastes and does not include NCMCWs. [200] The memorandum was issued by Bill Jordan of the Permit Assistance & Evaluation Division of EPA Headquarters to Bruce P. Smith of Region 3's Enforcement Division in response to a May 21, 1975 letter from Mr. Smith, noting "some confusion as to what actually constitutes metal cleaning wastes" within the industry. [201] Mr. Smith specifically provided that he was "inclined to agree with…companies" that:

> effluent streams that result exclusively from water washing of ash found on boiler fireside, air preheater, etc. should be considered in the low volume or ash transport waste categories while effluent streams resulting from cleaning processes involving chemical solution (acid cleaning of boilers) should be considered in the metal cleaning waste source category. [202]

However, because of the perceived "ambigu[ity]" on this issue, Mr. Smith expressly requested that EPA Headquarters provide clarification as to what constitutes NCMCWs. Mr. Smith specifically suggested that "Headquarters should distinguish the type of cleaning that generates metal cleaning wastes and the <u>type of cleaning that generates low volume waste.</u>" [203]

The Jordan Memorandum explicitly addresses Mr. Smith's concerns. In it, Bill Jordan explains that NCMCWs constitute "low volume" wastes and are therefore not subject to effluent limitations for total copper and total iron in metal cleaning waste. Further, the Jordan Memorandum specifies that "[a]ll water washing operations are 'low volume' while any discharge from an operation involving chemical cleaning should be included in the metal cleaning category." [204]

Due to the Jordan Memorandum, iron and copper limits for "metal cleaning wastes" (meaning chemical metal cleaning wastes) were often included in permits within the industry between 1975 and 1980. At the same time, nonchemical metal cleaning wastes were classified as low volume wastes and not mentioned by name in many permits. This was to be expected, since "low volume waste" is a residual category for wastewater from all sources that do not have specific limitations. [205]

In proposed amendments to Part 423 published in 1980, EPA recognized that it "adopted a policy" as to the classification and treatment of NCMCWs by and through the Jordan Memorandum. [206] And, this "policy" from the Jordan Memorandum was reaffirmed in EPA's final 1982 NELGs. [207] While EPA originally proposed in 1980 to reject the Jordan Memorandum for facilities that had previously relied upon it by adopting a new definition that purportedly "[made] clear that the 'metal cleaning waste' definition" was meant to include NCMCWs, [208] the agency ultimately succumbed to its equitable concerns regarding the Jordan Memorandum in the 1982 final rule, recognizing that "many dischargers may have relied on [the Jordan Memorandum] guidance." Thus, EPA determined that "until the Agency promulgates new limitations and standards, the previous guidance policy may continue to be applied in those cases in which it was applied in the past." [209]

EPA likewise abstained once again from establishing BAT effluent limitations for NCMCWs in this 1982 rulemaking, acknowledging both that the data the agency had collected pertaining to NCMCWs "were too limited to make a final decision" and that it had not sufficiently examined either "the available data on waste characteristics of non-chemical metal cleaning wastes [or] the costs and economic impacts of controlling them." [210] Thus, the Jordan Memorandum remained in effect for facilities that had relied on it following EPA's 1982 rulemaking. [211]

The latest NELGs do nothing to change how NCMCWs are regulated at facilities within the industry. In its 2013 proposed rule, EPA set out yet again to establish BAT requirements for NCMCWs equal to previously established BPT limitations for "metal cleaning wastes" [212] while preserving the status quo for those facilities historically authorized to discharge NCMCWs as a low volume waste. [213] In the final NELGs, the agency preserved the status quo for those facilities that rely upon the Jordan Memorandum to discharge NCMCWs as a low volume waste. However, EPA elected to not establish BAT requirements for NCMCWs due to flawed and imprecise data. [214] The agency did, however, establish how NCMCWs are to be regulated within the industry going forward:

> By reserving limitations and standards for non-chemical metal cleaning waste in the final rule, the permitting authority must establish such requirements based on BPJ for any steam electric power plant discharged non-chemical metal cleaning wastes. As part of this determination, EPA expects that the permitting authority would examine the historical permitting record for the particular plant to determine how discharges of non-chemical metal cleaning waste had been permitted in the past, including whether such discharges had been treated as low volume waste sources or metal cleaning waste. [215]

And, in its Response to Comments document, the agency provided that "[b]y not revising the [NCMCW] effluent limitations and standards and not revising the definitions, the final rule will not result in changes to industry operations for the specified wastestream[]."[216] The only reasonable interpretation of the above-referenced statements from the agency's final rulemaking is that NCMCWs will continue to be classified as a low volume waste if they have been historically. This has been recognized as the generally accepted practice for the last 30+ years by all relevant parties (permit writers, regulated community, interested third parties, etc.), with the assistance of the Jordan Memorandum. Any other interpretation by Region 1 is arbitrary and capricious.

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[191] *See* 39 Fed. Reg. 36,186 (Oct. 8, 1974), amended 40 Fed. Reg. 23,987 (June 4, 1975); 47 Fed. Reg. 52,290 (Nov. 19, 1982), amended 48 Fed. Reg. 31,403 (July 8, 1983); 80 Fed. Reg. 67,838 (Nov. 3, 2015).

[192] 80 Fed. Reg.at 67,863.

[193] 40 C.F.R. § 423.11(d). (brackets included in original).

[194] *Id*. § 423.11(c).

[195] *See*, e.g., Fact Sheet at 37.

[196] *See* 40 C.F.R. § 423.12(b)(5).

[197] *See Id*. § 423.13(e).

[198] *See Id*. § 423.13(f).

[199] *See* generally Jordan Memorandum.

[200] *Id*. at 3.

[201] *See* Letter from Bruce P. Smith, Delmarva-D.C. Section, EPA Region III, to Mr. Bill Jordan, EPA Headquarters (May 21, 1975) at 5.

[202] *Id*.

[203] *Id*. (emphasis added).

[204] Jordan Memorandum at 1.

[205] *See* 40 C.F.R. § 423.11(b)).

[206] *See* 45 Fed. Reg. 68,328, 68,333 (Oct. 14, 1980) (noting that "EPA adopted a policy" in the Jordan Memorandum).

[207] 47 Fed. Reg. 52,290 (Nov. 19, 1982).

[208] 45 Fed. Reg. at 68,333. The definition of "metal cleaning wastes" was ultimately revised in EPA's final 1982 regulations. *See* 47 Fed. Reg. at 52,305.

[209] 47 Fed. Reg. at 52,297.

[210] *Id*.

[211] *See* EPA's "Draft Advanced NPDES Permit Writer's Course, Module 1, Power Plant Permitting – re Steam Electric Power Generating Effluent Limitation Guidelines & Standards" at B-21 (June 1995) (accurately summarizing EPA's position following its 1982 rulemaking: "BPT requirements remain applicable to metal cleaning wastes, unless waived prior to November 19, 1982 under guidance of the Jordan Memorandum, and the Permit Issuing Authority agrees to continue it"); EPA, "High Capacity Fossil Fuel Fired Plant Operator Training Program Student Handbook," EPA-453/B-94-056 (September 1994), http://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=

2000HF7P.txt at 27-3 ("Since non-chemical metal cleaning is not currently specifically regulated, it is classified under low volume wastes.").

[212] 78 Fed. Reg. 34,432, (June 7, 2013).

[213] *See*, e.g., *Id*. at 34,436 n.1, 34,465.

[214] *See* 80 Fed. Reg. at 67,863.

[215] *Id*. (emphasis added).

[216] Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category: EPA's Response to Public Comments, Part 4 of 10 at 4-324 (Sept. 2015) (emphasis added).

EPA Response to PSNH Comment V.C.1:

During the recent 2015 rulemaking to revise the Steam Electric Effluent Limitations Guidelines (Steam Electric ELGs), EPA determined that it did not have sufficient information on a national basis to establish Best Available Technology (BAT) requirements for non-chemical metal cleaning wastes for the entire industrial category. 80 Fed. Reg. 67,838, 67,863; *see also Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category: EPA's Response to Public Comments*, at 7-179. The final rule, therefore, continues to ''reserve'' BAT standards for non-chemical metal cleaning wastes, as the previously promulgated 1982 regulations did.[39] The 2015 Steam Electric ELGs explicitly state that by reserving BAT standards for non-chemical metal cleaning wastes in the final rule, *permitting authorities are left to continue establishing such requirements based on Best Professional Judgement (BPJ) for any steam electric power plant discharging this waste stream.* 80 Fed. Reg. at 67,863. Region 1, as the permitting authority, has followed the regulatory requirements and made the required BPJ-based determination with regard to non-chemical metal cleaning wastes in the Schiller Station Final Permit. Region 1 determined that BAT limits for non-chemical metal cleaning wastes are equivalent to BAT limits for chemical metal cleaning wastes and, thus, include effluent limits for total copper and iron.

However, the commenter maintains that dischargers are entitled to continue to rely on EPA's 1975 guidance, the Jordan Memorandum, suggesting that metal cleaning wastes are those where chemical additives, not just water, are used for washing, and that non-chemical metal cleaning wastes should "continue to be classified as a low volume waste if they have been historically." EPA has carefully considered these comments, but, as explained below, in EPA's view, these comments and the assumptions upon which they are based do not provide a reasonable basis for EPA to regulate Schiller Station's non-chemical metal cleaning wastes as low volume wastes not subject to effluent limits for total copper and iron in the Final Permit.

EPA first promulgated national ELG regulations for the Steam Electric Generating Point Source Category in 1974. 39 Fed. Reg. 36186 (Oct. 8, 1974). These regulations identified numerous distinct wastestreams, including "metal cleaning wastes." "Metal cleaning wastes" were defined as:

> … any cleaning compounds, rinse waters, or any other waterborne residues derived from cleaning any metal process equipment including, but not limited to, boiler tube cleaning, boiler fireside cleaning and air preheater cleaning.

39 Fed. Reg. 36,199 (*see* former version of 40 C.F.R. § 423.11(d)). On its face, this regulatory definition encompasses both chemical and non-chemical metal cleaning wastes, as it covers *any* cleaning compounds and *any* rinse waters or other waterborne residues from cleaning metal process equipment. Furthermore, the above-cited definition in no way excludes non-chemical metal cleaning waste. The 1974 ELG regulations also identify "low volume wastes" as a distinct wastestream and define this wastestream as follows:

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[39] The final rule also continues to ''reserve'' New Source Performance Standards (NSPS), Pretreatment Standards for Existing Sources (PSES), and Pretreatment Standards for New Sources (PSNS) for non-chemical metal cleaning wastes.

> …taken collectively, as if from one source, wastewater from all sources except those for which specific limitations are otherwise established in this subpart. Low volume waste sources would include but are not limited to wastewaters from wet scrubber air pollution control systems, ion exchange water treatment systems, water treatment evaporator blowdown, laboratory and sampling streams, floor drainage, cooling tower basin cleaning wastes and blowdown from recirculating house service water systems.

39 Fed. Reg. 36,199 (*see* former version of 40 C.F.R. § 423.11(b)). This regulatory definition does not include metal cleaning wastes and, in fact, explicitly notes that wastewater from sources governed by separate, specific limitations in 40 C.F.R. Part 423, are *not* considered low volume wastes. As stated above, metal cleaning waste, which encompasses both chemical and non-chemical metal cleaning wastes, is a separate wastestream specifically identified and regulated under Part 423 and, therefore, excluded from the definition of low volume wastes. Taken together, the two definitions identify a clear distinction between metal cleaning wastes (whether chemically or non-chemically based) and low volume wastes.

Nevertheless, in 1975, just after the first Steam Electric ELGs were promulgated, a biologist in EPA's Region 3 Office wrote to an engineer in EPA Headquarters' Office of Enforcement seeking clarification regarding, among other things, whether "effluent streams that result exclusively from water washing of ash found on boiler fireside, air preheater, etc. should be considered in the low volume or ash transport waste source categories," as opposed to the metal cleaning waste category, and whether only chemical cleaning wastewaters should be categorized as "metal cleaning wastes." *See* Letter from Bruce P. Smith, Delmarva-D.C. Section, EPA Region 3, to Mr. Bill Jordan, EPA Headquarters (May 21, 1975), p. 2 (AR-313, Exhibit 3). In posing the question, Mr. Smith acknowledged that the ELG regulations clearly do *not* exclude non-chemical waste streams from the definition of metal cleaning waste, but indicated that some ambiguity was suggested by text in EPA's technical "Development Document" for the Steam Electric ELGs.

Mr. Jordan responded to Mr. Smith with a memorandum stating as follows:

> [i]n regard to the question on distinguishing between metal cleaning wastes and low volume wastes, the following clarification is offered. All water washing operations are 'low volume' while any discharge from an operation involving chemical cleaning should be included in the metal cleaning category.

See Memorandum from J. William Jordan, Chemical Engineer, Permit Assistance & Evaluation Section, Office of Enforcement, EPA Headquarters, to Bruce P. Smith, Biologist, Enforcement Division, EPA Region III (June 17, 1973) (the Jordan Memorandum), p. 2 (AR-313, Exhibit 3).[40] Thus, with no explanation or analysis provided, Engineer Jordan appears to propose, contrary to

[40] The bulk of the Jordan Memorandum addresses a question other than the one about how to categorize non-chemical metal cleaning waste. Specifically, Mr. Smith's letter had also asked how effluent limits should be applied when non-similar waste streams such as metal cleaning waste, low volume waste, and ash sluice water are all discharged to an ash pond prior to discharge. The Jordan Memorandum, at pp. 1-2, focuses largely on responding to that question and outlined several possible different approaches.

the text of the ELG regulations, that wastes from non-chemical washing of metal equipment (i.e., "water washing operations") should be treated as "low volume waste" (and not subject to BPT effluent limitations for total copper and total iron in metal cleaning waste).

In 1977, EPA promulgated new pretreatment standards for the Steam Electric ELGs. *See* 42 Fed. Reg. 15,690 (Mar. 23, 1977) (Interim Regulations, Pretreatment Standards for Existing Sources, Steam Electric Generating Point Source Category). In the preamble to the Final Rule, EPA identified five categories of wastewater produced by steam electric power plants, including metal cleaning wastes, cooling system wastes, boiler blowdown, ash transport water, and low volume wastes. *Id.* at 15693. In its discussion, EPA again did not distinguish between chemical and non-chemical metal cleaning wastes and gave no suggestion that that latter should be regarded as low volume waste. EPA's discussion, instead, indicated that non-chemical metal cleaning wastes would be included within the metal cleaning waste category. *See id*. ("Metal cleaning wastes are those wastes which are derived from cleaning of metal process equipments."); *see also id.* (list of examples of metal equipment the cleaning of which would yield metal cleaning wastes and discussion of what constitutes low volume wastes).

In 1980, EPA proposed amendments to the Steam Electric ELGs. 45 Fed. Reg. 68,328 (October 14, 1980). One particular area of focus in the proposed rule was EPA's effort to "clarify an issue of applicability for the 'metal cleaning wastes' stream limitations." *Id.* at 68,328. In essence, EPA expressly confronted the definition of metal cleaning waste and how the regulations outlining corresponding effluent limits must be read and applied. As part of this assessment, EPA reconsidered and rejected the Jordan Memorandum's exclusion of non-chemical metal cleaning waste from the metal cleaning waste category, noting that a distinction between the chemical and non-chemical wastes was contradicted by the existing regulations. The Agency explained that the existing requirements applied to *all* metal cleaning wastes, regardless of whether they resulted from cleaning with chemical solutions or water only. *Id.* at 68,333. EPA further indicated that its decision to reject the Jordan Memorandum's conclusion was supported by (a) cost and technology data supporting the original copper and iron limits, which were based on all metal cleaning wastes, not just the chemically-based ones, and (b) the presence of "toxic pollutants in these waste streams even where only water is used for washing." *Id*. EPA concluded that "the regulations proposed below make clear that the 'metal cleaning waste' definition will apply according to its terms, and the question of whether washing is done with water only will be irrelevant." *Id.*

Nevertheless, EPA went on to propose that, "[b]ecause many dischargers may have relied on EPA's memorandum of June 1975, however, the regulations proposed below adopt the memorandum's position for purposes of BPT only." *Id.* EPA proposed to implement this apparently equity-based approach by taking the following steps:

1. Revising the definition of "metal cleaning wastes" to even more explicitly *include both chemical and non-chemical metal cleaning wastes*. The new proposed definition was subsequently retained in the final regulations and remains in the current regulations. It is quoted above in this response. *Id*. at 68,350 (proposed 40 C.F.R. § 423.11(d)).

2. Adding a definition of “chemical metal cleaning waste.” *Id*. at 68,350 (proposed 40 C.F.R. § 423.11(c)). The proposed new definition was subsequently retained in the final regulations and remains in the current regulations. It is quoted above in this response.
3. Changing the BPT ELGs so that they would only apply to “chemical metal cleaning wastes,” rather than to “metal cleaning wastes” generally. *Id*. at 68,351 (proposed 40 C.F.R. § 423.12(b)(5)).
4. Promulgating new BAT ELGs applicable to “metal cleaning wastes” generally, which imposed effluent limits for copper and total iron. *Id*. at 68,352 (proposed 40 C.F.R. § 423.13(g)).

EPA’s approach would have amended the Steam Electric ELGs to correctly categorize non-chemical metal cleaning wastes as “metal cleaning wastes,” while legally exempting them from the application of the BPT ELGs for copper and iron. This result would have been consistent with the effect of the Jordan Memorandum, while at the same time would have corrected its mistaken underlying conclusion. It also would have correctly applied BAT ELGs to both chemical and non-chemical metal cleaning wastes going forward.

In the Final Rule, however, EPA shifted course somewhat in response to public comments received on the proposal. 47 Fed. Reg. 52,290 (Nov. 19, 1982). EPA retained the clarified definition of “metal cleaning waste” and the new definition of “chemical metal cleaning waste,” *id*. at 52,305 (40 C.F.R. §§ 423.11(c) and (d)), but dropped the regulatory language that applied the BPT limitations only to chemical metal cleaning wastes. *Id*. at 52,297, 52,306 (40 C.F.R. § 423.12(b)(5)). Thus, the regulations applied the BPT limits to *all* metal cleaning waste. With regard to BAT limitations, however, EPA decided to promulgate effluent limitations only for the *chemical* metal cleaning wastes and to “reserve” development of the limitations for the non-chemical metal cleaning wastes. *Id*. at 52,297, 52,307 (40 C.F.R. §§ 423.13(3) and (f)). EPA explained that while the BAT standard applied to non-chemical metal cleaning wastes, certain issues raised in the public comments, as discussed above, required further investigation. *Id*. at 52,297. *See also id*. at 52307-08 (40 C.F.R. §§ 423.15(e), 423.16(c), 423.17(c)). Specifically, EPA explained that it had insufficient information to determine whether the waste streams from oil-burning and coal-burning facilities had significant differences and whether compliance costs would be excessive on a national, industry-wide basis. *Id*. at 52,297.

In addition, EPA once more addressed its apparent equitable concern about the Jordan Memorandum by stating in the preamble that “until the Agency promulgates new limitations and standards, the previous guidance policy *may* continue to be applied in those cases in which it was applied in the past.” *Id*. (emphasis added). Thus, although it had concluded that the Jordan Memorandum was inconsistent with the regulations and its conclusion was fundamentally flawed, EPA indicated that it could apply it on a discretionary basis in cases where it had been applied in the past.

For the November 2015 revised Steam Electric ELGs, the Agency again “decided that it does not have enough information on a national basis to establish BAT/NSPS/PSES/PSNS requirements for non-chemical metal cleaning wastes. The final rule, therefore, continues to ‘reserve’

BAT/NSPS/PSES/PSNS for non-chemical metal cleaning wastes, as the previously promulgated regulations did." 80 Fed. Reg. 67,863. In the preamble to the 2015 Steam Electric ELGs, the Agency explains that:

> …the permitting authority must continue to establish such requirements based on BPJ for any steam electric power plant discharging this wastestream. As explained in Section VIII.I, in permitting this wastestream, some permitting authorities have classified it as non-chemical metal cleaning wastes (a subset of metal cleaning wastes), while others have classified it as a low volume waste source; NPDES permit limitations for this wastestream thus reflect that classification. In making future BPJ BAT determinations, EPA recommends that the permitting authority examine the historical permitting record for the particular plant to determine how discharges of non-chemical metal cleaning wastes have been permitted in the past. Using historical information and its best professional judgment, *the permitting authority could determine that the BPJ BAT limitations should be set equal to existing BPT limitations or it could determine that more stringent BPJ BAT limitations should apply*. In making a BPJ determination for new sources, EPA recommends that the permitting authority consider whether it would be appropriate to base standards on BPT limitations for metal cleaning wastes or on a technology that achieves greater pollutant reductions.

80 Fed. Reg. 67,884 (emphasis added). The 2015 preamble language makes three things clear: 1) moving forward, permitting authorities are expected to examine the historical classification of non-chemical metal cleaning wastes and method of regulation for a particular plant; 2) permitting authorities should use this historical information as one of several components in their BPJ BAT analysis; and 3) permitting authorities may or may not establish BAT limitations for non-chemical metal cleaning wastes that are equal to existing limitations and/or historical methods of regulation (*i.e.*, the Jordan Memorandum).

In early 2017, EPA received administrative petitions requesting that the Agency reconsider the November 2015 Steam Electric ELGs. After considering the petitions, EPA decided that it would be appropriate and in the public interest to conduct a rulemaking to potentially revise the BAT limitations and PSES established by the 2015 Rule for FGD wastewater and bottom ash transport water. As a result of this decision, EPA issued a Final Rule, *Postponement of Certain Compliance Dates for the Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category*, 82 Fed. Reg. 43,494 (Sept. 18, 2017), in which EPA postponed the earliest compliance dates for the new, more stringent, BAT effluent limitations and PSES for bottom ash transport water and flue gas desulfurization (FGD) wastewater that were included in the 2015 Rule for a period of two years. EPA explained that it did "not intend to conduct a rulemaking that would potentially revise the new, more stringent BAT effluent limitations and pretreatment standards in the 2015 Rule for . . . any of the other requirements in the 2015 Rule." 82 Fed. Reg. at 43,494.

Ultimately, EPA's September 2017 Final Rule "does not otherwise amend the effluent limitations guidelines and standards for the steam electric power generating point source category." 82 Fed. Reg. at 43,495. The rule, therefore, does not amend or affect the effluent limitations applied to metal cleaning wastes. The analysis and language included in the 2015 preamble related to NCMCWs, as mentioned above and discussed at length throughout EPA's responses to comments, remains effective, and is not subject to postponement or amendment. Thus, this discussion about the regulation of metal cleaning wastes is not affected by the 2017 reconsideration and Final Rule.

Having considered all of the above, EPA concludes that it would be unreasonable to exempt Schiller Station's non-chemical metal cleaning waste streams from effluent limits for copper and iron based on the Jordan Memorandum and preamble language that discusses issues identified in the Jordan Memorandum. EPA reaches this conclusion for a number of independently sufficient reasons.

First, to do so would be inconsistent with the CWA's requirements that BPT and BAT standards be satisfied by now (*i.e.*, no later than 1977 and 1989, respectively) and that NPDES permits include limits reflecting such standards based on ELGs or, in the absence of ELGs, BPJ determinations.

Second, issuing an NPDES permit to Schiller Station without copper or iron limits applicable to its "gas side (or fire side) ash washes" (which are non-chemical metal cleaning wastes), based on treating them as low volume wastes, would be inconsistent with the plain language of the regulations, which treats non-chemical metal cleaning wastes as a type of metal cleaning waste subject to copper and iron limits. The June 1975 Jordan Memorandum was a later-in-time staff opinion about how the terms from the October 1974 regulations should be applied, and it included no analysis of the regulations whatsoever. Rather than interpreting the regulations, the Jordan Memorandum *contradicts* the regulations, as EPA indicated in the 1980 preamble to the proposed Steam Electric ELGs.

Third, as EPA stated in the preamble to the revised Steam Electric ELGs proposed in 1980, the Jordan Memorandum was inconsistent with the regulations, provided no analysis to support its conclusion, was incorrect as a matter of fact, and was inadvisable as a matter of policy. The technology and cost data upon which EPA had based the BPT limitations for copper and iron in metal cleaning waste were based on both chemical and non-chemical metal cleaning wastes, and not just on the former. Furthermore, EPA pointed out that like chemical metal cleaning wastes, non-chemical metal cleaning wastes can contain toxic pollutants. At the same time, Schiller Station has not provided a description of its operations or any monitoring data to indicate that its non-chemical metal cleaning wastes are free from toxic pollutants. Subjecting non-chemical metal cleaning wastes to BAT standards is, thus, also reasonable from the standpoint of environmental protection.

Fourth, EPA's stated equitable concern about parties who may have relied on the Jordan Memorandum in the past is best understood as a concern about the application of BPT limits, which were the compliance limits applicable at the time of the Jordan Memorandum and the 1980 and 1982 preambles. In 1980, EPA proposed changing the ELGs to specify that BPT limits would not apply to non-chemical metal cleaning wastes because of past reliance on the Jordan Memorandum, but it later dropped that idea in the final ELGs. While EPA ended up *reserving* the development of national, categorical BAT limitations for NCMCWs because of insufficient information on certain issues, the Agency did not suggest that BAT limits should not be applied because of the Jordan Memorandum or that the Jordan Memorandum must govern a permitting authority's BPJ BAT determination for non-chemical metal cleaning wastes. Thus, it is appropriate that EPA's new NPDES permit for Schiller Station apply BAT limits on a BPJ basis to the facility's non-chemical metal cleaning waste discharges.

Fifth, while the Agency suggests that permitting authorities consider historical information when using their best professional judgment in determining BAT limitations (80 Fed. Reg. 67,884), it does not appear to EPA that the Jordan Memorandum was ever applied to Schiller Station in the past. Neither the 1990 Permit nor the Fact Sheet for that permit state that the non-chemical metal cleaning wastes (or "gas side ash washes") were being treated as low volume wastes or that they were not subject to effluent limits for copper and iron. Instead, EPA's permit applied copper and iron limits at both Outfalls 016 ("WWTF discharge – normal operation" which included a combined discharge of non-chemical metal cleaning wastes and low volume wastes) and 017 ("WWTF discharge – metal cleaning operation" which only included chemical metal cleaning wastes). As discussed in the 2015 Fact Sheet, although the Region explicitly notes that it was incorrect to have applied copper and iron limits to the commingled waste streams of Outfall 016, this was not an indication that EPA thought that the copper and iron limits were not applicable to non-chemical metal cleaning wastes.

Even if the Jordan Memorandum was implicitly incorporated into Schiller Station's past permit limitations, which it was not, the current EPA view, as outlined in the preamble to the 2015 Steam Electric Guidelines (quoted above), does *not mandate* that a permitting authority's new BAT determination must be consistent with past or historical application of the Memorandum. On the contrary, the 2015 Preamble suggests only that the permitting authority examine the historical permitting record and then use this information, along with its best professional judgment, to make a BAT determination that it deems appropriate. Again, "the permitting authority *could determine* that the BPJ BAT limitations should be set equal to existing BPT limitations or it *could determine* that more stringent BPJ BAT limitations should apply." 80 Fed. Reg. at 67,884 (emphasis added). Thus, there is no statutory or regulatory mandate to establish BPJ BAT limitations that are equal to those historically applied to non-chemical metal cleaning wastes. In addition, the fact that EPA determined it lacked sufficient information to develop national BAT effluent limitation guidelines for discharges of NCMCWs does not mean that facility-specific information is not available to support the development of BAT limits on a BPJ basis to regulate NCMCW discharges in a specific permit.

Finally, even as an equitable matter, it does not make sense to exempt Schiller Station from BPT or BAT effluent limits in a 2017 NPDES permit based on a guidance memorandum from more than 40 years ago. To the extent that the Jordan Memorandum was ever applied to Schiller Station in the past – and it does not appear to EPA that it was (see additional discussion in EPA's response to PSNH Comment V.C.2 below) – the facility would already have received many years of benefit from such application of the memorandum. EPA believes it is appropriate to properly apply the regulations and statute now and not to base the permit limits on a decades-old guidance memorandum that does not have the force of law.

As discussed in the 2015 Fact Sheet (at 35-41), the Region has determined that the BAT-based effluent limits for non-chemical metal cleaning waste discharges at Schiller Station should be at least as stringent as the applicable BPT limitations for such non-chemical metal cleaning wastes. This analysis included consideration of the following specific factors in determining the BAT: (i) age of the equipment and facilities involved; (ii) process employed; (iii) engineering aspects of the application of various types of control techniques; (iv) process changes; (v) the cost of achieving such effluent reductions; and (vi) non-water quality environmental impacts (including energy requirements). Consistent with the 2015 preamble language as discussed above, EPA also examined the historical classification of non-chemical metal cleaning wastes and previous methods of regulation for Schiller Station as part of its BPJ BAT analysis. The Region's BPJ analysis ultimately resulted in BAT limitations for TSS, O&G, copper and iron to be applied to non-chemical metal cleaning wastes either directly as a segregated waste stream or based on a combined waste stream formula when commingled with various low volume waste streams.

PSNH Comment V.C.2 NCMCWs Have Been and Should Continue to Be Classified as A Low Volume Waste at Schiller Station in Accordance with the Jordan Memorandum

PSNH Comment V.C.2.a The Historical Permitting Record at Schiller Station

Each unit at Schiller Station has, and continues to, treat NCMCWs as a low volume waste exempted from the iron and copper effluent limitations in the current NPDES permit for the facility. [217] This is the case despite the fact that NCMCWs are not expressly referenced anywhere in Permit No. NH0001473, its associated Fact Sheet, and/or in Region 1's Response to Comments documentation issued contemporaneously with the current permit. [218] Instead, NCMCWs at Schiller Station are subsumed in the category of low volume wastes, in accordance with applicable regulations and the principles of the Jordan Memorandum.

Handling NCMCWs in this manner is consistent with long-standing practice within the industry. Indeed, it applies to each of PSNH's three fossil fuel-fired steam electric generating facilities: Merrimack, Newington and Schiller Stations. Specifically, permit writers have historically provided "authorization" to discharge NCMCWs without copper or iron limitations implicitly, by omitting any reference to such effluent limitations for NCMCWs and declining explicitly to move NCWCW to the "metal cleaning category" contra the Jordan Memorandum. Because EPA's guidance from the Jordan Memorandum was the default rule, silence towards NCMCWs indicated that such wastewater should be treated as a "low volume waste." The clarity of the distinction made between low volume wastes and chemical cleaning wastes in that memorandum ("[a]ll water washing operations are 'low volume' while any discharge from an operation involving chemical cleaning [is] metal cleaning") obviated the need for permit writers to continually reference NCMCWs in their NPDES permits.

Moreover, facilities' current NPDES permits most often rely upon previous ones and do not contain any express discussion on the handling of NCMCWs. In some cases, decades have passed since permitting authorities have actively considered the regulation of NCMCWs in light of the Jordan Memorandum. This is a direct consequence of EPA having "reserved" time and again these regulations for future rulemakings. EPA acknowledged this reality in its latest final ELGs. [219]

The relevant analysis for Permit No. NH0001473 for Schiller Station centers on a single outfall that has been given two designations: one for normal operations at the plant (Outfall 016) and the other for operations during the time period when chemical waste from cleaning the boiler tubes enters the process waste treatment plant (Outfall 017). Consistent with EPA's 1982 regulations, Permit No. NH0001473 includes iron and copper discharge limitations with daily monitoring for discharges from the wastewater treatment plant ("WWTP") during chemical cleaning operations. Iron and copper discharge limitations with weekly monitoring requirements also exist for discharges from the WWTP during normal operations at the plant. The Fact Sheet and Response to Comments documents for this permit do not mention why these limits were made applicable to Outfall 016. Instead, one may look to documentation pertaining to the renewed NPDES permit for PSNH's Merrimack Station—a permit issued in 1992, approximately two years after the current permit for Schiller Station—to understand that Region 1 did not include iron and copper effluent limitations on Outfall 016 at Schiller Station due to the discharges of NCMCWs through that outfall during normal plant operations. [220]

Specifically, the Fact Sheet for the 1992 Merrimack Station Permit No. NH0001465 provides that iron and copper limits and monitoring requirements are included for discharges during normal operations solely to protect against the "possibility that copper [and iron] [221] retained in the pond may be released at times other than chemical cleaning periods." [222] Such limits are not meant to, and accordingly do not, apply to any NCMCWs that are also channeled to the ash settling pond. This fact is confirmed by Region 1's synopsis of Comment 8 to Permit No. NH0001465223 and the agency's corresponding response:

> COMMENT 8
>
> The permittee requests that the total copper discharge limit at Outfall 003A be eliminated, <u>since the ELGs regulate copper discharges for chemical cleaning operations only</u>, and not for routine-low volume discharges from ash settling ponds, for example.
>
> RESPONSE 8
>
> <u>The ELGs do not establish copper limitations on low volume wastes</u>, ash pile runoff, or storm water runoff (components of the ash pond discharge, Outfall 003A). The maximum total copper limitation of 0.2 mg/l is being maintained in accordance with the anti-backsliding provision of 40 CFR 122.44(1). It is to be noted that this discharge has shown an average total copper concentration of 0.0015 mg/l in the past two years .[224]

Like Merrimack Station, iron and copper effluent limitations are included in Permit No. NH0001473 for Schiller Station solely to: (1) safeguard that detectable concentrations of iron and copper are not being discharged at times other than chemical cleaning operations; and (2) confirm that metals are not present in any unexpected waste stream during normal operations. [225]

There can be no other reasonable interpretation as to the application of these discharge limitations given that approximately two years after Region 1 issued the current permit for Schiller Station the agency acknowledged in Comment 8 to Merrimack Station's Permit No. NH0001465 that the writers of PSNH's permits understood the ELG-based discharge limitations for copper and iron apply only to chemical metal cleaning operations .[226]

The fact that Permit No. NH0001473 requires only weekly monitoring for iron and copper during normal operations further supports the fact that the numeric limits do not apply to discharges of NCMCWs. If these limits did apply, monitoring likely would be required at least once per discharge—if not more frequently—as Schiller Station typically generates some form of NCMCWs (as Region 1 attempts to define the waste stream in the Fact Sheet) more often than once per week. [227] A weekly sampling frequency clearly illustrates that the monitoring is a prophylactic measure and is in no way linked to the management of NCMCWs.

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[217] *See* AR-002.

[218] The Fact Sheet and Response to Comments documents associated with the 1990 permit for Schiller Station are attached hereto as Exhibits 4 and 5, respectively.

[219] *See*, e.g., 80 Fed. Reg. at 67,863 (providing that "the Agency has learned that plants refer to the same [NCMCW] operation using different terminology; some classify non-chemical metal cleaning waste as such, while others classify it as low volume waste sources…EPA does not know the nomenclature each plant use[s]…so it…does not have sufficient information on the extent to which discharges of non-chemical metal cleaning wastes occur, or on the ways that industry manages their non-chemical metal cleaning wastes).

[220] The 1992 Fact Sheet for the 1992 Merrimack Station NPDES permit is attached hereto as Exhibit 6.

[221] The Fact Sheet associated with PSNH's existing NPDES permit for Merrimack Station explains that numeric copper limitations have been placed on discharges from the ash settling pond during normal operations to address the possibility that copper entering the pond following chemical metal cleaning operations may be released at other times. (*See* Ex. 6 at 5). And, even copper was discussed in the Fact Sheet for Merrimack Station only because there was debate regarding whether Region 1 needed to develop a water quality-based effluent limitation for the constituent. The expressed reasoning for regulating copper at Merrimack Station must apply to the numeric iron limitations applicable to that outfall during normal operations. It would be inconsistent to place numeric iron limits in an NPDES permit to regulate NCMCW discharges and not place such limits on copper discharges – or vice versa. The Fact Sheet substantiates this conclusion. Nowhere in the discussion of the numeric iron discharge limitations are NCMCWs mentioned. Instead, only chemical metal cleaning wastes, as well as the prevalent background concentration of iron in the Merrimack River, are discussed. In fact, the Fact Sheet identifies these sources as the only two from which iron discharges may originate: "EPA concludes that iron (<u>whether from intake water or chemical cleaning operations</u>) in the slag pond discharge..." (Ex. 6 at 5) (emphasis added). Consequently, the only rational conclusion is that numeric iron limitations were included in Permit No. NH0001465 to address the possibility that iron entering the pond following chemical metal cleaning operations may be released at other times.

This fact is also confirmed by the initial Fact Sheet drafted by Region 1 in 2009 (attached hereto as Exhibit 7) as a part of the NPDES permit renewal for PSNH's Merrimack Station, which was eventually issued for public notice and comment in September 2011. This permit renewal has not yet been finalized. With respect to the 1.0 mg/L total recoverable iron limitation included in PSNH's existing permit, Region 1 provided that "[i]t is surmised the 1.0 mg/L iron limit for Outfall 003A is to limit any iron discharged from WWTP No. 1 to the Slag Settling Pond when treating metal cleaning wastes." (Ex. 7 at 6). In other words, as explained above, a numeric iron limitation was only included for Outfall 003A (i.e. normal operations), to enable PSNH and Region 1 to detect if and/or when residual iron concentrations originating from chemical metal cleaning wastes are discharged during normal operations. These limits were not imposed to regulate NCMCWs.

[222] (Ex. 6 at 5).

[223] The 1992 Response to Comments document issued contemporaneously with the 1992 NPDES Permit for to Merrimack Station is attached hereto as Exhibit 8.

[224] (Ex. 8 at 4) (emphases added).

[225] (*See* Ex. 6 at 5).

[226] (*See* Ex. 8 at 4).

227 *See* Fact Sheet at 37 (defining NCMCWs as "any wastewater resulting from the cleaning of metal process equipment without using chemical cleaning compounds"); *See* also EPA Technical Development Document for the Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category, EPA-821-R-15-007 at 4-38 (Sept. 2015) ("The frequency of metal cleaning activities can vary depending on the type of cleaning operation and individual plant practices. Some operations occur as often as several times a day…").

EPA Response to PSNH Comment V.C.2.a:

The commenter suggests that NCMCWs have been historically defined as low volume wastes at Schiller Station pursuant to the Jordan Memorandum and, thus, should be exempt from the proposed copper and iron BAT limitations of 1.0 mg/l. In support of its comment, the commenter relies on three lines of argument. EPA is not persuaded by this comment, as is discussed in detail below. Ultimately, the historical record indicates that NCMCWs, comingled with other wastewater streams in Outfall 016, have been subject to the same effluent limitations for iron and copper as chemical metal cleaning wastes at Schiller Station and have not been expressly excluded from such regulation under the Jordan Memorandum. Schiller Station is not authorized to treat NCMCWs as if they had been exempted from applicable permit limits.

First, the commenter asserts that the Jordan Memorandum has historically been treated as "the default rule." Moreover, the commenter states that the Jordan Memorandum, in fact, is implicitly applied to NCMCWs when the permitting agency omits any reference to copper and iron limits and declines to explicitly move NCMCW to the "metal cleaning category." The commenter concludes that silence towards NCMCWs indicates that such wastewater should be treated as a low volume waste.

The Region does not agree that the Jordan Memorandum is or was the "default rule," or that the absence of an express discussion of NCMCWs indicates that they are considered low volume wastes. Even if the Jordan Memorandum served as a "default" rule for a period of time after it was written, this "default" status was clearly terminated through the 1980-1982 Steam Electric rulemaking process. The final 1982 regulations make clear that the Memorandum was inconsistent with the regulations and its conclusion was fundamentally flawed, and further that it only *may* be applied on a discretionary basis in cases where it had been applied in the past. *See* EPA Response to Comment V.C.1. Nowhere in the 1982 Steam Electric ELGs or most recent 2015 ELGs, does EPA identify the Jordan Memorandum as being a default rule or applying in the absence of a further detailed discussion of NCMCWs. While it may true that many permits have not discussed NCMCWs for years, the 2015 Steam Electric ELGs indicate that permitting authorities should evaluate how to regulate this wastestream now. The commenter provides no statutory or regulatory language to support the conclusion that the Jordan Memorandum has and continues to serve as a default rule for development of BPT or BAT limits for NCMCWs.

While the 1990 Schiller Station permit does not explicitly mention NCMCWs in the description of Outfalls 016 or 017, it does include identical copper and iron limits for both outfalls. The commenter correctly notes that the "Fact Sheet and Response to Comments documents for [the 1990] permit do not mention why these limits were made applicable to Outfall 016." *See* comment above. However, the fact that these limits are applied to Outfall 016 (containing low volume waste commingled with NCMCWs) does *not* imply that NCMCWs should be treated as a low volume waste but, rather, indicates that NCMCWs are treated as a type of metal cleaning waste, subject to 40 C.F.R. § 423.12(b)(5). In fact, low volume wastes do not have required BPT or BAT limitations for copper and iron, and, therefore, finding that application of copper and iron limitations to both low volume waste and NCMCWs at Outfall 016 necessarily means that NCMCWs are treated as low volume wastes is not a reasonable conclusion. *See* 40 C.F.R. 423.12(b)(3).

Instead, the presence of these limits reasonably leads one to conclude that NCMCWs are subject to technology based limitations for metal cleaning wastes, as defined by 40 C.F.R. § 423.12(b)(12), and that low volume wastes are also (albeit incorrectly) subject to these limits when commingled with NCMCWs. As indicated in the 2015 Fact Sheet (at pp. 35-41), EPA determined that, while it was appropriate to continue to apply these limitations to NCMCWs, it was inappropriate to apply them to the commingled waste stream (including low volume wastes) at Outfall 016 as done in the 1990 permit, unless a combined waste stream formula was used to develop adjusted limits, as discussed below. Doing so would be contrary to 40 C.F.R. § 125.3(f) and § 122.45(h). Therefore, the 2015 draft permit corrects a previous mistake from the 1990 permit and requires segregation of both chemical and non-chemical metal cleaning waste in Outfall 017 in order to apply these limits in the proper way, as required by EPA regulations. *See* 40 C.F.R. §§ 423.12(b)(12), 423.13(h); *see also* 40 C.F.R. § 125.3(f); 40 C.F.R. § 122.45(h). It is clear to the Region that the 1990 permit did not omit limits for NCMCWs, nor were they treated as low volume waste.

Secondly, the commenter seeks to use the 1992 Merrimack Station NPDES permit, its accompanying fact sheet, and supporting documents to draw conclusions about Schiller Station's 1990 permit and historical treatment of NCMCWs. Specifically, the commenter references the 1992 Merrimack Station permit issuance in which EPA states that "[t]he ELGs do not establish copper limitations on low volume wastes" but are established to protect against the "possibility that copper [and iron] retained in the pond may be released at times other than chemical cleaning periods." Of primary importance is the fact-specific nature of each individual NPDES permit and permitting process. While PSNH formerly owned both Schiller Station and Merrimack Station, each facility and permitting process is distinct and factually unique. The rationale employed by EPA in developing effluent limitations for waste streams in the 1992 Merrimack Station permit (even if those waste streams and outfalls bear similarities to those identified at Schiller Station) does not determine the effluent limitations in the 1990 Schiller Station permit. The commenter is right to point out that the Schiller permit was issued two years prior to issuance of the 1992 Merrimack Permit. The 1990 Schiller permitting process did not rely on practices or facts that were specific to the Merrimack permit.

Ultimately, EPA does not find the comparison presented by the commenter helpful to understanding the historical treatment of NCMCWs at Schiller Station. However, to respond fully to the comment, EPA finds it worth at least noting that the 1992 Merrimack Station permit also does *not* define NCMCWs as low volume wastes, but *does* apply copper and iron effluent limitations to the outfall through which NCMCWs are discharged. This simply confirms that the Region applied copper and iron effluent limits to NCMCWs in both the 1990 Schiller Station permit as well as the 1992 Merrimack Station permit, but has provided an alternate, yet equally valid, justification for each. The commenter's reference to Comment-and-Response 8 from the Merrimack permit record does not change this assessment. This colloquy only states that copper limits are not applied to low volume wastes, it does not establish that NCMCWs are classified as low volume wastes.

Thirdly, the comment suggests that weekly monitoring for copper and iron in the existing Schiller Station permit somehow indicates that these limits must not be based on NCMCWs because such wastes are typically generated more frequently than once per week. Yet, the monitoring frequency for effluent limitations is often less frequent than the expected discharge frequency for the target pollutants. For example, the 1990 Schiller Station permit also contained monthly monitoring requirements for Oil & Grease limits at Outfalls 001, 011 and 018 even though the expected discharge frequency at these outfalls was greater than once per month.

EPA maintains that NCMCWs are not classified as low volume wastes in the Schiller Station historical record. Therefore, EPA does not view this permit reissuance as a change to the historical classification of these waste streams. Rather, the only relevant change from the 1990 permit is the new requirement to segregate NCMCWs from dissimilar waste streams (or use a combined waste stream formula, as will be discussed below) so that compliance can be properly assessed for the same copper and iron effluent limits that were applied in the 1990 permit. (See EPA's previous response above for a more detailed discussion of how the historical record and the Jordan Memorandum are viewed in context of this final permit reissuance).

PSNH Comment V.C.2.b As Recently As 2013, EPA Specifically Determined That Iron and Copper Effluent Limitations Apply at Schiller Station Only During Boiler Chemical Cleaning Operations

As part of its rulemaking process for the now-final NELGs, EPA hired Eastern Research Group, Inc. ("ERG") as its agent to evaluate information received by the agency in response to Part E of its 2010 Information Collection Request ("ICR"). Part E of the 2010 ICR asked questions regarding, and sought production of documents specific to, how different waste streams (including NCMCWs) are handled at various facilities. EPA issued the 2010 ICR to preselected sources in each EPA region, with only a subset of those pre-selected facilities required to complete Part E of the ICR. Notably, EPA did not require PSNH to complete Part E of the ICR for Schiller Station. Yet somehow an evaluation of how NCMCWs are handled at Schiller Station was included in ERG's determinations document. [228]

Upon information and belief, Schiller Station was selected "at random" by Region 1 after EPA sought additional information from the various Regions to supplement the agency's record regarding how NCMCWs are handled at representative facilities. How or why Schiller Station was ultimately included in ERG's ultimate analysis is not important, however. What is important is the agency's ultimate conclusion regarding the treatment of NCMCWs at the facility. As to Schiller Station, ERG ultimately concluded that "ELG-based Cu and Fe limits apply to [WWTP #2] 'during boiler chemical cleaning operations only.'"[229] This conclusion, which was purportedly rendered after receipt of input from Region 1, necessarily means that iron and copper effluent limitations do not apply to NCMCW discharges at Schiller Station and therefore supports the comments and conclusions set out in the preceding subpart of these comments.

This 2013 EPA determination, coupled with the documented historical permitting practice for Schiller Station, prove that NCMCWs have been and continue to be treated as a low volume waste not subject to iron and copper effluent limitations. The equitable considerations that caused EPA to refrain from eliminating reliance upon the Jordan Memorandum in its 1982 rulemaking for facilities that have relied upon the guidance policy in the past [230] therefore are applicable to Schiller Station. This historical permitting record must be evaluated and considered in the determination of how NCMCWs will be regulated prospectively at the facility. The new NELGs mandate this assessment. [231] In fact, as mentioned earlier in these comments, EPA went so far as to state in its Response to Comments for the NELGs that no changes to historical operations at a facility will result from the final rule given that the agency elected to not revise the effluent limitations and/or definitions pertaining to the NCMCW waste stream. [232]

Region 1's failure to even consider, much less evaluate, the historical permitting record for Schiller Station is arbitrary, capricious, and violates a tenet of the NELGs. A thorough review of this record demonstrates that NCMCWs are classified as a low volume waste at Schiller Station and therefore should continue to be classified as such, in accordance with the new NELGs.

[228] *See* Attachment 1 to ERG's Pollutants of Concern Methodology Memorandum, EPA-HQ-OW-20090819-2188 (Mar. 13, 2013) ("Permit Review Information" spreadsheet).
[229] *Id*. (emphasis added).
[230] 47 Fed. Reg. at 52,297.
[231] *See* 80 Fed. Reg. at 67,863.
[232] *See* Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category: EPA's Response to Public Comments, Part 4 of 10 at 4-324 (Sept. 2015).

EPA Response to PSNH Comment V.C.2.b:

This comment addresses a specific analysis conducted during EPA's rulemaking process and attempts to draw conclusions from that analysis which are either not consistent with the final NELGs or are incomplete interpretations of EPA data. EPA notes that while the rulemaking process included the evaluation of many analyses, including ERG's analysis, the result of the rulemaking process in the final NELGs was that NCMCW was still "reserved" as it was in the previous rule. In other words, no determination was made in the final rule that NCMCWs should be classified as a low volume wastes if they had not been classified as such previously. Indeed, BAT determinations must continue to be established based on BPJ. Furthermore, the preamble to the 2015 Steam Electric ELGs "recommends" (not requires) that a permitting authority consider the historical record during future BPJ BAT determinations and that "the permitting authority could determine that the BPJ BAT limitations should be set equal to existing BPT limitations or it could determine that more stringent BPJ BAT limitations should apply." 80 Fed. Reg. 67,884.

As stated earlier, EPA considered the historical record and maintains that NCMCWs are not and have not been classified as low volume wastes for Schiller Station. Therefore, EPA does not view this permit reissuance as a change to the historical classification of these waste streams. Rather, the only relevant change from the 1990 permit is the new requirement to segregate NCMCWs from dissimilar waste streams so that compliance can be properly assessed for the same copper and iron effluent limits that were applied in the 1990 permit. *See* EPA's response above for a more detailed discussion of how EPA considers the historical record and the Jordan Memorandum as they relate to this permit reissuance.

The commenter also bases its conclusion that Schiller Station's non-chemical metal cleaning waste is classified as a low volume waste on an incomplete interpretation of the ERG analysis mentioned above. In order to fully assess the conclusions made by ERG relating to Schiller's non-chemical metal cleaning waste, it is important to assess the data in context, rather than simply examining an isolated finding.

ERG compiled data that reads as follows:

NPDES Permit	Plant Name	Metal Cleaning Waste Type	Is there a distinction between chemical cleaning waste and Nonchemical cleaning waste?	Is nonchemical cleaning waste permitted with limits for metal cleaning waste or low volume waste?	If nonchemical cleaning waste is handled as low volume waste, what is the basis?	Limits and Other Comments
NH0001473	Schiller	Chemical	NA; only chemical	NA	NA	ELG-based Cu and Fe limits apply to wastewater treatment plant "during boiler chemical cleaning operations only."

Attachment 1 to ERG's Pollutants of Concern Methodology Memorandum, EPA-HQ-OW-20090819-2188 (Mar. 13, 2013).[41]

The commenter quoted only the information included in the last column ("ELG-based Cu and Fe limits apply to wastewater treatment plant 'during boiler chemical cleaning operations only'"), but failed to put that language into context. Instead, the comment states that "[t]his conclusion . . . necessarily means that iron and copper effluent limitations do not apply to NCMCW discharges at Schiller Station." However, upon closer inspection of the entire data set, this conclusion does *not* necessarily mean that NCMCW discharges are not subject to the same effluent limits as chemical metal cleaning waste. Rather, the table above shows that Schiller was described as producing *only* chemical metal cleaning waste and as not discharging non-chemical metal cleaning wastes at all. Furthermore, under the column, "Is there a distinction between chemical cleaning waste and Nonchemical cleaning waste," the table specifically states "NA" or not applicable, because "only chemical" metal cleaning waste was noted to be discharged at Schiller Station. In addition, under the column "Is nonchemical cleaning waste permitted with limits for metal cleaning waste or low volume waste," the table again states "NA." It does not state that non-chemical metal cleaning waste was treated as low volume waste and not subject to iron and copper effluent limitations. Finally, in response to the question, "If nonchemical cleaning waste is handled as low volume waste, what is the basis?" the answer "NA" is provided, rather than stating that NCMCWs are handled as low volume wastes due to the Jordan Memorandum. In fact, the data still supports EPA's adherence to the position that NCMCW has not been

[41] This Memorandum can be accessed at https://www.regulations.gov/document?D=EPA-HQ-OW-2009-0819-2188.

historically treated as a low-volume waste pursuant to the Jordan Memorandum. Nothing in the data above contradicts EPA's conclusion.

However, the data set outlined above should not by itself be relied upon to assess Schiller's past and current practices for discharging metal cleaning wastes. Contrary to the data, Schiller *does* discharge non-chemical metal cleaning waste in addition to chemical metal cleaning waste. Thus, the data in this table is inaccurate. EPA concludes that it is inappropriate to draw a conclusion based upon one piece of data without looking at it in the context of the larger set of data, and more importantly, finds it inappropriate to draw conclusions from the abovementioned data relating to Schiller Station because it is premised on incomplete findings.

The above comment also misrepresents the EPA's Response to Comments for the 2015 Steam Electric ELGs when it states that "no changes to historical operations at a facility will result from the final rule given that the agency elected to not revise the effluent limitations and/or definitions pertaining to the NCMCW waste stream." EPA notes that this is an incorrect reading of the RTC and the direct quote from the RTC for the 2015 Steam Electric ELGs is as follows:

> [b]y not revising the effluent limitations and standards and not revising the definitions, the final rule will not result in changes to industry operations for the specified wastestreams. However, the permitting authority will continue to have discretion in determining which cleaning wastewaters are metal cleaning wastes based on the facility-specific operations, the wastewater generated and the wastewater's characteristics.

Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category: EPA's Response to Public Comments, Part 4 of 10 at 4-324 (Sept. 2015).[42]

EPA again notes that this permit reissuance is not implementing any change to the definition of metal cleaning waste, either chemical or non-chemical, but is simply exercising discretion to identify NCMCWs and require their segregation in order to properly apply the same effluent limits that were applied in the 1990 permit.

PSNH Comment V.C.3 Region 1's BAT Analysis and Administrative Record Are Wholly Inadequate Even If the Agency Erroneously Refuses to Continue To Classify NCMCWS As a Low Volume Waste

NCMCWs at Schiller Station should continue to be treated as low volume wastes. Even if Region 1 erroneously rejects this regulatory course of action, the agency is authorized to establish effluent limitations for this waste stream only after it completes a thorough BAT analysis utilizing its BPJ. [233] The BAT analysis set out in the Fact Sheet for the Draft Permit is deficient and will not pass judicial scrutiny. Indeed, none of the information necessary to complete a defensible BPJ-based BAT analysis is to be found in the administrative record.

[42] To access this Response to Comments document, see https://www.regulations.gov/document?D=EPA-HQ-OW-2009-0819-6469.

Region 1 lacks essential data regarding the makeup of NCMCW discharges at Schiller Station necessary to identify the constituents of concern in the waste stream, much less the quantities of each. Furthermore, Region 1 has failed to adequately consider the changes in current processes employed at Schiller Station, as well as the costs necessary to achieve these changes, that would be required to comply with new effluent limitations applicable to this waste stream. Thus, the agency has no way of knowing whether its proposed effluent limitations are reasonable and/or cost-effective.

Because the agency's current BPJ-based BAT determination is wholly inadequate, arbitrary, and capricious, Region 1 cannot legally impose iron and copper effluent limitations on NCMCW discharges at Schiller Station.

[232] *See* Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category: EPA's Response to Public Comments, Part 4 of 10 at 4-324 (Sept. 2015).
[233] *See* 80 Fed. Reg. at 67,863.

EPA Response to PSNH Comment V.C.3:

Contrary to the comment, EPA asserts that the Fact Sheet presents an adequate BAT analysis based on BPJ. As laid out in the Fact Sheet, the analysis considered: the age of equipment and facilities involved; the process employed; the engineering aspects of the application of various types of control techniques; process changes; the cost of achieving such effluent reduction; and non-water quality environmental impacts (including energy requirements). In response to this comment, EPA has addressed the more specific comments in detail below.

PSNH Comment V.C.3.a(1) Relevant Legal Background

To conduct a legally-defensible BAT analysis in accordance with Section 304 of the CWA, EPA must first identify "available" technologies by "survey[ing] the practicable or available pollution-control technology for an industry and assess[ing] its effectiveness." [234] Once identified, EPA must evaluate the following factors for each technology to determine which constitutes BAT: the age of equipment and facilities involved; the process employed; the engineering aspects of the application of various types of control techniques; process changes; the cost of achieving such effluent reduction; and non-water quality environmental impacts (including energy requirements). [235] EPA also must consider "the appropriate technology for the category or class of point sources of which the applicant is a member, based upon all available information" and "[a]ny unique factors relating to the applicant." [236] No one factor is determinative; instead, EPA must balance all of the factors in determining BAT.

EPA's analysis of the BAT factors and its determination that the corresponding effluent limitations are economically and technologically achievable must be reasonable.[237] EPA ultimately bears the burden of demonstrating a reasonable basis for its conclusions that the chosen effluent limitations are achievable and a failure to do so renders the limitations arbitrary, capricious, and "not the result of reasoned decision-making." [238] Effluent limitations simply will not pass muster if they are "based on a flawed, inaccurate, or misapplied study." [239] Likewise, a failure to evaluate any one of the aforementioned BAT factors, [240] and/or demonstrate the effectiveness of the chosen BAT, [241] automatically renders EPA's BPJ-based effluent limitations arbitrary and capricious.

Cost of the technology and retrofit is especially important. Indeed, the CWA specifically recognizes that BAT must be economically achievable, [242] and requires the "cost of achieving such effluent reduction" [243] to be similarly evaluated. [244] Therefore, the cost determination is twofold: cost must be considered in the six-factor BAT analysis, and the resulting effluent limitations must be economically achievable. [245] It makes sense that cost is such an important factor in the BAT analysis because "at some point extremely costly more refined treatment will have a de minimis effect on the receiving waters." [246] Thus, EPA is authorized to "balance factors such as cost against effluent reduction benefits" and, courts have upheld EPA's decision to reject a technology based on high economic impacts that might otherwise have been the most effective pollution control technology. [247]

EPA has repeatedly contended it need not conduct a cost-benefit analysis as part of its BAT determination. Even if EPA's assertion is correct—which PSNH does not concede [248]—this does not mean that cost is not important in the BAT analysis and the establishment of effluent limitations. EPA must implicitly consider the costs of the technology and the corresponding benefits received from the technology because of the duty to consider all of the factors in the BAT analysis. Additionally, the final BAT effluent limitations that are established must be economically achievable for the source. [249] In fact, the BPJ analysis requires a further step: the chosen technology must also be appropriate for point sources like the point source subject to the BPJ, based on all available information. [250] "All available information" certainly includes the costs of implementing the proposed BAT at similar facilities. Furthermore, EPA cannot solely rely on the fact that a facility or the public can "afford" a treatment technology as a basis for determining whether it is cost-effective.[251] The cost-benefit evaluation must be more than pretextual.

Once EPA determines BAT on a case-by-case basis based on its BPJ, EPA takes the technology standards established under the factors described above and applies that BAT to create actual effluent discharge limitations under Section 304 of the CWA. It is through the creation of these effluent limitations that EPA imposes technology-based treatment requirements into permits. [252]

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[234] Nat'l Wildlife Fed'n v. EPA, 286 F.3d 554, 561 (D.C. Cir. 2002) (quoting E.I. du Pont de Nemours & Co. v. Train, 430 U.S. 112, 131 (1977)).

[235] 40 C.F.R. § 125.3(d)(3) (i) – (vi).

[236] 40 C.F.R. §§ 125.3(c)(2)(i)–(ii); 125.3(d)(3); 33 U.S.C. § 1311(b)(2)(A).

[237] BP Exploration & Oil v. EPA, 66 F.3d 784, 794 (6th Cir. 1996).

[238] Ass'n of Pac. Fisheries v. EPA, 615 F.2d 794, 820 (9th Cir. 1980); Chem. Mfr's Ass'n v. EPA, 885 F.2d 253, 265 (5th Cir. 1989); Reynolds, 760 F.2d at 559.

[239] Texas Oil & Gas Ass'n v. EPA, 161 F.3d 923, 935 (5th Cir. 1998).

[240] *See*, e.g., Texas Oil & Gas Ass'n v. EPA, 161 F.3d 923, 934–35 (5th Cir. 1998) (noting that a failure to consider the age of the equipment and the facilities involved when determining BAT would constitute an abuse of discretion); Am. Iron & Steel Inst. v. EPA, 526 F.2d 1027, 1048 (3d Cir. 1975) (remanding effluent limits because EPA did not consider the age of the facilities involved and the impact that age would have on the cost and feasibility of retrofitting older facilities).

[241] Ass'n of Pac. Fisheries, 615 F.2d at 819; Chem. Mfr's Ass'n, 885 F.2d at 265.

[242] 33 U.S.C. § 1311(b)(2)(A)(i).

[243] 40 C.F.R. § 125.3(d)(3).

[244] *See* Texas Oil & Gas Ass'n 161 F.3d at 934 (noting cost refers to a consideration of the cost of the technology itself).

[245] *See* Ass'n of Pacific Fisheries, 615 F.2d at 819-20 (finding that EPA's failure to adequately consider the cost of land acquisition in the determination of whether a technology is an achievable technology is an example of unreasonable decision-making).

[246] *Id*. at 818; *See* also Am. Petroleum Inst. v. EPA, 787 F.2d 965, 972 (5th Cir. 1986) (providing that "EPA would disserve its mandate were it to tilt at windmills by imposing BAT limitations which removed de minimis amounts of polluting agents from our Nation's waters, while imposing possibly disabling costs upon the regulated industry.") (citing Alabama Power Co. v. Costle, 636 F.2d 323 (D.C. Cir. 1979) and Appalachian Power Co. v. Train, 545 F.2d 1351 (4th Cir. 1976)).

[247] *See* e.g., BP Exploration, 66 F.3d at 796. (rejecting a technology as BAT, in part, because of the cost of the technology).

[248] Importantly, neither does the Supreme Court or the President. Specifically, in Entergy Corp. v. Riverkeeper, Inc., 556 U.S. 208 (2009), the Court responded to Petitioner's argument that a "cost –benefit analysis is precluded under the [BAT] test" by stating that "[i]t is not obvious to us that [this] proposition is correct, but we need not pursue that point, [since we assuredly agree with other points]." *Id*. at 221-22. Likewise, the requirements of the President's Executive Order 13,563 mandate such a cost-benefit consideration on significant regulatory matters. *See* 76 Fed. Reg. 3821 (Jan. 16, 2011) (providing, in relevant part that "[o]ur regulatory system . . . must be based on the best available science. . . must promote predictability and reduce uncertainty. It must identify and use the best, most innovative, and least burdensome tools for achieving regulatory ends. It must take into account benefits and costs, both quantitative and qualitative" and that "each agency must, among other things: (1) propose or adopt a regulation only upon a reasoned determination that its benefits justify its costs (recognizing that some benefits and costs are difficult to quantify)").

[249] Texas Oil & Gas Ass'n, 161 F.3d at 934.

[250] 40 C.F.R. § 125.3(c)(2).

[251] If this were the case, EPA would be able to forego rigorous analyses of what technology is necessary for a particular site, and just rely on whether the owner of that facility is a Fortune 100, 500, or 1000 company ostensibly with deep pockets. *See* In re Pub. Serv. Co. of New Hampshire (Seabrook Station, Units 1 and 2), Case No. 76-7, 1 E.A.D. 332, 1977 WL 22370, at *7 (EAB 1977) ("Seabrook").

[252] *See* 40 C.F.R. § 125.3(c). EPA does not require the permittee to use this exact technology, and instead the permittee may use whatever technology it desires as long as the technology can achieve the effluent limits. *See*, e.g., Nat'l Wildlife, 286 F.3d at 561. However, application of EPA's chosen technology is generally the only way to achieve the effluent limitations.

EPA Response to PSNH Comment V.C.3.a(1):

In this subpart of the comment, PSNH presents its view of how EPA should determine BAT limits on a site-specific, BPJ basis. PSNH comments that EPA must consider and balance the multiple factors, including cost, that are specified in the CWA and EPA regulations, that no single factor is determinative in that balancing, and that EPA's determination that a particular technology is technologically and economically available must be reasonable. EPA agrees with the commenter that EPA must consider the variety of factors, including cost, that are specified in the applicable provisions of the statute and regulations, that EPA must balance these factors together in a reasonable way, and that the law does not dictate that any particular factor is determinative in all cases.

At the same time, the commenter suggests that cost is an "especially important" factor in the BAT determination. What the commenter intends by this comment is not entirely clear to EPA. As the commenter previously stated, no single factor is necessarily determinative in every case. Furthermore, CWA case law and legislative history indicates that cost should not necessarily be regarded as the most important factor in determining the BAT in a particular case. As one court explained, "for 'BATEA' [i.e., BAT] standards, cost was to be less important than for the BPCTCA= [i.e., BPT] standards, and that for even the 'BPCTCA' standards, cost was not to be given primary importance." *American Iron & Steel Inst. v. EPA*, 526 F.2d 1027, 1052, n. 51 (3d Cir. 1975), *modified in other part*, 560 F.2d 589 (3d Cir. 1977), *cert. denied*, 435 U.S. 914 (1978) (industry challenge to EPA regulations implementing BAT limits for iron and steel industry point sources). If the commenter's point, however, is simply that cost must be considered and it could be an important factor in a particular site-specific, BPJ determination of the BAT for a specific facility, then EPA agrees with this comment, too.

EPA further notes that given that neither the statute, regulations, nor case law, dictate precisely how EPA must balance the various factors together, EPA has the discretion to do so in any reasonable manner. *See BP Expl. & Oil v. EPA*, 66 F.3d 784, 800 (6th Cir. 1995) ("Congress intended that EPA have discretion 'to decide how to account for the consideration factors, and how much weight to give each factor.'"). In site-specific, BPJ determinations of technology standards, the relative importance of the various factors to be considered may vary based on the facts of each case.

At the same time, EPA agrees with the commenter that the technology selected as the BAT (and the effluent limits derived from projected use of that technology) must be economically and technologically achievable. This is apparent from the fact that the CWA's BAT standard calls for the best *available* technology *economically achievable* for making reasonable progress toward the statute's goal of eliminating point source discharges of pollutants. *See* 33 U.S.C. §§ 1311(b)(1)(A), 1314(b)(2)(B). *See also* 40 C.F.R. § 125.3(d)(3).

As set forth in the Fact Sheet (pp. 37-41), EPA considered the relevant factors, including costs, in a manner consistent with the Clean Water Act and the accompanying regulations. *See* 33 U.S.C. § 1342(a)(1)(B); 40 C.F.R. §§ 125.3(d)(3). EPA has found, and explained in its findings, that the BAT specified for Schiller Station control of non-chemical metal cleaning waste discharges is technologically and economically achievable. Additionally, the fact that EPA promulgated national effluent BPT limitations for *all* metal cleaning wastes that were equal to Region 1's BAT limits, further supports a finding that these limits are economically achievable.

The commenter notes that EPA stated in the Fact Sheet that it is not legally required to conduct a cost-benefit analysis in support of this BPJ, site-specific BAT determination for the Schiller Station permit. While the commenter states that it does not concede this point, it does not make a case that cost-benefit analysis *is* required. It only further argues that cost must be considered along with all the other enumerated factors, that cost is an important factor, and that a BAT technology must be technologically and economically feasible. EPA has already addressed these points and has, for the most part, agreed with them. EPA also maintains that it is not required to conduct a cost-benefit analysis in determining BAT limits, notwithstanding the sources cited in the commenter's footnote 248. Neither the Supreme Court's decision in *Entergy Corp. v. Riverkeeper, Inc.*, 556 U.S. 208 (2009) (cost-benefit analysis is permitted for setting CWA § 316(b) standards), nor Executive Order 13,563, 76 Fed. Reg. 3821 (Jan. 16, 2011) (directing agencies to consider cost-benefit analysis in developing *significant* regulations), nor the referenced Executive Order dictate that EPA must include cost-benefit analysis in a site-specific, BPJ determination of the BAT for setting effluent limits for a specific NPDES permit. *See also EPA v. Nat'l Crushed Stone Ass'n*, 449 U.S. 64, 71 (1980); *Tex. Oil & Gas Ass'n v. EPA*, 161 F.3d 923, 936 n.9 (5th Cir. 1998).

The commenter also suggests that EPA is obligated to assess the costs of using the same BAT technology at *other facilities* in the same industrial category. EPA disagrees with this comment to the extent that it suggests that the Agency must determine the costs of a technology at other facilities in the context of a site-specific, BPJ determination for a particular facility. While EPA agrees that it can consider available information about the use of various technologies at other facilities, requiring EPA to conduct an industrial category-wide analysis for a site-specific, BPJ decision would defeat the purpose of providing for BPJ analysis in the absence of national guidelines. In this case, EPA did consider the available information regarding technological approaches at other facilities. *See* 2015 Fact Sheet, p. 40 (discussion of Mystic Station). Furthermore, it is essential to remember that a site-specific, BPJ determination of BAT limits for a specific facility will not be determinative for or binding upon the industry as a whole in any subsequent rulemaking that sets nationwide standards or in any future BPJ evaluation.

Ultimately, EPA found that compliance with the application of this BAT analysis could be done with existing technology at a "modest" and "relatively insignificant" cost, based on the fact that the facility already segregates and treats chemical metal cleaning waste to comply with the same effluent limits being applied to NCMCWs. AR-259 (2015 Fact Sheet), p. 41. In fact, the administrative record includes a letter dated March 14, 2003 (AR-078), in which the Permittee describes the use of a holding tank to segregate "boiler fireside washwater (water that is used to wash coal ash from the boiler)," which is a specific type of NCMCW. The correspondence states that "[n]ormally, these boiler washwaters are stored separately in the holding tank to allow for settling and slow processing to the treatment basin for a more managed treatment process." EPA notes that it was actually standard practice for the Permittee to segregate this NCMCW in the holding tank at that time; *see also* Response V.C.3.c below. Furthermore, the other options for achieving compliance (*i.e.*, combined wastestream formula and wastewater reuse), which EPA discusses below (*see* EPA Responses to PSNH Comments V.C.3.c, V.C.3.d, and V.C.3.e) and outlines in the Final Permit, are even less costly than the anticipated costs associated with segregation of NCMCW through existing infrastructure and schedule changes.

Hence, this analysis adequately addresses cost and concludes that the proposed treatment is indeed economically achievable. There is no basis, therefore, to invalidate EPA's BAT analysis based on a lack of consideration of cost or any other necessary factor.

PSNH Comment V.C.3.a.(2) Region 1's Definition of NCMCWs is Vague and Seemingly Too Broad

Region 1 attempts to define "non-chemical metal cleaning waste" in its Fact Sheet as "any wastewater resulting from the cleaning of metal process equipment without using chemical cleaning compounds." [253] This definition lacks clarity and is overboard. For instance, must an operator be intending to actually clean a given piece of metal process equipment for the water that comes in contact with it to constitute NCMCWs? If so, is water that incidentally contacts metal process equipment still considered a low volume waste? Interjecting subjective intent into the definition of NCMCWs is problematic and will create unnecessary confusion for PSNH and personnel at the facility. And, what all is included in the definition of "metal process equipment?" Will water intended to clean an electrical junction box associated with operation of the CWISs or water from an intake screen backwash constitute NCMCWs—requiring segregation and isolated chemical precipitation treatment? Without clarity on these issues, it is not possible for PSNH to know what process changes and/or retrofits will be required to comply with the new permit.

In crafting this bloated definition of NCMCWs, Region 1 has ignored EPA's historical management of this waste stream and disregarded the instructive list of pieces of metal process equipment specifically referenced in the definition of "metal cleaning wastes" to serve as a guide for determining the scope of regulation for metal cleaning wastes (chemical and nonchemical) at a given facility. "Metal cleaning wastes" were first defined in the 1974 ELGs as "any cleaning compounds, rinse waters, or any other waterborne residues derived from cleaning any metal process equipment including, but not limited to, boiler tube cleaning, boiler fireside cleaning and air preheater cleaning." [254] For decades, EPA focused on developing data limited to chemical boiler cleaning wastes and NMCMWs associated with water washing of ash on boiler firesides and air preheaters. This makes perfect sense, given that these pieces of metal process equipment are specifically referenced in EPA's definition for the waste stream. This list was presumably included in the definition for a reason. Although it is not exclusive, inclusion of a representative list such as this one should be interpreted to clarify that the agency never intended for all water that comes in contact with any metal process equipment to be interpreted as metal cleaning waste. To do so renders the representative list of metal process equipment included in the "metal cleaning waste" definition semantic and meaningless.

Only recently, as a part of the 2015 ELGs, did EPA attempt to better ascertain the potential breadth of the metal cleaning waste stream and gather corresponding additional data beyond water washing of ash on boiler firesides and air preheaters. And, this effort proved fruitless, as the agency itself provided that "plants refer to the same [NCMCW] operation using different terminology" and that results of EPA's data collection efforts are "skewed" and insufficient. [255] Region 1 has not concerned itself with understanding the wastewater management issues that will arise at Schiller Station by the expansive definition of NCMCWs advanced in the Draft Permit. Nor has the agency heeded the specific list of metal process equipment included in the definition of "metal cleaning wastes" and attempted to extrapolate a reasonable list of additional metal process equipment that may be included in the definition of NCMCWs at Schiller Station. Instead, Region 1 has elected to adopt a definition of NCMCWs that is seemingly all-inclusive. This interpretation is not supported by the administrative record and cannot pass muster without additional analysis or discussion of the costs (including infrastructure needs) and expected pollutant reductions associated with such an expansive definition. In actual fact, expanding the meaning of "NCMCWs" to water washing of process equipment other than gas-side ash removal will be expensive and of limited environmental benefit, especially if comingling is prohibited and iron and copper limits imposed. Any definition of NCMCWs should therefore be restricted to the gas-side removal of ash without chemicals. A suitable definition of "NCMCWs" would be "any wastewater from the cleaning of ash from gas-side process equipment from the boiler to the stack without chemical cleaning compounds, including boiler fireside cleaning and air preheater cleaning."

[253] Fact Sheet at 37.

[254] 39 Fed. Reg. 36,186, 36,205 (Oct. 8, 1974).

[255] *See* 80 Fed. Reg. at 67,863.

EPA Response to PSNH Comment V.C.3.a.(2):

In general, EPA disagrees with the comment that the definition for NCMCW in the Fact Sheet is vague and too broad. At the beginning of this comment, the commenter asks "must an operator be intending to actually clean a given piece of metal process equipment for the water that comes in contact with it to constitute NCMCWs?" To this, the Region replies "Yes." It is not the Region's intent to broaden the scope of non-chemical metal cleaning waste beyond that defined for metal cleaning waste to necessarily include any water that incidentally, or accidentally, comes into contact with any metal equipment within the facility. However, neither does the Region intend to narrow the scope as suggested to limit it only to "wastewater from the cleaning of ash from gas-side process equipment from the boiler to the stack without chemical cleaning compounds, including boiler fireside cleaning and air preheater cleaning." This would be inconsistent with the definitions of metal cleaning wastes in EPA's regulations and regulatory preambles, as has been discussed already herein. In EPA's view, the same scope of the definition of "metal cleaning waste" should apply to both chemical and non-chemical metal cleaning wastes.

As explained in the 2015 Fact Sheet, metal cleaning waste is defined in the regulations as:

> any wastewater resulting from cleaning [with or without chemical cleaning compounds] any metal process equipment including, but not limited to, boiler tube cleaning, boiler fireside cleaning, and air preheater cleaning.

40 C.F.R. § 423.11(d). Thus, the plain language of this regulation defines *metal cleaning waste* to include *any* wastewater generated from *either the chemical or non-chemical cleaning of metal process equipment*. Furthermore, the regulations define *chemical metal cleaning waste* as *any wastewater resulting from cleaning of any metal process equipment with chemical compounds, including, but not limited to, boiler tube cleaning*. EPA also uses, but does not expressly define, the term *non-chemical metal cleaning waste* in the regulations when it states that it has *reserved* the development of BAT ELGs for such wastes. 40 C.F.R. § 423.13(f). These definitions for *metal cleaning waste* and *chemical metal cleaning waste* make clear that *non-chemical metal cleaning waste* is any wastewater resulting from the cleaning of any metal process equipment without chemical cleaning compounds. Finally, the regulations define *low volume waste* as:

> …wastewater from all sources except those for which specific limitations or standards are otherwise established in this part. Low volume waste sources include, but are not limited to, the following: Wastewaters from ion exchange water treatment systems, water treatment evaporator blowdown, laboratory and sampling streams, boiler blowdown, floor drains, cooling tower basin cleaning wastes, recirculating house service water systems, and wet scrubber air pollution control systems whose primary purpose is particulate removal. Sanitary wastes, air conditioning wastes, and wastewater from carbon capture or sequestration systems are not included in this definition.

40 C.F.R. § 423.11(b). The waste sources listed as examples of low volume wastes include various process and treatment system wastewaters and do not include wastewater generated from

washing metal process equipment. Therefore, low volume wastes are distinct from metal cleaning wastes.

The ELG regulations establish Best Practicable Technology (BPT) daily maximum and 30-day average limits of 1.0 mg/L for both total copper and total iron in discharges of "metal cleaning waste." On the face of the regulations, these limits apply to both chemical and non-chemical metal cleaning wastes because, as stated above, both are included within the definition of "metal cleaning waste." 40 C.F.R. § 423.12(b)(5), 423.11(d). Thus, under the effluent limitation guidelines, the facility's chemical and non-chemical metal cleaning wastes are subject to BPT limits of 1.0 mg/L (maximum and 30-day average limits) for both total copper and total iron.[43]

The regulations also set BAT daily maximum and 30-day average limits of 1.0 mg/L for both total copper and total iron in discharges of *chemical metal cleaning waste*, 40 C.F.R. § 423.13(e), while indicating that EPA has "reserved" specification of BAT ELGs for non-chemical metal cleaning waste. 40 C.F.R. § 423.13(f). Thus, although the regulations only set national, categorical BAT ELGs for *chemical* metal cleaning waste, they nevertheless indicate that the BAT standard applies to non-chemical metal cleaning wastes. EPA explained in the preamble to the Steam Electric ELGs promulgated in 1982, that it was "reserving" the specification of BAT ELGs for non-chemical metal cleaning waste because it felt that it had insufficient information regarding (a) the potential for differences between the inorganic pollutant concentrations found in the nonchemical metal cleaning wastes of oil-burning and coal-burning power plants, and (b) the cost and economic impact that would result from requiring that nonchemical metal cleaning wastes satisfy the same limits that had been set for chemical metal cleaning wastes. 47 Fed. Reg. 52297 (Nov. 19, 1982).[44]

Of course, in the absence of an applicable national ELG, EPA applies the Clean Water Act's (CWA's) narrative technology standards on a case-by-case, BPJ basis in order to develop NPDES permit limits. 33 U.S.C. § 1342(a)(1)(B); 40 C.F.R. § 125.3(c)(2).[45] As previously stated, Region 1 engaged in just such a case-by-case analysis for this permit. Considering the

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[43] While the Jordan Memorandum may affect BPT limits for NCMCW in limited circumstances, as discussed above in Responses V.C.1 and V.C.2.a, it does not apply to NCMCWs at Schiller Station.

[44] For the November 2015 revised Steam Electric ELGs, the Agency "…decided that it does not have enough information on a national basis to establish BAT/NSPS/PSES/PSNS requirements for non-chemical metal cleaning wastes. The final rule, therefore, continues to ''reserve'' BAT/ NSPS/PSES/PSNS for non-chemical metal cleaning wastes, as the previously promulgated regulations did." 80 Fed. Reg. 67,863.

[45] In the preamble to the 2015 Steam Electric ELGs, the Agency explains that "…the permitting authority must continue to establish such requirements based on BPJ for any steam electric power plant discharging this wastestream. As explained in Section VIII.I, in permitting this wastestream, some permitting authorities have classified it as non-chemical metal cleaning wastes (a subset of metal cleaning wastes), while others have classified it as a low volume waste source; NPDES permit limitations for this wastestream thus reflect that classification. In making future BPJ BAT determinations, EPA recommends that the permitting authority examine the historical permitting record for the particular plant to determine how discharges of non-chemical metal cleaning wastes have been permitted in the past. Using historical information and its best professional judgment, the permitting authority could determine that the BPJ BAT limitations should be set equal to existing BPT limitations or it could determine that more stringent BPJ BAT limitations should apply. In making a BPJ determination for new sources, EPA recommends that the permitting authority consider whether it would be appropriate to base standards on BPT limitations for metal cleaning wastes or on a technology that achieves greater pollutant reductions." 80 Fed. Reg. 67,884.

discussion above, EPA disagrees that it expanded the scope of the regulation. Rather, given this clarification regarding the scope of the regulation, EPA maintains that the cost of implementing the required process changes and subsequent treatment would remain modest.

For further clarification, the 2015 Fact Sheet also mentions that non-chemical metal cleaning wastes may include wastewater from a variety of sources such as the following non-chemical metal process equipment washing operations: air pre-heater wash, SCR catalyst wash, boiler wash, furnace wash, stack and breeching wash, fan wash, precipitator wash, and combustion air heater wash. If the Permittee is unable to determine whether a particular waste stream should be classified as NCMCW, they should feel free to contact the Region for additional clarity.

PSNH Comment V.C.3.b There Is No NCMCW Discharge Data in the Current Administrative Record

Central to any BPJ-based BAT determination is a keen understanding of the waste stream to be regulated. Knowledge of both the kind and quantity of constituents found within that waste stream is fundamental inasmuch as it provides the only foundation upon which to assess the costs and economic achievability of any proposed regulation of the wastewater. Region 1 lacked the necessary information regarding NCMCWs generated at Schiller Station. This is so regardless of the precise definition of the waste stream advanced by the agency. Specifically, a review of the administrative record for this permit renewal proceeding reveals Region 1 does not possess any data analyzing isolated discharges of NCMCWs at Schiller Station. Instead, what Region 1 does possess is limited data of constituents discharged through Outfall 016, in accordance with the terms and conditions of the current permit. [256] NCMCWs comprise only a small, relatively infrequent, and varying fraction of the total volume of wastewater discharged through this internal outfall. It is therefore improper for Region 1 to attempt to rely upon this data as representative of constituents found in isolated NCMCW discharges at Schiller Station. [257]

The reality is that currently there is no data analyzing isolated NCMCWs generated at Schiller Station due to the fact that PSNH historically has relied upon the Jordan Memorandum and commingled this waste stream with other low volume waste streams periodically generated at the facility. PSNH never needed to analyze this isolated waste stream due to this longstanding practice; nor has Region 1 ever requested any analyses of isolated NCMCWs over the 50+ year life of this facility. This is true despite the agency's inexplicable attempt to alter the regulatory requirements applicable to this waste stream in this permit renewal proceeding. This data is indispensable in establishing reasoned BPJ-based BAT effluent limitations. The agency's current BAT analysis is therefore necessarily arbitrary, capricious, and "not the result of reasoned decision-making" given it ultimately is Region 1's burden to demonstrate a reasonable basis for its conclusions that its chosen effluent limitations are achievable. [258]

Collecting a representative sample of NCMCWs at Schiller Station could prove difficult, if not impossible, due to the current configuration and operation of the facility. Region 1's supposition in the Fact Sheet that PSNH can prospectively either:

> (1) eliminate or divert all other low volume waste streams whenever NCMCWs are being generated and treated; or

> (2) divert isolated NCMCWs to another treatment process before commingling it with other low volume waste streams; [259]

simply does not reflect reality given wastewater treatment at the facility was designed to centrally treat all wastewaters, meaning commingled treatment of NCMCWs with other low volume wastes is unavoidable.

Region 1 has not, and indeed cannot, adequately evaluate the requisite BAT factors and establish BPJ-based effluent limitations for NCMCW discharges at Schiller Station without representative data of isolated NCMCWs generated at the facility. Its attempt to do so in this permit renewal proceeding is arbitrary, capricious, and a violation of the CWA and EPA's implementing regulations.

Although not mentioned in the Fact Sheet or the administrative record, it likewise would be improper, arbitrary, and capricious for Region 1 to attempt to rely upon any NCMCW data compiled by EPA for use in formulating its NELGs for the industry. This is prohibited when generating site-specific effluent limitations utilizing BPJ. [260] Furthermore, even if reliance on industry data were acceptable, the data EPA has collected over the years is of limited or no utility. EPA admits as much in its latest NELGs:

> EPA based [its 2013 NCMCWs BAT] proposal on EPA's understanding, from industry survey responses, that most steam electric power plants manage their chemical and non-chemical metal cleaning wastes in the same manner. Since then, based in part on public comments submitted by industry groups, the Agency has learned that plants refer to the same operation using different terminology; some classify non-chemical metal cleaning waste as such, while others classify it as low volume waste sources. Because the survey responses reflect each plant's individual nomenclature, the survey results for non-chemical metal cleaning wastes are skewed. Furthermore, EPA does not know the nomenclature each plant used in responding to the survey, so it has no way to adjust the results to account for this. Consequently, EPA does not have sufficient information on the extent to which discharges of non-chemical metal cleaning wastes occur, or on the ways that industry manages their non-chemical metal cleaning wastes. Moreover, EPA also does not have information on potential best available technologies or best available demonstrated control technologies, or the potential costs to industry to comply with any new requirements. Due to incomplete data, some public commenters urged EPA not to establish BAT limitations for non-chemical metal cleaning wastes in this final rule. Ultimately, EPA decided that it does not have enough information on a national basis to establish [BAT] requirements for non-chemical metal cleaning wastes. The final rule, therefore, continues to "reserve" [BAT] for non-chemical metal cleaning wastes, as the previously promulgated regulations did.[261]

Data from the agency's 1974 and 1982 rulemakings is also unsuitable. There was no representative or verified data of isolated NCMCW discharges in the record of the 1974 ELG rules. And, the agency's 1982 record contained only limited data on fireside washes that, if anything, demonstrated applying iron and copper limits to NCMCWs is unnecessary and would be extremely expensive, and ultimately led EPA to conclude the available "data were too limited to make a final decision" in that rulemaking initiative. [262]

These collective realities compel the conclusion that Region 1 lacks sufficient data on the waste characteristics of NCMCWs to adequately assess the feasibility and costs of controlling the waste stream at Schiller Station by and through the imposition of new BPJ-based effluent limitations. Its attempt to do so in the Draft Permit despite the lack of this imperative data is arbitrary and capricious. Indeed, despite the fact that the agency refused to set BAT effluent limitations in the NELGs due to incomplete data and information, Region 1 is attempting here to impose BPJ-based limitations with no data. This too is arbitrary and capricious.

[256] *See* AR-044, AR-139, AR-142, & AR-214 to AR-220.

[257] Reliance upon data and/or facts pertaining to chemical metal cleaning wastes discharged through Outfall 017 at Schiller Station as representative of NCMCW discharges is also not acceptable, as chemical metal cleaning wastes are much more complex and warrant individual management because they are more difficult, and take significantly more time, to effectively treat before they may be properly discharged.

[258] *See*, e.g., Ass'n of Pac. Fisheries, 615 F.2d at 820. 259 Fact Sheet at 36.

[259] Fact Sheet at 36.

[260] *See*, e.g., EPA NPDES Permit Writers' Manual, EPA-833-K-10-001 (Sept. 2010) at 5-44 to -48 (listing a facility's NPDES application form and discharge monitoring reports as sources of permissible information about constituents found in a given waste stream and further providing that without such data, "[t]he permit writer might need to establish a monitoring-only requirement in the current NPDES permit to identify pollutants of concern and potential case-by-case limitations for the subsequent NPDES permit renewal.").

[261] *See* 80 Fed. Reg. at 67,863; *See* also Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category: EPA's Response to Public Comments, Part 7 of 10 at 7-179 (Sept. 2015) (providing that "[b]ecause EPA lacks solid baseline information about what the current practices are, which is the foundation for assessing costs and economic achievability, as well as the other factors required to be assessed for BAT the final rule continues to reserve [BAT] for non-chemical metal cleaning wastes, as the previously promulgated regulations did.").

[262] *See* 47 Fed. Reg. at 52,297

EPA Response to PSNH Comment V.C.3.b:

EPA agrees that the data available in the BAT analysis was limited. However, EPA did review both site-specific data for Outfall 016 which includes NCMCWs comingled with dissimilar low volume waste streams, as well as site-specific data for Outfall 017 which contains segregated chemical metal cleaning waste. Both outfalls had permit limits of 1.0 mg/l for both total copper and total iron and neither outfall had any permit violations for copper or iron during the review period (November 1990 through April 2014). Based on this limited data, and that there is no reason to believe NCMCW would contain significantly more copper or iron than chemical metal cleaning waste, it can reasonably be concluded that the Permittee is able to effectively treat both chemical metal cleaning waste and NCMCW with existing treatment processes.

Additionally, EPA notes that this requirement and the underlying ELG are technology-based and not water quality-based effluent limits. Therefore, site-specific water quality data is not necessarily required in setting permit limits (*see Am. Petroleum Inst. V. EPA*, 858 F.2d 261, 265-66 (5th Cir. 1988)), but the regulations instead state that EPA use "all available information" to determine the appropriate BAT technology applicable to the applicant. 40 C.F.R. § 125.3(c)(2)(i). *See also* EPA Response to PSNH Comment V.C.3.a(1). The 2015 Fact Sheet and the administrative record demonstrate that EPA utilized available data specific to Schiller Station as well as to the industry to determine that the selected BAT is economically achievable, reasonable, and is consistent with the goals of the Clean Water Act.

As for the commenter's suggestion that any data used in past Steam Electric ELG rulemakings is irrelevant or inappropriate for this BPJ BAT determination, EPA finds it overly broad and incorrect. First, as stated previously, EPA uses all available information, and determines which of that information is applicable and relevant to the case-specific BPJ determination. Nowhere in the 2015 Fact Sheet or administrative record does EPA explicitly base this BPJ determination on the data compiled in support of the 2015, 1982, and 1977 national rulemakings, and the commenter even acknowledges this fact. Instead, the 2015 Fact Sheet makes clear that the Agency based its BPJ analysis on both the site-specific information (as it relates to each of the regulatory and statutory factors) and model technology at facilities such as Mystic Station, in Everett, Massachusetts. *See* AR-259 (2015 Fact Sheet), p. 40 (citing to the Mystic Station NPDES Permit No. MA0004740). Moreover, to the extent that EPA did rely on the records supporting past ELG rulemakings, EPA acknowledges that some of the past data was incomplete or was not sufficiently robust to support an *industry-wide* BAT determination for NCMCWs. *See, e.g.*, AR-259, p. 38.[46] This does not mean that 1) all the data and records supporting past rulemakings are invalid for consideration in this permit proceeding, and 2) that this data and record would be inapplicable or insufficient to inform a *site-specific*—as opposed to an *industry-wide*—BPJ analysis, such as this one for NCMCWs at Schiller Station.

Finally, EPA disagrees with the claim in this comment that PSNH has historically relied on the Jordan Memorandum. This is discussed in more detail in Responses V.C.1 and V.C.2.a above.

PSNH Comment V.C.3.c Requiring Changes in Current Plan Processes to Segregate and Treat NCMCWs Would Be Difficult, If Not Impossible

Current infrastructure and processes employed at Schiller Station would need to be extensively overhauled to attempt to segregate and treat NCMCWs from other low volume wastes, as Region 1 has proposed in the Draft Permit. Even then, complete segregation from other low volume waste streams prior to treatment may not be possible. Region 1 attempts to gloss over these operational realities by baldly asserting PSNH can either eliminate or divert all other low volume waste streams whenever NCMCWs are being generated and treated or divert isolated NCMCWs to another treatment process before commingling the waste stream with other low volume waste streams. [263] These abstract statements ignore that Schiller Station was specifically designed to handle and treat smaller and less infrequent waste streams, like NCMCWs, in a centralized manner for the sake of efficiency. Attempting to overhaul this decades-long practice does not take place by the push of a button or a change in operational procedure.

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[46] "EPA explained in the preamble to the Steam Electric Power Plant NELGs, promulgated in 1982, that it was 'reserving' the specification of BAT standards for non-chemical metal cleaning wastes because it felt that it had insufficient information regarding (a) the potential for differences between the inorganic pollutant concentrations found in the non-chemical metal cleaning wastes of oil-burning and coal-burning power plants, and (b) the cost and economic impact that would result from requiring the *entire industrial category* to ensure that non-chemical metal cleaning wastes satisfy the same limits that had been set for chemical metal cleaning wastes." AR-259 (2015 Fact Sheet), p. 38 (citing 47 Fed. Reg. 52297 (Nov. 19, 1982)) (emphasis added).

As currently proposed, any wash water that comes in contact with any "metal process equipment" constitutes NCMCWs, according to Region 1's broad definition. [264] At Schiller Station, this includes all wash water utilized to pressure wash boilers, air heaters, precipitators, and stacks, among other associated process equipment. Within the industry, the primary treatment system for wastewaters of this kind is designed to operate in a centralized manner, i.e., to mix streams and manage them together in order to be efficient. [265] Schiller Station is no different.

For instance, wastewaters from boiler blowdown, demineralizer regenerations, and floor drains (collectively considered low volume wastes) are commingled at Schiller Station, both out of necessity and by design. Even during other shorter outages, Schiller Station's floor drains are routinely exposed to fireside wastewater or some other nonchemical metal cleaning operation, *e.g.*, condenser and heat exchanger cleanings. Therefore, the floor drain system routinely transfers a combination of low volume wastes and NCMCWs from Schiller Station to the treatment facility.

A mandate to manage NCMCWs separately is not currently possible at Schiller Station since the wastewater treatment facilities were designed to centrally treat all wastewaters. Such wash waters necessarily end up in floor drains, where they are unavoidably combined with other low volume wastes. Furthermore, even if possible, segregation of NCMCWs from other low volume waste streams would be labor intensive (e.g., construction of isolated berms or other temporary containment structures so that wash water could be contained and held for treatment) and likely lead to upsets and/or recurring operational issues.

Further complicating matters is that the infrastructure retrofits necessary to isolate NCMCWs, as Region 1 has proposed, are generally very expensive and, once installed, necessarily preclude other technologies from occupying the same space, meaning facilities have limited space in which to achieve the maximum environmental benefit from control technologies. The relative infrequency of nonchemical metal cleaning operations at Schiller Station, the comparatively low concentrations of constituents of concern believed present in the NCMCWs, the fact the metals in the waste stream settle out easily, and the substantial volume of water generated during a unit wash down (at least under Region 1's expansive definition of what constitutes NCMCWs) that would need to somehow be isolated and retained, lead to only one reasonable conclusion: the investment in retrofit technology for the isolated treatment of NCMCWs cannot be justified given all other environmental regulatory initiatives requiring retrofits that compete for the same space within the facility.

Managing NCMCWs in the manner Region 1 has proposed in the Draft Permit will likely require the addition of a second storage facility at Schiller Station. Unless a facility has a substantial existing footprint with copious amounts of unused real estate, which Schiller Station does not, the most likely option to fit a storage facility would be to reclaim a section of an existing treatment system to construct new basins. This is a costly proposition and would impact the effectiveness of treatment currently provided by reducing retention time in existing treatment systems.

Separately, Region 1 is forthright that its initiative to isolate NCMCWs from other low volume wastes is to avoid the purported dilution of the concentration of certain constituents that occurs when these streams are commingled. Remarkably, even under the regulatory scheme proposed in the Fact Sheet to the Draft Permit, there is no practical way to regulate dilution. Region 1 has no means of knowing or predicting how much water a permittee will need to use to clean its equipment and facilities to a satisfactory level, nor does Region 1 have a right to regulate such cleaning. Commingling of waste streams is about providing an efficient, centralized method of treatment in accordance with the facility's original design and has nothing to do with secretly diluting wastewater.

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[263] *See* Fact Sheet at 36.

[264] *See* Fact Sheet at 37.

[265] *See*, e.g., EPA Technical Development Document for the Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category, EPA-821-R-15-007 (Sept. 2015), at 8-19 ("The vast majority of plants combine some of their legacy wastewater with each other and with other waste streams, including . . . metal cleaning wastes, and low volume waste sources in surface impoundments.").

EPA Response to PSNH Comment V.C.3.c:

Firstly, see EPA's Response to PSNH Comment V.C.3.a.(2) above regarding the definition of NCMCWs not being as "broad" as the commenter suggests. Given this clarification, EPA acknowledges that there still may be feasibility issues with managing NCMCWs separately from low volume and other waste streams. If this is the case, EPA notes that the option of using a combined waste stream formula (CWF) to develop limits was also put forward in the 2015 Fact Sheet. EPA explained in 2015 that it did not have sufficient information to derive a combined waste stream limit. Therefore, the Permittee is responsible for developing a CWF approach to compliance, if desired. *See* EPA's Response to PSNH Comment V.C.3.d below for further discussion of this topic.

Given some of the practical considerations raised in this comment, EPA also notes that other options may also be explored to properly segregate NCMCW in compliance with this permit. These options include (1) the use of WWTF #1 (which is rarely operated) to treat NCMCWs separately from other waste streams, or (2) using the boilers to evaporate NCMCW (similar to that done for chemical metal cleaning waste as described in the Fact Sheet at 21), or (3) direct piping for NCMCW within the same floor drain system, so as not to occupy additional space, or (4) the use of an alternate holding tank to segregate and treat NCMCW. EPA maintains that, given the various options available to the permittee presented in the Fact Sheet as well as here and in Response V.C.3.d below, proper segregation of NCMCWs and compliance with the permit is both possible and the costs associated with such segregation would be modest.

Regarding the fourth option described above (i.e., the use of an alternate holding tank), EPA notes that on March 14, 2003 the Permittee submitted a letter to EPA which included a description of a holding tank that was being used to segregate "boiler fireside washwater (water that is used to wash coal ash from the boiler)," which is a specific type of NCMCW. The correspondence states that "[n]ormally, these boiler washwaters are stored separately in the holding tank to allow for settling and slow processing to the treatment basin for a more managed treatment process." AR-078. EPA notes that it was actually standard practice for the Permittee to segregate this NCMCW in the holding tank at that time. This is contrary to the assertion in this comment that "Schiller Station would need to be extensively overhauled" or that "complete segregation from other low volume waste streams prior to treatment may not be possible". EPA has therefore modified the description of Outfall 017 in the Final Permit to allow metal cleaning waste (both chemical and non-chemical) to be completely segregated at an alternate holding tank, if desired, rather than at WWTP #2 as specified in the Draft Permit, and permit compliance for the copper and iron limits may be achieved either at the discharge point from this holding tank or at the discharge point from the WWTP #2. This flexibility in monitoring location may provide yet another option for the Permittee to properly comply with the permit.

Furthermore, EPA notes that other power plants have been able to manage their waste separately, as required for Schiller Station. The NPDES permit for the Mystic Station power plant in Everett, Massachusetts, for instance, requires non-chemical metal cleaning wastes to receive the same level of treatment as chemical metal cleaning wastes and both must meet mass-based limits equivalent to concentration-based limits of 1.0 mg/L for total copper and total iron. *See* Mystic Station NPDES Permit No. MA0004740. The 2008 final Canal Station NPDES Permit (withdrawn and re-noticed for unrelated reasons) also requires that non-chemical metal cleaning wastewater meet copper and iron limits prior to dilution with other waste streams (except for chemical metal cleaning).

In addition to the commenter's discussion of the difficulties of implementing the BAT limits for NCMCW, the commenter also seems to argue that it is an industry norm to mix NCMCWs with other waste streams for the sake of efficiency. To support this line of argument, the commenter cites to EPA Technical Development Document for the Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category, EPA-821-R-15-007 (Sept. 2015), and quotes the following text: "The vast majority of plants combine some of their legacy wastewater with each other and with other waste streams, including . . . metal cleaning wastes, and low volume waste sources in surface impoundments." pp. 8-19. This quote, however, is taken out of context. The quote is referring to management of legacy wastewater for the purpose of the 2015 Steam Electric ELGs. The fact that legacy wastewater, under the 2015 ELGs, is often held in impoundments along with other waste streams does not mean that the impoundment does not require such other waste streams to be *treated* and subject to other effluent limits prior to entry. In fact, this combination of waste streams is consistent with EPA's approach here, in that internal outfalls may be treated and then later combined prior to discharge from the facility. Thus, the quote does not stand for the principle the commenter seeks to set forth above.

Furthermore, it is notable that the commenter seeks to rely on a document that was generated in support of the 2015 Steam Electric ELG rulemaking to influence the BAT limits selected by EPA for NCMCW. In Comment V.C.3.b above, this commenter, PSNH, stated that it is "improper, arbitrary, and capricious" to rely on data from EPA's 2015 rulemaking to support this BAT determination, and that such reliance "is prohibited when generating site-specific effluent limitations utilizing BPJ" and is "of limited or no utility." The commenter should not seek to have it both ways; it should not now seek to use the same data and analysis upon which it claims EPA is prohibited from relying.

PSNH Comment V.C.3.d Use of a Combined Waste Stream Formula Will Not Work at Schiller Station

Region 1 advances the development of a combined waste stream formula as one potential mechanism for handling and treating NCMCWs in the manner it has proposed in the Draft Permit. [266] The agency asserts that electing to comply with the proposed permit limitations utilizing this approach could be less expensive than making engineering modifications at the facility. [267] In reality, use of a combined waste stream for the effective treatment of NCMCWs at Schiller Station is not practical and would likely result in the use and waste of thousands of dollars of chemical treatments not ultimately necessary to comply with the proposed iron and copper effluent limitations.

To establish effluent limitations for NCMCWs based on a combined waste stream formula, Region 1 states that it will need "a comprehensive list of all non-chemical metal cleaning, low volume and stormwater waste streams that currently commingle at WWTP #2. This list must include the <u>total volume, frequency and concentrations of iron and copper for each wastewater stream</u>." [268] It is in providing the respective total volumes, frequencies, and concentrations of iron and copper for NCMCWs and each of current waste streams commingled with NCMCWs that best illustrates the impracticalities associated with this treatment theory. No two volumes of NCMCWs are the same for equipment water washes at Schiller Station or anywhere in the industry. EPA recognized this as part of its 2015 ELGs rulemaking: "Additionally, some waste streams have significant variations in flow, such as metal cleaning wastes." [269] The volumes of boiler blowdown, demineralizer regenerations, floor drains, and other low volume wastes currently commingled with NCMCWs at Schiller Station likewise fluctuate a great deal.

The frequencies at which these various commingled waste streams are generated vary significantly, as well. Employing Region 1's overly-broad definition of NCMCWs, some form of this waste stream may be generated hourly or daily most days and may be continuous for extended periods of time during a planned outage. Frequencies of boiler blowdown, demineralizer regenerations, floor drains, and other commingled low volume wastes often times vary a great deal depending upon plant operations and other factors, as well.

Concentrations of iron and copper attributable to each waste stream are likewise impossible to predict or estimate with any degree of certainty and would be further compounded by intake credit issues. [270] While the discharge monitoring reports for the facility demonstrate that concentrations of iron and copper from these combined low volume waste streams have never so much as approached the effluent limitations applicable at Schiller Station, [271] PSNH currently has no way of knowing what amount of iron and copper limits are attributable to each isolated low volume waste stream. Moreover, given the aforementioned variables, PSNH has serious doubts that the concentrations of iron and copper within these isolated low volume waste streams remain consistent. Instead, it is more likely that the amount of iron and copper in, for instance, NCMCWs and wastewater entering floor drains fluctuate a great deal depending upon plant and/or personnel operations.

Due to the aforementioned myriad of variables and unknowns, establishing a preset formula to effectively treat NCMCWs at Schiller Station and ensure compliance with the proposed iron and copper effluent limitations utilizing the combined waste stream theory is not possible. Attempting to rely upon a formula such as this would cause PSNH to either over-treat the combined waste stream with excessive amounts of chemicals to precipitate out the iron and copper constituents at a significant annual cost to the company and its customers or, conversely, subject PSNH to frequent and repeated exceedances of the proposed effluent limitations due to the great degree of variability in the makeup of the combined waste stream. Neither scenario is a sensible one. The combined waste stream formula approach should therefore be disregarded as impractical for the regulation of NCMCWs at Schiller Station.

[266] *See* Fact Sheet at 36.

[267] *See* Fact Sheet at 41.

[268] Fact Sheet at 36 n.7 (emphasis added).

[269] 80 Fed. Reg. at 67,855.

[270] *See* 40 C.F.R. § 122.45(g) (providing that technology-based effluent limitations shall be adjusted to reflect credit for pollutants in the discharger's intake water under certain conditions).

[271] Again, these effluent limitations are made applicable only to ensure iron and copper constituents are not being discharged at times other than chemical cleaning operations and to confirm that metals are not present in any unexpected waste stream during normal operations.

EPA Response to PSNH Comment V.C.3.d:

See EPA's Response to PSNH Comment V.C.3.a.(2) above regarding the definition of NCMCWs not being as "broad" as the commenter suggests. If the resulting NCMCW streams are still not able to be segregated, EPA maintains that incorporating a CWF may be a suitable option. Based on the commenter's description of the current operation of the facility in the previous comments, it seems that neither a complete segregation of NCMCW nor the direct application of a CWF are ideal solutions. In this case, EPA suggests the following hybrid approach that may be a simpler and more affordable option.

First, while not all dissimilar flows may be easily segregated from NCMCWs, certainly some of the flows could be segregated simply through schedule changes, as suggested in the Fact Sheet. Next, the remaining dissimilar flows could be sampled (for copper, iron, flow, etc.) and the results used to develop a simplified CWF which only includes those waste streams that cannot be reasonably segregated from NCMCW. EPA acknowledges that this subset of waste streams may still have highly variable flows and concentrations of copper and iron, but expects that a robust dataset along with some conservative assumptions for volumes and frequencies of certain waste streams could adequately approximate the level of treatment required to comply with the copper and iron effluent limits. Given the complex nature of this facility, EPA is open to assist the Permittee in developing such an approach, if requested.

EPA understands that the volumes of certain waste streams are highly variable and may need to be estimated in order to develop a reasonable CWF. EPA also acknowledges that these waste streams may vary over time as processes within the facility change. One possible way to develop a CWF is to use the historical flow results from Outfall 016 (referred to as 016A in the previous permit) in order to provide a baseline flow. As shown in the 2015 Fact Sheet, the average flow from this outfall was 65,413 gallons per day. Assuming the only source of copper and iron are from the NCMCW (a conservative assumption), then the only other necessary information to develop a reasonable CWF would be the average flow of the NCMCW, defined in accordance with EPA's Response V.C.3.a.(2) above. This data would provide a somewhat conservative baseline dilution factor which could then be modified by implementing schedule changes to segregate certain waste streams (described above) and/or by reusing certain waste streams as metal cleaning waste (described below) and/or by accounting for other sources of copper and iron from alternate waste streams which do not have copper and iron limits. EPA expects that this type of simplified CWF development would not be unnecessarily burdensome to the Permittee and would comply with the relevant regulatory requirements. If the Permittee wishes to apply a CWF in order to comply with the permit, EPA simply requires that the Permittee notify EPA of the results of the CWF (with all relevant assumptions and calculations) prior to implementation. If and when the CWF changes in the future, the Permittee must notify EPA of the update before it is implemented. Accordingly, conditional copper and iron limits for Outfall 016 are included in the Final Permit with a footnote describing that compliance may be based on an up-to-date CWF, if this option is utilized. These limits are conditional and only apply to Outfall 016 if NCMCW is present in the discharge.

EPA also notes that water reuse, in combination with the options described above, may also alleviate the need to segregate all dissimilar flows. In certain cases, one waste stream (with equal or less stringent limitations) may be used as process water and subsequently contributes to the generation of another waste stream. Indeed, the 2015 Steam Electric ELGs allow for this type of situation. Generating units (except for those equal or below 50 MW) may only discharge pollutants in fly ash or bottom ash transport waters (after a permitted compliance date[47]) if those transport waters are used as process water within an air pollution control scrubber (*i.e.*, flue gas desulfurization or "FGD" system). 40 C.F.R. §§ 423.13(h)(1)(i) and (k)(1)(i). As a more relevant example, low volume waste water may be reused as the wash water for metal cleaning. This would be considered reuse and not comingling of waste streams. Consequently, the limits for metal cleaning (Outfall 017) would apply to the resulting wastewater. EPA notes that the Permittee should be familiar with this type of reuse because PSNH indicated that this is commonly practiced at Merrimack Station (another facility that it owns) in its public comments on the 2014 Merrimack Station draft NPDES permit (pages 211-214).

As this discussion demonstrates, there are several different approaches that PSNH could employ individually or in combination to comply with the BAT limits for metal cleaning wastes.

PSNH Comment V.C.3.e Region 1 Did Not Even Attempt to Evaluate the Cost of Its Proposed Regulation of NCMCWs

"Modest" and "relatively insignificant"—these are the two terms used within the four-sentence analysis that comprises the entirety of Region 1's discussion of the anticipated costs to comply with the regulatory requirements applicable to NCMCWs set out in the Draft Permit. [272]
The agency's attempt to convert its cost-effectiveness analysis into a cursory "affordability"

[47] Note that on September 18, 2017, EPA promulgated a rule to postpone the compliance dates for flue gas desulfurization ("FGD") wastewater and bottom ash transport water. 82 Fed. Reg. 43494 (Sept. 18, 2017). The compliance date for bottom ash transport water was formally changed from November 1, 2018 to November 1, 2020. Thus, to the extent that this example of reuse involves bottom ash transport water, the new compliance date must be taken into account.

determination is impermissible, wholly inadequate, and legally insufficient. [273] Region 1 failed to even estimate in its Fact Sheet or in the administrative record the actual monetary amount required for PSNH to comply with its anticipated regulation of NCMCWs under any of its proposed scenarios. [274] It is the agency's burden to demonstrate a reasonable basis for its conclusions that the chosen effluent limitations are achievable. More is required than its speculative and conclusory analysis here. [275]

PSNH has never undertaken to estimate the costs associated with attempting to isolate NCMCWs at Schiller Station. Indeed, there has never been a reason to do so given the longstanding classification of this waste stream as a low volume waste, in accordance with the Jordan Memorandum. Even without the benefit of a detailed analysis, PSNH can offer the following comments that adequately demonstrate that the costs required to attempt to reconfigure the facility to separately manage NCMCWs would be more than "modest" or "relatively insignificant" and, in fact, would be substantial enough to grossly outweigh whatever benefits Region 1 expects to arise from the isolation of this waste stream.

Ensuring that NCMCWs would never be commingled with boiler blowdown, demineralizer regenerations, floor drains, and other low volume wastes at Schiller Station could likely require the design and installation of a collection system, supporting pumps and pipes, lined basin, and chemical precipitation treatment system capable of capturing and transporting the maximum quantity of NCMCW produced during a three-day outage and processing NCMCWs within a 30-day period. The estimated capital costs for modifications of this kind at facilities within the industry can range from a few to in excess of $32 million. [276] And, annual operation and maintenance costs would also likely be substantial.

The table below, submitted by UWAG in its comments to EPA's 2013 proposed rule for the NELGs, itemizes costs actually incurred at a facility that installed necessary infrastructure to isolate and achieve the 1.0 mg/L copper and iron limits for NCMCW discharges:

Equipment/Product/Task	**Cost**
Internal & External Engineering Costs	$475,235
Exiting Tank Retrofits & Refurbishment – Clarifier Tank & Clean Effluent Tank (Chemical Clean Tank)	$1,148,568
Collection Package Civil – Collect Trenches and Wash Sump Construction: Neutralization Basin Closure	$1,615,712
Material & Equipment Purchases – Pump Sumps (Qty-4); Sludge Recycle Pumps (Qty-2) Sludge Disposal Pumps (Qty-2); Clarifier Conversion Internals; Rake Drive Reaction Action	$2,568,508
Electrical & Control & Instrumentation Install VFDs (Qty-8); MCC's' AllenBradley PLC w/HMI, Remote I/O; Chemical Skids (Qty-2); Instrumentation (All); Cable, Conduits, Lighting	$1,022,971
Mechanical Install Installation of Interconnecting Piping: Supports; Reaction Tank; Clarifier Tank-Walkways-Rake-Truss	$1,735,273
Reaction Tank Foundation – Concrete and Steel Supports	$222,204
Metal Wash Startup Support/Training	$5,394
Metal Wash Startup Support/Straining	$2,343

Equipment/Product/Task	Cost
Total of Current Expenditures	$8,796,208
Additional Planned Improvements	$350,000
Planned Total Expenditures	**$9,145,208**

Like Schiller Station, the facility has three generating units and its operator installed a metal cleaning wastewater collection system on each unit with piping to direct the wastewater to a common treatment system. Solids generated in the system are sent to the facility's existing solid waste processing system. The treated effluent is sampled to demonstrate compliance before being piped to and mixed with the facility's low volume wastewater collection/treatment system for discharge. Importantly, some of the infrastructure needed for this project was already available at the facility and only needed to be re-purposed or required repairs or modification. Had the operator not been able to reuse this equipment, use the existing solid waste processing system, and use covered areas for equipment that needed to be indoors, the capital expenditures would have been much greater.

The aforementioned comments demonstrate Region 1's current assessment of costs necessary to isolate and treat NCMCWs at Schiller Station is grossly inadequate. The CWA and EPA's own regulations require a more rigorous analysis that, at a minimum, includes competently comparing the anticipated benefits and the relative cost of achieving those benefits before imposing BPJ-based effluent limitations in a permit. Had the agency undertaken such an analysis, it would have been apparent that the costs associated with regulating NCMCWs in this manner grossly outweigh whatever benefits Region 1 expects to yield by its proposed changes to the permit for the facility.

Collectively, these comments, the administrative record, and a reasoned evaluation of the factors that must be considered in a BAT analysis, demonstrate that Region 1 cannot impose iron and copper effluent limitations on NCMCW discharges at Schiller Station and that the agency's current BPJ-based BAT determination is wholly inadequate, arbitrary, and capricious and must be revisited prior to issuing the Draft Permit as final.

[272] *See* Fact Sheet at 40-41.

[273] *See* Seabrook, 1977 WL 22370, at *7.

[274] Again, Region 1 cannot attempt to rely upon any data or information EPA has collected or generated as part of its recent NELGs rulemaking because the agency has stated time and again that the data pertaining to NCMCWs it has collected is insufficient and does not accurately reflect how this waste stream is handled within the industry:
At the time of the final rule, EPA acknowledges not having sufficient information to perform a nationwide BAT evaluation for non-chemical metal cleaning wastes. Information such as:

- identification of potential treatment systems that represent BAT for non-chemical metal cleaning wastes;
- cost information for BAT technologies;
- wastewater characterization data for untreated non-chemical metal cleaning wastes; and
- treatment system performance data for the treatment of non-chemical metal cleaning wastes.

Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category: EPA's Response to Public Comments, Part 7 of 10 at 7-393 (Sept. 2015).

[275] *See* Ass'n of Pac. Fisheries v. EPA, 615 F.2d at 820 (finding that a failure to explain and justify a BAT determination renders the resulting effluent limitations arbitrary, capricious, and "not the result of reasoned decisionmaking"); *See* also Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category: EPA's Response to Public Comments, Part 7 of 10 at 7-179 (Sept. 2015) (providing that "the CWA requires EPA to make a reasonable assessment of costs. Without a baseline of what is the status quo, it is difficult to make a reasonable assessment of the cost of additional controls").

[276] These monetary figures were compiled by and through a review of public comments submitted by the industry in response to EPA's 2013 proposed rulemaking for the now final NELGs. *See* Docket EPA–HQ–OW– 2009–0819, available at http://www.epa.gov/eg/steam-electric-power-generating-effluent-guidelines-2015-final-rule and www.regulations.gov.

EPA Response to PSNH Comment V.C.3.e:

EPA maintains that its assessment of costs in developing appropriate BAT limits based on its BPJ was both adequate and in accordance with the law and regulations. The commenter first suggests that EPA failed to identify or make any specific cost estimates for coming into compliance with the proposed BAT limits of 1.0 mg/L. EPA did assess, using all information available, the changes and steps necessary for the Permittee to achieve compliance with the proposed BAT limits, and then further assessed whether such changes would require PSNH to incur costs, given the existing infrastructure and historical processes at the facility. This assessment took into account the nature and scope of the costs that the permittee would incur coming into compliance with the proposed limits. EPA is not required to develop a precise calculation of costs as part of its cost assessment, as the commenter suggests. *See BP Expl. & Oil v. EPA*, 66 F.3d 784, 803 (6th Cir. 1995) (citing *Nat. Res. Def. Council, Inc. v. EPA*, 863 F.2d 1420, 1426 (9th Cir. 1988)) ("According to EPA, the CWA not only gives the agency broad discretion in determining BAT, the Act merely requires the agency to consider whether the cost of the technology is reasonable. EPA is correct that the CWA does not require a precise calculation of BAT costs."). Moreover, the commenter, PSNH, has not provided EPA with precise, facility-specific numbers for cost in its Comments to the Draft Permit or throughout the permitting process, as will be discussed in more detail below.

The commenter also seems to again suggest that EPA failed to assess costs and identify "anticipated benefits" in its BAT determination. Please see Response to PSNH Comment V.C.3.a(1), above, for a discussion of the factors requiring examination for a BAT analysis.

The drastic process changes and facility upgrades mentioned in this comment are indeed beyond the scope of changes considered necessary in EPA's analysis. It is unclear if PSNH is suggesting that the itemized cost estimate table and accompanying cost assessment presented in this comment is a reasonable cost estimate for Schiller Station, which already has the technology and ability to segregate and treat or otherwise dispose of chemical metal cleaning wastewater (PSNH has not disputed the existence of such technology). The Permittee did not provide a site-specific rationale for why they are unable to utilize the same disposal method for non-chemical metal cleaning waste as for chemical metal cleaning waste. Instead, the Permittee points to a cost estimate table and general cost estimates associated with a different facility to demonstrate high costs associated with Region 1's proposed BAT limits. The estimates do not specify where this facility is located, any details (other than that the facility has three generating units and an existing solid waste processing system) about the facility, or when these estimates were developed. The comment does not even provide the name of the facility. The cost estimates identified in this comment are extracted from Utility Water Act Group's ("UWAG's") 2013 Comments on EPA's Proposed Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category. *See* UWAG Comment, DCN EPA-HQ-OW-2009-0819-4655 (Sept. 20, 2013), pp. 268-71. UWAG, like the commenter here, fails to provide any detail as to where this data came from or how it was compiled. As a result, EPA cannot assess whether and to what extent this cost information[48] is applicable to the Schiller Station facility. The commenter does not provide any explanation to enable such an assessment, and further does not provide additional documentation *specific* to potential costs that would be incurred at Schiller Station. Ultimately, EPA does not find this information to be applicable to a site-specific assessment for costs at Schiller Station.

It is assumed, as stated in the Fact Sheet, that compliance can be achieved using existing treatment systems and either schedule changes or the combined waste stream formula. As described in the previous response, EPA also proposes a hybrid approach that utilizes a combination of these relatively inexpensive options as well as the potential for water reuse. EPA maintains that the cost for complying with these permit requirements would not require significant investment in facility upgrades and would be modest.

EPA recognizes, however, the complex nature of this type of facility and the possibility of some additional expenses as described in the comment. Therefore, EPA recommends that by the effective date of the permit, the Permittee fully evaluate and begin to implement these low-cost options to the best of its ability in compliance with the permit. If a combined waste stream formula is utilized, the Permittee must submit the details of this formula to EPA before implementation. Then, each monitoring period, the Permittee would be required to apply a dilution factor based on the combined waste stream formula to the effluent copper and iron data for Outfall 016 in order to determine the degree of treatment received by the NCMCW. Therefore, the results reported would then be the measured concentration of copper and iron times the dilution factor associated with the combined waste stream formula, if utilized. Compliance with the permit will be based on the 1.0 mg/L effluent limits for copper and iron.

For example, if the NCMCW is determined to be 10% of the combined waste stream, the measured effluent concentration for copper and iron should be multiplied by a factor of 10 and the results reported. Since the reported value must be in compliance with the copper and iron effluent limits of 1.0 mg/L, a dilution factor of 10 means the measured effluent concentration must not exceed 0.1 mg/L (a factor of 10 below the effluent limit).

If EPA deems at any time that the formula must be modified, EPA will provide written notification to the Permittee.

As a final note, footnotes 274 through 276 of the above comment contain references to EPA's Responses to Comments for the 2015 Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category. In the 2015 responses related to NCMCWs, EPA acknowledged that it had insufficient information with respect to several analyses required to evaluate BAT for NCMCWs, cost analysis being one. The commenter wishes to conflate that acknowledgement into the conclusion that information does not exist to support *any* site-specific BAT determination for NCMCWs. Rather, the 2015 rulemaking was a *national* rulemaking. EPA may have been without sufficient information to make a categorical,

[48] The commenter's estimate of the range of costs associated with the type of upgrades necessary to comply with the proposed BAT limits (*see* footnote 276) is likewise based on information that is not specific to Schiller Station. Furthermore, the commenter fails to describe or characterize this information in a manner that demonstrates its specific applicability to Schiller Station.

national standard (*see* Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category: EPA's Response to Public Comments, Part 7 of 10 at 7-393 (Sept. 2015) ("EPA acknowledges not having sufficient information to perform a *nationwide* BAT evaluation for non-chemical metal cleaning wastes.") (emphasis added)), but this insufficiency solely applies to the national rulemaking context. The cost information required for a national rulemaking is not identical to that required for a site-specific BPJ BAT determination. Therefore, the language included in the 2015 Response to Comments does not support a finding that EPA failed to sufficiently analyze cost in its BAT evaluation for NCMCWs at *Schiller Station*. *See also* EPA Response to PSNH Comment V.C.3.b above.

PSNH Comment V.C.4 If Region 1 Erroneously Elects to Impose Iron and Copper Limits On NCMCWs It Should Allow PSNH Sufficient Time to Comply

The Draft Permit purportedly would require PSNH to comply with the proposed iron and copper limits for the NCMCW stream on the effective date of the final permit. This is based on Region 1's incorrect assumption that the new effluent limits will not require changes to the infrastructure and treatment systems at Schiller Station in order to efficiently comply with these new limitations. In truth, and due to the reasons articulate above, PSNH would have to extensively modify pipes, sumps, and treatment systems so as to collect isolated NCMCW discharges and treat them by chemical precipitation for iron and copper. The facility would also likely have to perform extensive excavation of existing sumps and piping and install new pipes and treatment tanks. This work in isolation could take two years or more to complete and could be even further complicated or prolonged due to any approvals and/or permits that may be required, as well as by other EPA rulemakings that may cause a need for other significant modifications at the facility in the foreseeable future, such as EPA's ozone National Ambient Air Quality Standards revisions and possibly others.

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For the reasons stated above, Region 1 must not—and indeed cannot based on the current permitting record—impose iron and copper effluent limitations on NCMCW discharges at Schiller Station and should allow such wastewaters to continue to be classified as a low volume waste stream and commingled with other similar low volume waste streams.

EPA Response to PSNH Comment V.C.4:

As mentioned in the previous responses, the Permittee is not expected to perform any significant facilities upgrades in order to comply with the revised NCMCW requirements. EPA expects that a simplified combined waste stream formula (as described in EPA Response to PSNH Comment V.C.3.d) could be developed quickly upon permit issuance, with the assistance of EPA if requested. Subsequently, the Permittee could evaluate and implement the necessary combination of schedule changes, water reuse options, the use of an alternate holding tank and other minor process modifications to achieve consistent compliance with the permit beginning on the effective date of the permit.

Given the variety of cost-effective options for compliance described in the responses above, EPA recognizes that the Permittee will need to decide which approach to compliance to pursue. Depending upon the selected approach, the Permittee may potentially find that it is unable to fully comply with the copper and iron limits for a period of time immediately following the effective date of the permit. In anticipation of this possibility, EPA is unable to implement a compliance schedule for a technology-based limit directly in the permit. *See* 40 CFR Part 122.47(a)(1). Rather, EPA would work with the Permittee after the effective date of the permit to develop an appropriate compliance schedule through a mechanism such as an administrative order on consent. This compliance schedule would allow the Permittee to have additional time to achieve proper compliance with the limits without penalty.

PSNH Comment V.D Miscellaneous Issues with the Draft Permit

In addition to Region 1's arbitrary and capricious determinations with regard to CWA 316(b) and NCMCWs, the agency has included other terms in the Draft Permit that PSNH requests be reconsidered and revised before a final permit is issued. The revisions of these permit terms (discussed in order by outfall or permit part) are proposed to provide Schiller Station with a more manageable permit that continues to protect water quality to the maximum extent reasonably practicable.

EPA Response to PSNH Comment V.D:

EPA has addressed each of these comments below.

PSNH Comment V.D.1 Outfalls 002, 003, and 004

PSNH respectfully requests that the currently allotted two-hour period during which the temperature difference or rise between the withdrawal and discharge of water at the facility may be increased from 25°F to 30°F to conduct condenser maintenance be increased to a period of three hours. PSNH is hopeful Region 1 will provide the company the opportunity to demonstrate that this "Delta-T" temperature can be increased from 25°F to 30°F at all times without causing any appreciable harm to the BIP of the Piscataqua River. Until that time, however, PSNH requires a three-hour window of time to allow personnel adequate time to clean and maintain the condensers.

EPA Response to PSNH Comment V.D.1:

The Draft Permit authorizes a limited, two-hour period per day where the allowable rise in temperature may increase from 25°F to 30°F at Outfalls 001, 002, 003, and 004. In its comments on the Draft Permit, PSNH has requested one additional hour for personnel to clean and maintain the condensers. This change would increase the cleaning and maintenance time, during which the accompanying delta-T would increase from 25°F to 30°F, from two hours to three hours per day. During this period the maximum daily instantaneous temperature limit (95°F) must be met.

In response to the comment, EPA has evaluated the potential thermal impacts of the additional one hour per day when the facility's delta-T temperature would increase from 25°F to 30°F (approximately a 1% increase in overall heat load to the receiving water allowed over a 24-hour period) on the balanced, indigenous population in the Piscataqua River. Based on available temperature data, including temperatures collected under reasonably worst cases summer conditions, the majority of the 200-foot mixing zone maintains temperatures within 1-2°C of ambient and surface temperatures are generally at or below 25°C (77°F) with a localized "hot spot" near at the surface at the discharge. The high energy tidal influence dissipates the thermal plume relatively quickly, so that only about 12% of the cross-sectional area of the water column of the river at the outfalls is encompassed by the mixing zone. Since temperatures within the mixing zone are not expected to adversely affect the biological community, the lower temperatures outside this zone will also not adversely affect the biological community. *See* Fact Sheet at 62-63. In addition, the plume does not create an impediment to fish or other organisms swimming past the facility and where the plume does result in temperature increases above ambient, these increases are likely to be localized, primarily confined to the surface, and short in duration. *See Id*. at 63-64. The relatively minor proposed increase in delta-T (5°F) and short duration (one additional hour) of the proposed change will not substantially alter the characteristics of the thermal discharge. Given that the thermal plume affects about 0.1% of the receiving water (in this case the receiving water is the approximate 6-mile length of this section of the Lower Piscataqua River, from Bloody Point to Oriorne State Park) and has not caused appreciable harm in the past (under the existing 2-hour allowance for the increased delta-T), the additional hour at a delta-T of 30°F is not likely to result in measurable thermal impacts to the balanced, indigenous population of the Piscataqua River. Therefore, the Final Permit includes an additional one-hour increase in delta-T, from 25°F to 30°F at Outfalls 001, 002, 003, and 004 for condenser maintenance. *See* Part I.A.1 footnote 4 and I.A.2 footnote 4. As the existing permit limits, Draft Permit limits, and proposed Final Permit limits have been based on a variance granted under Section 316(a) of the CWA, this increase is not subject to anti-backsliding regulations. *See* 40 C.F.R. § 122.44(l)(2)(i)(D).

As EPA explained in Response to PSNH Comment V.A., an increase in delta-T for a longer, sustained period of time would need further evaluation before EPA could make an informed determination on potential thermal impacts from a long-term increase in delta-T.

PSNH Comment V.D.2 Outfall 006

PSNH requests that the monitoring conditions applicable to this outfall remain unchanged from the existing permit and the proposed pH discharge limitation be omitted. Region 1 expressly states in its Fact Sheet that discharges through this outfall are "rare." [277] In actual fact, PSNH has utilized this outfall only one time within the past five years and, in that instance, the discharge would have complied with the pH limits proposed in the Draft Permit. [278] Moreover, the entire volume of the discharge on this occasion was approximately 200 gallons, which is infinitesimal compared to the size and volume of the Piscataqua River. Specific measures have been implemented in recent years at Schiller Station to reduce the number of discharges through this outfall, including but not limited to the installation of instrumentation to limit deaerator overflows and the repiping of the Unit 6 blowdown tank to the wastewater treatment system. These measures have proven effective at eliminating the emergency conditions that cause boiler water to flow through this outfall, which is evidenced by the fact that it has been used only once within the past five years compared to the 22 times it had been utilized in the preceding 20 years of the current permit term.

PSNH expects that the pH of wastewater discharged through Outfall 006 would only occasionally exceed the maximum 8.0 SU limit proposed in the Draft Permit, but Region 1 proposes that if compliance is not maintained PSNH would be "required to route this wastewater to the on-site WWTP for pH neutralization." [279] The modifications required to reroute the network of boiler and turbine piping would be costly and the expenditures would far exceed any environmental benefit the treatment of such a small volume of wastewater would yield.

In the end, the infrequent use of the outfall, the comparatively tiny volume of wastewater discharged through the outfall on the isolated occasions when it is used, coupled with the high costs associated with treating this rare and sporadic waste stream, all point to a reasonable and practical solution that the pH effluent limitations set out in the Draft Permit should be omitted. PSNH has successfully reduced the frequency of use from a few times a year to roughly once per permit cycle. At the very least, PSNH requests a continuation of the pH monitoring requirement in the final permit for this outfall, allowing Region 1 to revisit the need for numeric limitations in the next permit cycle. If it is determined that the outfall has been used to discharge wastewater with undesirable pH levels with sufficient regularity, then the imposition of numeric effluent limitations can be justified at that time based on this additional data.

PSNH also requests the Total Suspended Solids ("TSS") and oil and grease effluent limitations, as well as the Nitrogen monitoring requirements, proposed for this outfall be deleted as unnecessary. Boiler condensate is the only waste stream that is discharged through this outfall with any regularity and it will not contain TSS or oil and grease in any quantity that will even approach the limits proposed in the Draft Permit. [280] The same is true for the nitrogen monitoring proposed in the Draft Permit. Representative historical monitoring of this outfall reveals that these constituents have not been discharged through this outfall in appreciable quantities. [281] Imposing the aforementioned limitations and/or monitoring requirements on the outfall create unnecessary administrative burdens that result in pointless expenditures by PSNH. PSNH requests this monitoring be omitted from the final permit given the extremely rare conditions that are necessary to cause a release, the relatively clean water involved (treated boiler water), and the very small volumes of water discharged.

[277] Fact Sheet at 26.
[278] See EPA Enforcement and Compliance History Online Database, available at http://echo.epa.gov/effluent-charts#NH0001473 (last visited Jan. 26, 2016) (listing a pH value of 6.9 SU through Outfall 006 on January 25, 2011).
[279] Fact Sheet at 26.
[280] Indeed, PSNH disclosed TSS and oil and grease values in its permit application of <10mg/L and <5mg/L, respectively.
[281] Again, PSNH disclosed in its permit application the following concentrations of nitrogen-related constituents: nitrate-nitrite (<0.05 mg/L), total organic nitrogen (<5 mg/L), and ammonia (0.9 mg/L).

EPA Response to PSNH Comment V.D.2:

PSNH comments that the monitoring conditions applicable to Outfall 006 should remain the same as they were under the 1990 NPDES Permit (*viz.*, flow and pH only) and that the additional limitations and monitoring requirements in the Draft Permit should be removed because they "create unnecessary administrative burdens that result in pointless expenditures" by the

Permittee. Further, the comment requests that the pH limit be removed because of “the infrequent use of the outfall, the comparatively tiny volume of wastewater discharged through the outfall on the isolated occasions when it is used, [and] the high costs associated with treating this rare and sporadic waste stream.” PSNH also comments that the TSS and oil and grease (“O&G”) limits should be removed “as unnecessary” since “[b]oiler condensate is the only waste stream that is discharged through this outfall with any regularity and it will not contain TSS or [O&G] in any quantity that will even approach the limits proposed in the Draft Permit.” PSNH Comment V.D.2. Lastly, the comment requests removal of the nitrogen monitoring requirement for similar reasons and because past monitoring has shown that it is not discharged in “appreciable quantities.”

As an initial matter, EPA clarifies that statements in the comment that “Region 1 expressly states in its Fact Sheet that discharges through this outfall are ‘rare’” and that “PSNH has utilized this outfall only one time within the past five years” overlook the stormwater discharge from this outfall. The statements in the Fact Sheet characterizing the use of the outfall as “rare” refer only to the non-stormwater discharges. Fact Sheet at 20. EPA discusses the stormwater component of the discharge later in this response.

Regarding the commenter’s request to remove the pH limit in the Draft Permit, that limit is a state certification requirement, AR-259 at 26, and, as such, EPA may not remove it, 40 C.F.R. § 124.55(a)(2). New Hampshire does provide a separate process, however, whereby the Permittee may demonstrate that the pH limits may be relaxed. *See* Fact Sheet at 26. With respect to the pH monitoring results described in this comment, the 2015 Fact Sheet stated that “[h]istoric discharges from this outfall, although rare, have not consistently been in compliance with the upper pH limit of 8.0 S.U.” and that “there have been 18 exceedances out of 23 pH measurements” since the 1990 permit issuance. Fact Sheet at 26. Although the frequency of these discharges has indeed dropped in recent years, the comment concedes that exceedances may continue. This frequency of exceedances when discharges do occur provides adequate justification for the imposition of numeric effluent limitations.

PSNH raises reasonable concerns about the cost to comply with the proposed condition to route this discharge to the on-site WWTP when the required pH range is not met, given how infrequently discharges from this outfall occur. The Final Permit eliminates the proposed requirement to route this wastewater to the on-site WWTP for pH neutralization if the discharge pH is not able to be maintained within the range of 6.5 to 8.0 standard units. However, the numeric pH limit is required for state certification and, as such, has not been omitted from the Final Permit. By removing the requirement to route the discharge to the WWTP, the Permittee has additional flexibility to comply with this pH limit if it is determined that there is a more cost-effective option. Alternatively, given the low frequency and volume of the discharge, the Permittee could pursue an in-stream dilution study with the State to demonstrate that in-stream pH standards could be met with a relaxation of the pH limits consistent with Part I.C of the Final Permit.

Turning to the comment that TSS and O&G limits should not be included in the Final Permit, as EPA explained in the Fact Sheet, the discharge from Outfall 006 “contains ‘low volume waste’ (boiler blowdown), as defined in 40 C.F.R. § 423.11(b),” and therefore these limits are required pursuant to the Steam Electric ELGs. Fact Sheet at 25-26 (citing 40 C.F.R. § 423.12(b)(3)). The definition of low volume waste sources at 40 C.F.R. § 423.11(b) covers "all sources except those for which specific limitations or standards are otherwise established," with the exception of "[s]anitary wastes, air conditioning wastes, and wastewater from carbon capture or sequestration systems." Because boiler condensate is neither an exception to the "all sources" described in the definition of low volume waste sources nor listed as a wastestream for which specific limitations or standards are established, EPA considers boiler condensate to be a source of low volume waste. Furthermore, boiler blowdown, which is a component of Outfall 006, is expressly included in the definition of low volume waste sources at 40 C.F.R. § 423.11(b). Although "[b]oiler condensate is the only waste stream that is discharged through this outfall with any regularity," boiler blowdown also may be present. PSHN Comment V.D.2. Technology-based treatment requirements represent the minimum level of control that must be imposed under Sections 301(b) and 402 of the CWA. 40 C.F.R. § 125.3(a). When EPA has promulgated ELGs for pollutant discharges from a particular industrial category, then those ELGs provide the basis for technology-based effluent limits that must be included in NPDES permits issued to individual facilities within that industrial category. *Id.* § 122.44(a)(1). For these reasons, the required technology-based TSS and O&G limitations will remain in the Final Permit for Outfall 006. In addition, these limitations should not impose any undue burden on the Permittee if, as the comment states, "PSNH has utilized this outfall only one time within the past five years" and the effluent "will not contain TSS or oil and grease in any quantity that will even approach the limits proposed in the Draft Permit." Rather, the requirement to monitor the discharge is expected to be quite infrequent and when monitoring is required, the discharge is expected to be in compliance with the TSS and O&G limitations.

This comment also requests that EPA remove the total nitrogen monitoring requirement for Outfall 006. PSNH Comment V.D.7 below also requests that EPA remove stormwater-related requirements from this individual permit and continue to address them via the Permittee's existing MSGP coverage. As discussed in more detail below, *see* EPA Response to PSNH Comment V.D.7, EPA has decided to remove all stormwater-related monitoring requirements from the Final Permit. This includes total nitrogen monitoring at Outfall 006. In lieu of monitoring in the Final Permit, EPA will explore monitoring for total nitrogen through the MSGP and/or separate information requests under Section 308 of the CWA. All data provided through these alternate routes will be available to EPA for use during future permitting actions.

PSNH Comment V.D.3 Outfall 011

Language in the Draft Permit for this outfall currently provides that "[t]he combined discharge of the 3 individual pipes shall be considered a representative sampling point." [282] The three individual pipes are not always discharging at the same time, however. This language should therefore be revised to make clear that it is a single composite sample of all discharging pipes at the time of collection that is required and will be considered representative of the sampling point. pH monitoring should only be required quarterly instead of the monthly interval proposed in the Draft Permit. The quarterly interval would be consistent with the requirements applicable to Outfall 018, through which storm water is similarly discharged. A monthly monitoring requirement creates an unnecessary administrative burden on the company and results in the expenditure of needless dollars with no ultimate improvement to the environment.

The imposition of TSS monitoring at this outfall is unwarranted. Region 1 notes that oil and grease effluent limitations exist in the current NPDES permit for Schiller Station but the agency does not explain why that is the case. Instead, simply because such limitations exist in the 1990 permit, the agency makes the analytical leap that low volume wastes must be routed through this outfall. Whether flows from heater condensate drains constitute a low volume waste is an open question given that it does not fall squarely within the regulatory definition [283] and because Region 1 did not even attempt to discuss or reason why such a waste stream should or does constitute a low volume waste subject to the TSS effluent limitations. Effluent with material concentrations of TSS is not typically discharged through this outfall.[284] The TSS effluent limitation is therefore not needed and its inclusion in the Draft Permit creates an unnecessary administrative burden on the company and results in the expenditure of needless dollars with no potential overall improvement to the environment.

The Polynuclear Aromatic Hydrocarbons (PAH) effluent monitoring requirements applicable to this outfall are also unwarranted. There is no history of these constituents being discharged at Schiller Station. And, Region 1 should have requested limited sampling for these PAHs in advance of issuing the Draft Permit if the agency thought they were a potential concern. Waiting to raise this issue in the context of a new NPDES permit for the facility is cumbersome and creates an ongoing 5+ year monitoring obligation that could have potentially been dismissed if addressed in a different manner. Region 1 does provide that the frequency of monitoring for these PAHs can be reduced if the first two years of data collection reveals no such discharges exist. This proffered reduction in monitoring is insufficient, however. If PAHs are not present in the discharges at Schiller Station, PSNH should not be required to continue to monitor for them for the duration of the permit term.

The nitrogen monitoring requirements proposed for this outfall should likewise be omitted for the reasons articulated above in the discussion pertaining to Outfall 006.

[282] Draft Permit at 6.
[283] See 40 C.F.R. § 423.11(b).
[284] PSNH disclosed TSS concentrations in its permit application of <10mg/L.

EPA Response to PSNH Comment V.D.3:

EPA agrees with the comment that a representative sample for Outfall 011 must include the combined discharge of the 3 pipes only when all 3 pipes are discharging. If fewer than 3 pipes are discharging, a representative sample must include the combined discharge of all discharging pipes. EPA notes that this clarification should also apply to Outfall 018. Language to this effect has been included in the Final Permit for both Outfalls 011 and 018.

PSNH requests that the frequency of pH monitoring be reduced from monthly to quarterly consistent with the requirements for discharges from Outfall 018. The NPDES Permit Writers' Manual (Chapter 8) indicates that monitoring frequency should be sufficient to characterize effluent quality and detect events of noncompliance. When establishing monitoring frequency, the permit writer should consider, among other things, the variability of the parameter and the compliance history of the facility.[49] Since 1990 the facility has collected over 270 pH samples from Outfall 011 and has never exceeded the water quality-based effluent limits of 6.5 to 8.0 s.u. (recorded range equals 6.5 to 7.7 s.u.). *See* Fact Sheet Attachment D. Based on this compliance history, and the relative low variability of pH in the effluent, EPA agrees that pH monitoring may be done once per quarter instead of once per month. This change has been reflected in the Final Permit.

TSS and O&G limitations are required for low volume waste. 40 C.F.R. § 423.12(b)(3). The definition of low volume waste sources in the Steam Electric ELGs covers "all sources except those for which specific limitations or standards are otherwise established." *Id.* § 423.11(b). The definition also expressly excludes "[s]anitary wastes, air conditioning wastes, and wastewater from carbon capture or sequestration systems." *Id.* Because the discharge from the heater condensate drains is neither listed as a wastestream for which specific limitations or standards are established nor is it a listed exception in the definition of low volume waste sources, EPA considers the discharge from heater condensate drains to be a source of low volume waste. *See* Fact Sheet at 28. Therefore, the required TSS and O&G limitations will remain in the Final Permit for Outfall 011.

This comment also states that PAH monitoring at Outfall 011 is not warranted, because there is "no history" of PAHs being discharged via this outfall. The commenter did not, however, provide any data to support this claim nor is it clear that any such data exist. Without such data, it is impossible to determine whether the stormwater discharge contains harmful levels of such pollutants. Moreover, it is not unreasonable to expect that stormwater discharges from a tank farm may contain measurable levels of PAHs, since they are present in petroleum products. The comment also asserts that EPA should have requested PAH monitoring data prior to issuance of the Draft Permit because requiring the monitoring in the context of a reissued permit is "cumbersome" and creates a "5+ year monitoring obligation that could have potentially been dismissed if addressed in a different manner." The comment does not explain, however, why sampling pursuant to a CWA § 308 letter, for instance, is more manageable than sampling performed pursuant to a NPDES permit. In either case, the sampling would be performed in the same manner. Moreover, the comment recognizes that the Draft Permit provided a mechanism to reduce the frequency of PAH monitoring after two years, if warranted by the results. Thus, EPA does not agree that it necessarily follows that the Permittee would be required to monitor "for the duration of the permit term" if PAHs "are not present in the discharges at Schiller Station." In any event, in the Draft Permit EPA intended to include all stormwater monitoring requirements, including PAH and nitrogen monitoring, rather than relying on the Multi-Sector General Permit ("MSGP") or other monitoring options outside of the NPDES individual permit. In light of the Permittee's request (both in this comment as well as in PSNH Comment V.D.7 below) to remove stormwater requirements from this individual permit in favor of retaining its MSGP coverage, EPA has removed these stormwater-related monitoring requirements from the Final Permit. In lieu of monitoring in the Final Permit, EPA is exploring opportunities to require monitoring for both PAHs and total nitrogen through the MSGP and/or separate information requests under

[49] The NPDES Permit Writers' Manual is available at https://www.epa.gov/npdes/npdes-permit-writers-manual.

Section 308 of the CWA. All data provided through these alternate routes will be available to EPA for use during future permitting actions.

Relatedly, in order to ensure that pH, TSS and O&G monitoring at Outfall 011 is representative of the low volume waste and does not include discharges that are commingled with stormwater, the Final Permit has been updated to clarify that quarterly sampling must be done during dry weather. The Final Permit specifies that "dry weather" must be at least seventy-two (72) hours following a storm event that results in an actual discharge of stormwater from the outfall ("measurable storm event").

PSNH Comment V.D.4 Outfall 018

The TSS and PAH issues outlined for Outfall 011 apply equally to Outfall 018. With respect to TSS, Region 1 again notes that oil and grease effluent limitations exist in the current NPDES permit for Schiller Station as part of its justification as to why TSS limits should also be required. This time, however, Region 1 states that it has employed its BPJ to determine that the commingled discharge of heater condensate drips that passes through an oil/water separator "is similar to a low volume waste." [285] Region 1 offers no explanation or reasoning for this BPJ determination which renders it arbitrary and capricious. Perhaps worse, however, the agency does not actually classify the waste stream as a low volume waste. Instead, it only states that it is "similar." Being similar does not mean the waste stream is a low volume waste and should be subjected to the limitations applicable to that categorical effluent discharge. Region 1's actions in this regard are arbitrary and capricious and the TSS limits proposed for Outfall 018 should be removed in the final permit.

PAHs monitoring should not be required for Outfall 018 for the reasons articulated in the discussion of Outfall 011. If they are ultimately required, however, PSNH should be allowed to discontinue monitoring for them if data indicates the constituents are not present in effluent discharged through this outfall.

The nitrogen monitoring requirements proposed for this outfall should be omitted for the same reasons articulated above in the discussion pertaining to Outfall 006.

[285] See Fact Sheet at 42.

EPA Response to PSNH Comment V.D.4:

TSS and O&G limitations are required for low volume waste. 40 C.F.R. § 423.12(b)(3). *See also* Response to PSNH Comment V.D.3. The definition of low volume waste sources in the Steam Electric ELGs covers "all sources except those for which specific limitations or standards are otherwise established" in the Steam Electric ELGs. *Id.* § 423.11(b). The definition also expressly excepts "[s]anitary wastes, air conditioning wastes, and wastewater from carbon capture or sequestration systems." *Id.* Because heater condensate drips are neither listed as a wastestream for which specific limitations or standards are established nor a listed exception in the definition of low volume waste sources, EPA considers heater condensate drips to be a source of low volume waste. This determination results in an application of the TSS and O&G limits for low volume waste sources from the ELG, rather than through BPJ as described in the Fact Sheet at 42. However, because the ELG limits are identical to the BPJ limits described in the Fact Sheet, the result is no change to the Final Permit. *See also* Responses to PSNH Comments V.D.2 and V.D.3.

This comment incorporates PSNH Comments V.D.2 and V.D.3 with respect to total nitrogen and PAHs, respectively, stating that monitoring for those pollutants should be removed for Outfall 018, for the same reasons. EPA has responded to those particular comments in Responses to PSNH Comments V.D.2 and V.D.3 and incorporates those responses here by reference. EPA has decided to remove the stormwater-related monitoring requirements for Outfall 018 from the Final Permit as well. In lieu of monitoring in the Final Permit, EPA will explore monitoring for both PAHs and total nitrogen through the MSGP and/or separate information requests under Section 308 of the CWA. All data provided through these alternate routes will be available to EPA for use during future permitting actions.

Relatedly, in order to ensure that pH, TSS and O&G monitoring for Outfall 018 does not include discharges that are commingled with stormwater, the Final Permit has been updated to clarify that quarterly sampling must be done during dry weather. The Final Permit specifies that "dry weather" must be at least seventy-two (72) hours following a storm event that results in an actual discharge of stormwater from the outfall ("measurable storm event").

PSNH Comment V.D.5 Outfalls 020 and 021

Footnote 2 applicable to these outfalls provides in relevant part that "[a]ll solid materials removed from the screens shall be disposed of via land disposal." [286] This is not practicable. The removal and return of these solid materials, including leaves, twigs, debris, etc., from the screens to the source waterbody via the fish return trough is automatic after the materials are removed by the spray wash process. It is simply impractical to dedicate personnel at Schiller Station to handpick all solid material collected on the screens and dispose of it through some other means and there is no ultimate benefit to the environment in requiring PSNH to do so. At the very least, the condition should be limited to the removal of all solid wastes (e.g., paper and plastic) while an operator is attending to the screenwash and/or "to the extent practicable" or some equivalent language should be added to the end of the above-quoted sentence to permit PSNH the ability to demonstrate why the failure to remove solid material at some point during the permit term was justified under the circumstances.

[286] Draft Permit at 13.

EPA Response to PSNH Comment V.D.5:

EPA agrees that this requirement should be limited to the extent practicable. In addition, EPA has clarified that natural debris may be returned to the receiving water. Therefore, footnote 2 for Outfalls 020 and 021 has been changed to the following:

> All live fish, shellfish and other organisms collected or trapped on the intake screens should be returned to their habitat, sufficiently distant from the intake structures to

prevent re-impingement. All other material, except natural debris (e.g., leaves), shall, to the extent practicable, not be returned to the receiving waters and, in any event, shall be disposed of in accordance with all existing federal, state, and/or local laws and regulations that apply to waste disposal.

PSNH Comment V.D.6 Outfall 023

pH monitoring for an asphalt parking lot drain should only be required quarterly instead of the monthly interval proposed in the Draft Permit. The quarterly interval would be consistent with the requirements applicable to Outfall 018, through which storm water is similarly discharged. A monthly monitoring requirement creates an unnecessary administrative burden on the company and results in the expenditure of needless dollars with no ultimate improvement to the environment.

EPA Response to PSNH Comment V.D.6:

Outfall 023 has been removed from the Final Permit based on this comment and PSNH Comment V.D.7. *See* EPA Response to PSNH Comment V.D.7. The Permittee must ensure that the discharge of stormwater associated with an industrial activity from this outfall is appropriately authorized and monitored under MSGP NHR053208 rather than individual NPDES permit NH0001473.

PSNH Comment V.D.7 Parts I.B and I.C of the Draft Permit

Parts I.B. and I.C. of the Draft Permit should be deleted because Schiller Station already maintains a SWPPP and has obtained coverage under MSGP NHR053208 to manage all stormwater discharges related to the facility. Any additions Region 1 therefore wishes to impose at Schiller Station should be implemented by and through that MSGP. The following is a list of notable differences between the requirements of the MSGP and those proposed in the Draft Permit that PSNH has identified:

- Part B.3.: Proposes collection of compliance samples within the first 15 minutes of discharge, which is more stringent than the current 30-minute window provided in the MSGP.
- Part B.6.: Requires enhanced BMPs related to nitrogen when nitrogen is not even listed as a benchmark pollutant for the steam electric power generating point source category. Region 1 has not provided any basis for why it believes discharges from Schiller Station contain significant nitrogen loadings. In fact, they do not. At most, nitrogen could be added to the facility's SWPPP monitoring program to demonstrate nitrogen loading from Schiller Station is immaterial. Were this monitoring information somehow to demonstrate a reasonable potential for the discharges to worsen the impairment, PSNH could then implement best management practices specific to nitrogen.
- Part B.6.a.: Addresses "new development and redevelopment" without defining precisely the meaning of this phrase or what it might encompass.

- Part B.7.a.ii.: Addresses regulation of catchments with "high nitrogen loading" but does not define what precise loading would or should be considered a "high" loading.
- Part B.9: In discussing how to obtain a waiver from the proposed nitrogen regulation requirements, the Draft Permit provides that PSNH must be able to demonstrate that "its discharge does not contain a measurable amount of nitrogen by characterizing its discharge using EPA approved lab methods." This burden of proof would be impossible to satisfy. Even tap water contains a level of nitrogen that is "measurable" utilizing current EPA laboratory methods. If not ultimately deleted, PSNH requests that this provision be revised to establish a reasonable threshold for exclusion from this arduous program. The proposed method of ultimately demonstrating a lack of nitrogen loading is too onerous, as well. Region 1 discusses a two- to three-year study comprised of up to 30 composite stormwater samples at multiple outfalls as necessary to provide an adequate demonstration. This would be unreasonably time-consuming and costly. Instead, a series of grab samples collected throughout the year during various-sized storm events and from each season would provide a confident, representative qualification of the relative presence/absence of nitrogen within stormwater discharging from an outfall. Region 1 should revise this provision accordingly if it does not ultimately delete Parts B. and C. from the final permit. [287]

For the reasons stated herein, Parts I.B and I.C should be deleted from the final permit.

[287] Region 1 does not require what would amount to monthly flow-weighted composite sampling when demonstrating compliance with the sector-specific water quality benchmarks contained within the MSGP. This approach is therefore not appropriate for demonstrating applicability with a non-numeric, chemical-specific BMP.

EPA Response to PSNH Comment V.D.7:

This comment compares stormwater-related requirements in the Multi-Sector General Permit ("MSGP") to those in Parts I.B ("Non-Numeric Technology-Based Effluent Limitations and Additional Requirements for Stormwater) and I.C ("Stormwater Pollution Prevention Plan") of the Draft Permit (*i.e.*, the individual permit) and states that these provisions should be removed from the individual permit because the facility "already maintains a SWPPP [Stormwater Pollution Prevention Plan] and has obtained coverage under MSGP NHR053208 to manage all stormwater discharges related to the facility." The comment requests that any additions to existing stormwater-related requirements at the facility be implemented via Schiller Station's MSGP coverage (NPDES ID No. NHR053208) rather than its individual permit (NPDES Permit No. NH001473). EPA originally included stormwater provisions in the 2015 NPDES Draft Permit based on PSNH's earlier request to consolidate all NPDES requirements into a single permit, including stormwater-related requirements. *See* AR-202. Accordingly, stormwater provisions were included in the Draft Permit within Parts I.B and I.C, as well as several new, outfall-specific monitoring requirements. EPA understands this comment to mean that the Permittee now desires "to manage all stormwater discharges related to the facility" under the MSGP NHR053208 and all non-stormwater discharges under its individual NPDES permit (No. NH0001473).

First, as specifically requested in the comment, EPA agrees that regulated stormwater discharges at Schiller Station may be authorized under either a general permit or an individual permit. Since the Permittee has now indicated that it would prefer to manage all of its regulated stormwater discharges via the MSGP rather than the individual permit, EPA agrees to remove Parts I.B and I.C from the Final Permit. Of course, the Permittee must maintain appropriate coverage under the MSGP for the regulated stormwater discharges.

Second, Outfalls 013 and 023, which discharge only stormwater associated with an industrial activity, were included in the Draft Permit consistent with the effort to incorporate all stormwater requirements in the individual NPDES permit. Given that the Permittee will retain coverage under MSGP NHR053208, these two outfalls will not be authorized under the NPDES Final Permit NH0001473. Therefore, these outfalls have been removed from the Final Permit, and the Permittee must ensure that stormwater discharges from Outfalls 013 and 023 are appropriately authorized and monitored under the MSGP.

Third, stormwater from the Schiller and Newington Tank Farms and various roof and yard drains were included in the 2015 Draft Permit to be authorized discharges from Outfalls 001, 006, 011 and 018. Authorization for stormwater discharges from these outfalls has also been removed from the Final Permit consistent with the Permittee's request to manage all stormwater discharges under the MSGP. The Permittee must ensure that stormwater discharges from Outfalls 001, 006, 011 and 018 are appropriately authorized and monitored under MSGP NHR053208.

Given that the authorization to discharge stormwater from Outfalls 001, 006, 011, 013, 018 and 023 will all be included in the MSGP, it is also reasonable to accomplish any related monitoring via the MSGP rather than the individual NPDES permit. Therefore, stormwater-related monitoring requirements for total nitrogen and PAHs that were included in the 2015 Draft Permit have been removed from the Final Permit. *See also* Responses to PSNH Comments V.D.2 through V.D.4. EPA will explore establishing monitoring requirements for these stormwater-related pollutants via the MSGP and/or through separate information requests under Section 308 of the CWA.

In summary, all requirements related to the discharge of stormwater associated with an industrial activity have been removed from the Final NPDES Permit. As a result, it is the Permittee's responsibility to ensure that all regulated stormwater discharges from the facility are appropriately authorized and monitored under the MSGP. This will require the Permittee to submit an updated NOI for its MSGP a minimum of 30 days prior to commencing discharge in accordance with the terms of the MSGP. *See* 2015 MSGP Part 1.2.1.3, Table 1-2. EPA expects that this will be feasible given that the time between issuance of the Final Permit and its effective date will be at least 60 days.

PSNH Comment VI. Conclusion

Region 1's Draft Permit must be revised based on the comments set out herein. The agency correctly determined PSNH is entitled to a continuation of its § 316(a) variance for the thermal discharges at Schiller Station. Region 1's § 316(b) BTA determination and BPJ-based BAT limitations for NCMCWs are arbitrary and capricious and require substantial revision prior to issuing the permit as final, however. The June outage requirement for Unit 5 must be removed from the final permit because it is not possible and, even if it were, it does not make economic sense for PSNH and its customers. Modified traveling water screens with an upgraded fish return system constitute BTA for the CWISs at Schiller Station. Entrainment at the facility is de minimis, falls far below the average 125 MGD AIF threshold EPA recently established, and is not causing any environmental impact that is adverse to the aquatic ecosystem of the Piscataqua River (a conclusion with which Region 1 agrees). Installation of fine-mesh CWW screens at Schiller Station to address entrainment is therefore unwarranted.

Were Region 1 to improperly reject PSNH's well-founded BTA conclusions, the agency, prior to making its BTA determination, must allow PSNH to submit additional entrainment data and analyses similar to the information facilities with an average withdrawal volume in excess of 125 MGD AIF are required to submit pursuant to the final § 316(b) rule. This additional information would confirm technologies to address entrainment are not needed at Schiller Station. If that somehow is not the case, Region 1 should allow PSNH to test larger slot-width CWW screens than the 0.8 mm maximum slot-width currently proposed in the Draft Permit. Recent studies compel this authorization and there is no drawback in the agency permitting PSNH to do so. Finally, the proposed timeline for the design, permitting, and construction of the CWW screens at Schiller Station must be revised if the company is ultimately required to install this CWIS technology. The current schedule is unworkable.

The imposition of iron and copper limits to discharges of NCMCWs at Schiller Station is arbitrary and capricious, as well. This waste stream has historically been, and continues to be, treated as a low volume waste exempted from any iron and copper effluent limitations in accordance with the Jordan Memorandum. EPA (with assistance from Region 1) recently confirmed this fact as part of the promulgation of the new NELGs. Region 1 did not even consider the historical permitting record at Schiller Station before establishing BPJ-based BAT limits for the waste stream. This fact alone compels a conclusion that the agency's proposed effluent limitations are arbitrary and capricious and based on an incomplete analysis.

The agency's actual BAT analysis for establishing BPJ-based effluent limitations for NCMCWs at Schiller Station is likewise arbitrary and capricious. Region 1 does not have any data on the makeup of NCMCWs. Thus, it does not and cannot know what, if any, environmental benefit its proposed regulation of NCMCWs will yield. The BAT determination is also insufficient due to the agency's cursory analysis of the costs and implementation issues regulation of NCMCWs in this manner would present at the facility. A thorough evaluation of these and the other factors mandatory to a legally-defensible BAT analysis, along with a review of the historical permitting record, would result in a conclusion that NCMCWs must continue to be classified as a low volume waste and the new final permit must be revised accordingly.

For all the reasons set out herein, PSNH respectfully urges Region 1 to reconsider what is reasonably necessary for Schiller Station to comply with the CWA, and to amend the Draft Permit accordingly.

EPA Response to PSNH Comment VI.:

EPA has previously addressed each of these comments in specific responses above and, where indicated, has incorporated all changes into the Final Permit.

PSNH Comment VII. Exhibits 1 through 8

Exhibit 1 – PSNH Schiller Station Draft NPDES Permit Comments, PSNH Schiller Station, Portsmouth, NH prepared for Public Service Company of New Hampshire D.B.A. Eversource Energy by Enercon Services, Inc. and Normandeau Associates

PSNH Comment VII.A. Appendix 1 – Specific Comments

This Appendix contains a list of specific comments stemming from Enercon and Normandeau's respective reviews of the Fact Sheet and Draft NPDES Permit for Schiller Station. This appendix is first organized by document; that is, fact sheet-or permit-only comments. Document-specific comments are then further organized into categories (*e.g.*, State Water Quality Standards). Finally, each category contains one or more comments relating to that particular category with references to specific sections, page numbers, paragraphs, etc. of the fact sheet or permit. Some comments may also include direct excerpts from these locations, which will be denoted using italics.

PSNH Comment VII.A.1

Fact Sheet

Use of DIF and AIF

1. The EPA appears to be inconsistent in how it presents design and actual intake flow rates for Schiller Station as shown below:

- Page 18: *"The two CWISs have a combined total maximum design intake flow of 150 million gallons per day (MGD)."*
- Page 80: *"Given Schiller Station's intake flow of 125 MGD, the facility was expected to be covered by the Phase II Rule."*
- Page 93: *"In addition, to be more conservative, EPA's presentation of Schiller Station entrainment losses reflect the plant design flow of 124.4 MGD…"*
- Page 104: *"Schiller Station's once-through cooling system is designed to withdraw up to 125.7 MGD of water from the Piscataqua River."*
- Page 112: *"At Schiller Station, the intake flow of 125 MGD is relatively small as compared to the river width and depth, and an adequately sized wedgewire screen installation is not likely to interfere with other uses of the river."*

Per Table 1 of the 2014 Report, the Station's DIF is 125.8 MGD, and AIF was 73.7 MGD. These parameters are updated in Section 4.2 of this report. It is requested that EPA consistently reference the basis for the flow numbers they cite and include DIF or AIF whenever flow rates are discussed.

EPA Response to PSNH Comment VII.A.1:

The Fact Sheet at 18 incorrectly states "these two CWISs have a combined total maximum design intake flow of 150 MGD." It is unclear how this value was calculated. The other inconsistencies that Enercon refers to in its comments likely resulted from inconsistencies in calculating intake volume from circulating pumps with or without the additional volume provided by the salt water and screen wash pumps. The Fact Sheet is not a draft document and will not be revised, but this Response to Comment serves to correct these errors. The screen wash pumps (140 gpm for Unit 4 and 560 gpm for Unit 5 and 6 combined) do not provide cooling water, and as such, this volume in not included in the intake flow of cooling water for the purposes of the Final Rule. The DIF for Schiller Station is 29,150 gpm at Unit 4 and 58,000 gpm for Units 5 and 6 (29,000 gpm each), which is a total DIF of 125.5 MGD. This RTC consistently uses this value as the DIF for the existing CWISs. The AIF at Schiller Station is dependent on the time period over which it is calculated. In Section 4.2 of its comments (p. 21), Enercon references at least two values for AIF: 72.4 MGD (calculated from August 27, 2012 through August 16, 2015) and "approximately" 74 MGD (calculated based on three-year span from 2011 to 2013). The AIF in the comment (73.7 MGD) is the actual value based on intake flows from 2011 to 2013 as presented in the 2014 Supplemental Engineering Response (AR-227, Table 1). For the purposes of this RTC and consistent with the 316(b) Rule, EPA looks at the most recent three years of intake flow data and has determined that the AIF is currently 61.2 MGD based on average monthly flow data from January 1, 2014 through December 31, 2016 obtained from discharge monitoring reports.

PSNH Comment VII.A.2:

State Water Quality (WQ) Standards

2. Page 85: *"(i) More stringent standards. The Director must establish more stringent requirements as best technology available for minimizing adverse environmental impact if the Director determines that compliance with the applicable requirements of this section would not meet the requirements of applicable State or Tribal law, including compliance with applicable water quality standards (including designated uses, criteria, and antidegradation requirements)."*

New Hampshire has no Water Quality standards for 316(b)-related issues that call for EPA to select more stringent standards than the Federal CWA 316(b) regulations.

EPA Response to PSNH Comment VII.A.2:

The Fact Sheet plainly discusses the New Hampshire Water Quality Standards as they apply to cooling water intake structures. *See* Fact Sheet at 86-87. As explained, the limits in the NPDES permit issued by EPA to address cooling water intake structures must satisfy both CWA § 316(b) and any more stringent requirements necessary to satisfy applicable state water quality standards. *Id.* The statement on page 85 of the Fact Sheet referenced in the comment is factual. EPA also states that although the water quality standard for Class B waters (RSA 485-A:8, II) "does not include any specific numeric criteria that apply to cooling water intakes, it is nevertheless clear that permits must include any conditions necessary to protect the designated uses of the river, including that it provide good quality habitat for fish and other aquatic life and as a recreational fishing resource." Fact Sheet at 163. The Director must establish more stringent requirements *if* necessary to meet the requirements of applicable State law. *See* 40 C.F.R. § 125.94(i). More stringent requirements may not be necessary in all cases and, in this case, neither EPA nor the State have explicitly determined that compliance with the Final Rule would not meet the requirements of applicable state law.

PSNH Comment VII.A.3

CWWSs

3. Page 107: *"According to PSNH, a mesh size of no greater than 1.0 mm is necessary to effectively screen most fish eggs and larvae. Enercon, 2008, p. 80."*

This was not stated directly by ENERCON/Normandeau. The 2008 Response evaluated slot sizes from 0.6 mm up to 1.0 mm given the understanding (at that time) that their entrainment reduction performance was considered primarily as a mechanical filter functioning to physically exclude eggs and larvae if their limiting dimensions were larger than the slot width. EPA should examine the considerable new evidence obtained since 2008 and presented in this report and modify their evaluation of CWWS according to these new facts, which support effective performance at slot widths greater than 1.0 mm.

EPA Response to PSNH Comment VII.A.3:

See Response to Comment V.B.5.

PSNH Comment VII.A.4

4. Page 110: *"According to PSNH, this option would include two Johnson Screens Model T78HC half-screens with a slot width of 3/8 inches (9.5 mm) for Screen House #1 (the Unit 4 intake) and three of the same screens for Screen House #2 (Units 5 and 6 intakes)."*

The wedgewire screens for Units 5 and 6 were specified as larger diameter screens than the Unit 4 screens (84 in.).

EPA Response to PSNH Comment VII.A.4:

The commenter's issue seems to be resolved by the very next sentence in the Fact Sheet, which states: "The company indicated that each of the two screens installed for Screen House #1 would be 18.25 feet long and have a diameter of 78 inches, and that each of the three Screen House #2 screens would be 20.75 feet long and have a width/diameter of 84 inches." Fact Sheet at 110.

PSNH Comment VII.A.5

5. *Page 111: "Finally, the biological efficacy of wide-slot wedgewire screens was not evaluated in Enercon, 2014 since, according to Enercon, "biological efficacy is not required under the final § 316(b) regulations." Enercon, 2014, p. 48."*

ENERCON did not state that biological efficacy was not required, the report states that evaluation and monitoring of screen efficacy would not be required as it would meet the 0.5 fps design intake velocity criteria. This is consistent with the 316(b) rule for meeting the BTA standard for impingement mortality.

EPA Response to PSNH Comment VII.A.5:

The 2014 Supplemental Engineering Response ("2014 Response") states: "By selecting either compliance option [barrier nets or wide-slot wedgewire screens], evaluating the biological efficacy is not required under the final § 316(b) regulations." AR-227 at 48. The 2014 Response also states that "evaluating the biological efficacy of these proposed wide-slot wedgewire screens is not required under the final §316(b) regulations, although they may offer some entrainment reduction benefits in addition to impingement mortality BTA compliance" and that "narrow-slot wedgewire screens would provide increased entrainment performance relative to wide-slot screens due to the smaller opening size." *Id.* at 28. EPA agrees that the Final rule does not require evaluation and monitoring of biological effectiveness in order to comply with the BTA standards for impingement mortality at 40 C.F.R. § 125.94(c)(2). *See* Response to Comment V.B.3. The point of the statement in the Fact Sheet, however, was to note that, unlike the 2008 Response, which estimated an entrainment reduction expected from narrow-slot wedgewire screens, the 2014 Response did not include an evaluation of the biological efficacy of wide-slot wedgewire screens with respect to entrainment.

PSNH Comment VII.A.6

6. *Page 111: "Further, dredging would not likely be necessary with wedgewire screens because the screen cylinders are commonly located off the river bottom mounted on a central intake pipe as shown in the figure below (shown with an active airburst system for removing small debris and silt from the screens) (TDD, 2014, p. 6-22)."*

Dredging would be required for the construction phase. Maintenance dredging would potentially be required depending on how much margin is provided above and beyond the required half-screen diameter between the river bed and the bottom of the screen. Given the shallow water depth at times for this site, it may be difficult to obtain ample margin in this location; thus, periodic maintenance dredging would also be expected.

EPA Response to PSNH Comment VII.A.6:

As EPA stated in the Fact Sheet, a general rule of thumb is that "'[t]he available water depth should be at least twice the diameter of the intake screen.'" Fact Sheet at 111 (citing http://www.wedgewire.com/intakescreen.htm). The Fact Sheet also explains:

> Adequate water depth near the intakes is required to ensure that wedgewire screens remain submerged at all times. PSNH reports that the depth in front of the current intakes is nearly 20 feet and that it must periodically dredge sediment that accumulates in front of the intake structures. Enercon, 2008, p. 4 and 5.

Id. Based on the general specifications for the screens (maximum proposed screen diameter of 84 inches), the approximate depth at the site (20 feet), and the aforementioned rule of thumb, there does not appear to be an obvious need for dredging to accommodate the screens. According to Enercon, some dredging will be required for the construction phase of the wedgewire screen installations and also may be needed periodically for maintenance, similar to current practices. The half-screen option proposed in the 2014 Response (and referred to in the comment) may be located closer to the seafloor than the full cylinder design proposed in the 2008 Response, and, as such, may require dredging. Ultimately, however, the need for dredging will be at the discretion of the Permittee and its contractors. EPA has not concluded, nor has PSNH or Enercon asserted, that any dredging would affect the availability of the technology at Schiller Station. It may increase the cost of the technology, however. In responding to the comments on the Draft Permit and assessing the conditions for the Final Permit, EPA relied on the more detailed cost information from the 2014 Supplemental Engineering Response (AR-227), which includes a line item for seafloor dredging.

PSNH Comment VII.A.7

7. *Page 114: "As a result, EPA rejects PSNH's 2014 proposal of wide-slot wedgewire screens (9.5 mm), as presented in the Enercon, 2014 report, as a possible BTA for reducing entrainment mortality at Schiller Station because such screens would be of limited value for reducing entrainment."*

The 9.5 mm wedgewire screens were not proposed as BTA for entrainment, they were proposed to comply with the BTA standard for impingement only. This was based on the understanding at the time that only impingement would be considered in the technology evaluation since the Station had an AIF of less than 125 MGD.

EPA Response to PSNH Comment VII.A.7:

The Fact Sheet states: "PSNH proposed wide-slot wedgewire screens as a compliance candidate for Section 316(b) of the CWA under § 125.94(c)." Fact Sheet at 110. PSNH's intent in proposing wide-slot wedgewire screens to comply with the impingement mortality standards of the Final Rule was understood. However, EPA must also consider the need for site-specific entrainment controls for all facilities, even those with AIF less than 125 MGD, which this section of the Fact Sheet discusses. Although the wide-slot wedgewire screen design with a 0.5 fps through-screen velocity proposed in the 2014 Response (AR-227) would comply with the impingement mortality standards at § 125.94(c), this design would be of limited value for reducing entrainment. In any event, the comment does not provide the basis for PSNH's "understanding at the time that only impingement would be considered" in the BTA determination for Schiller Station based on an AIF below 125 MGD. The Region notes that, to the contrary, the preamble to the Final Rule indicates that facilities below 125 MGD would not "automatically qualify as meeting BTA" and that the administrative threshold was "not an indicator that facilities under that threshold are no longer of concern in the final rule." 79 Fed. Reg. at 48,309-10; *see also* Response to Comment V.B.2.b. The Fact Sheet also explains that Schiller Station is subject to entrainment control requirements under 40 C.F.R. § 125.94(d) regardless of whether it withdraws more or less than 125 MGD. *See* Fact Sheet at 115 n.34.

PSNH Comment VII.A.8

8. Page 116, Table 9-B shows that 1.0 mm wedgewire screens have an effectiveness of 11.5 percent as compared to the rest of the screen sizes that have >80 percent effectiveness.

11.5 percent is based on the understanding at the time the 2008 Response was prepared that the entrainment reduction performance of narrow slot WWS was based primarily on the screens functioning to physically exclude eggs and larvae if their limiting dimensions were larger than the slot width. As stated above, larger slot sizes will have higher effectiveness when considering other mechanisms such as hydraulic bypass and behavioral avoidance of actively swimming larvae as documented in Appendix 3 of this report.

EPA Response to PSNH Comment VII.A.8:

See Responses to Comments V.B.4.b and V.B.5.

PSNH Comment VII.A.9

9. EPA does not appear to have a basis in stating that the fine mesh wedgewire screens will not simply convert entrainment into impingement. EPA states that they have no information to assess what happens to the eggs and larvae once they come into contact with the screens. At the top of Page 117, EPA states that due to the passing currents, they would expect fish eggs to be swept off if they contact the outer surface of the CWW screen because the sweeping flows run along the length of the cylinder, and not perpendicular to the screen mesh as is typical for standard traveling screens. EPA's unsubstantiated expectations are insufficient. The agency must confirm that requiring the costly CWWS at Schiller Station will provide sufficient net benefit.

EPA Response to PSNH Comment VII.A.9:

Normandeau initially estimated the expected reduction in entrainment by counting any organism that is likely too large to fit through the slot size of the CWW screen (*i.e.*, "physical exclusion") as not being entrained. AR-140 at 92. In the Fact Sheet, EPA noted that organisms that would have been entrained but are excluded based on slot size may still not necessarily avoid any impacts from the CWIS if they contact the screens and do not survive. Fact Sheet at 116-17. Eggs and smaller larvae incapable of avoidance but too large to be entrained through the screens could become impinged on the screens and suffer mortality, even if not from entrainment. *Id.*; *see also* 79 Fed. Reg. 48,331. While EPA stated that it had "insufficient information that directly assesses egg and larval survival after contacting a fine-mesh wedgewire screen," it noted that there was information from the scientific literature based on impingement against fine-mesh traveling screens that suggested that 80% of eggs and 12% of larvae may be able to survive encounters with fine-mesh traveling screens. FS at 116-17 and n.36 (citing, among other things, several EPRI reports), 154; *see also* 76 Fed. Reg. 22,174 at 22,186 (Apr. 11, 2011) (finding that survival of "eggs 'converted' to impingement ranged from" 70 to 80 percent and that survival of "larvae collected from a fine mesh screen was usually" less than 20 percent). EPA then reasoned that, "[g]iven the manner in which wedgewire screens are intended to take advantage of passing currents to move organisms, EPA would expect fish eggs to do equally well or better after contact with a wedgewire screen as with a travelling screen." FS at 117. The comment offers no specific criticism, asserting only that "EPA's unsubstantiated expectations are insufficient." Notwithstanding the comment, PSNH appears to agree that fish eggs would likely be swept off if they contact the CWW screens, due to sweeping flows running the length of the cylinder, rather than perpendicular to the screen mesh as they would in the case of traveling screens, given PSNH's statements elsewhere in its comments about sweeping flows in the river at Schiller Station.[50] In any event, EPA recognized the uncertainty inherent in the survival estimates, *see* Fact Sheet at 117-18, 154, and did not actually increase the numeric estimates to reflect the expected effect of the sweeping flow on eggs and larvae, instead using the original estimates, *see* FS at 153-54.

PSNH's comment is, in essence, that EPA "must confirm" that its BTA determination for entrainment "will provide sufficient net benefit." EPA disagrees. It is not necessary for EPA to resolve all uncertainty before reaching a permitting decision under the CWA. Instead, "[a]s in many science-based policymaking contexts, under the CWA the EPA is required to exercise its judgment even in the face of some scientific uncertainty." *Upper Blackstone Water Pollution Abatement Dist. v. United States EPA*, 690 F.3d 9, 23 (1st Cir. 2012); *see also In re Dominion Energy Brayton Point, LLC*, 13 E.A.D. 407, 426 (EAB 2007) ("In the face of unavoidable scientific uncertainty, the Region is authorized, if not required, to exercise reasonable discretion and judgment."). Nor do the new § 316(b) regulations support the comment. The Final Rule at 40 C.F.R. § 125.98(f) requires that EPA establish entrainment requirements for Schiller Station that reflect EPA's determination of the maximum reduction in entrainment warranted after consideration of factors relevant for determining the best technology available for minimizing adverse environmental impact. Additionally, EPA may reject an otherwise available technology as a BTA standard for entrainment if the social costs are not justified by the social benefits. 40 C.F.R. § 125.98(f)(4); *see also* 79 Fed. Reg. at 48,351 ("The [permitting authority] may be able to reject otherwise available entrainment controls if the costs of the controls are not justified by their associated benefits (taking into account monetized, quantified, and qualitative benefits) and the other factors discussed in the final rule."). The Final Rule affords EPA significant latitude to exercise its reasoned judgment in considering the regulatory factors, including quantified, qualitative, and monetized social costs and benefits in establishing site-specific entrainment requirements. EPA has presented a reasoned and extensive explanation for its overall determination. *See* Fact Sheet at 88-172. The comment does not point to statutory or regulatory language to support its claim that EPA must confirm sufficient net benefits before establishing

[50] For instance, PSNH comments that sweeping flows "are likely to minimize the thickness of an installed CWW screen's withdrawal zones [or 'zone of hydraulic influence'], and allow hydraulic bypass and behavioral avoidance to contribute significantly to the entrainment reduction performance of installed CWW screens compared to physical exclusion," *see* PSNH Comments, Exhibit 1, Appendix 3 at 2-10, and that they would be sufficient to remove debris from, and "facilitate adequate cleaning of[,] the wedgewire screens." AR-140 at 86.

site-specific entrainment requirements. The Final Rule sets no obligation to calculate "net benefits" and doing so would potentially limit EPA's ability to consider qualitative and quantitative benefits in its assessment, which the Final Rule not only authorizes, but encourages EPA to do. *See, e.g.*, 79 Fed. Reg. at 48,351 ("Merely because it is difficult to put a price tag on those benefits does not mean that they are not valuable and should not be included at least qualitatively in any assessment.").

PSNH Comment VII.A.10

Impingement and Entrainment Impacts

10. Page 91, Section 8.2.1, first paragraph. The description of entrainment studies is incorrect. Nets were not hung outside of Screen House #2 to collect entrainment abundance samples. Section 2.1 of the methods of the 2008 Biological Report clearly state "Entrainment samples were collected through a 0.300 mm mesh plankton net suspended in a barrel sampler located outside of the Schiller Station Screen House #2 (Figure 2-2). Entrainment samples were collected from a 4-inch raw-water tap drawing un-chlorinated ambient cooling water at low pressure (about 15 psi) from a common service water feed line that taps into both the Unit 5 and Unit 6 circulating water pumps on the condenser side of the pumps."

However, a pump and net rig suspended in a tank in the water was used for control sample collection of source water body entrainment survival studies once monthly. It appears that EPA has confused the two different types of entrainment studies and the methods used, which are clearly explained in the methods section of the 2008 Biological Report.

EPA Response to PSNH Comment VII.A.10:

The Fact Sheet will not be revised and reissued, but this comment is noted for the record. EPA notes that neither the description of entrainment studies in the Fact Sheet nor the comment assert any impact from this issue on the BTA determination.

PSNH Comment VII.A.11

11. Page 92, first paragraph: *"Impingement losses were calculated using design flow, because this represents a worst-case impact analysis."*

Impingement losses were also shown in Attachment 6 of the 2008 Response at full DIF (125.8 MGD, units 4, 5, and 6 combined) and at all 5% reductions in intake flow from DIF. EPA selectively uses the highest abundance numbers for impingement based on design flows as part of their determination for BTA, when current and foreseeable future AIF is 72.4 MGD and is considerably lower than DIF (Section 4.2 of this report).

EPA Response to PSNH Comment VII.A.11:

In its 2008 Biological Report (AR-136), Normandeau presented impingement abundance calculated using the actual operating flows for the 52-week sampling year from 2 October 2006 to 30 September 2007 adjusted for collection efficiency. Tables 4-6 (for fish) and 4-11 (for macrocrustaceans) in the 2008 Biological Report present the total impingement abundance as 5,365 fish and 12,649 macrocrustaceans. The Fact Sheet presents total annual impingement losses calculated at design flow as 5,557 fish and 13,536 macrocrustaceans. Fact Sheet at 92. Tables 6-1 and 6-5 in Attachment 6 of the 2008 Engineering Response (AR-140, referenced in the comment) present total annual impingement at maximum generating flow as 5,606 fish and 13,276 macrocrustaceans. The differences between the values in the Fact Sheet and in Attachment 6 are relatively minimal (less than 1% for fish and less than 2% for macrocrustaceans). The difference is likely caused by the method of calculation (*e.g.*, using average impingement rate or actual raw data from the study). Neither Enercon nor Normandeau provide an explanation of how the values in Attachment 6 are calculated so EPA was unable to clarify the cause of this difference. In any case, the difference is small and does not alter the determination that impingement of fish and macrocrustaceans at Schiller Station is an adverse environmental impact. EPA correctly considers the potential for impingement losses at design flow because this flow was requested in the application for permit issuance and authorized by the Draft Permit. The current energy market has largely driven the recent capacity reductions at Schiller Station; however, the current permit does not limit the capacity, nor is EPA aware of any commitment by the Permittee to maintain Schiller Station's AIF at 72.4 MGD.

The Final Rule requires that Schiller Station comply with one of seven possible alternatives to meet the impingement mortality BTA standard. *See* 40 C.F.R. § 125.94(c). For the most part, compliance with one of the possible alternatives for the BTA for impingement mortality is not dependent on the actual numbers of fish impinged – either at AIF or DIF. There are three exceptions: (1) the impingement mortality performance standard at § 125.94(c)(7); (2) de minimis rate of impingement (at § 125.94(c)(11)), and (3) low capacity utilization (at 40 C.F.R. § 125.94(c)(12)). If PSNH installs and operates the BTA for entrainment—fine-mesh wedgewire screens—the design through-screen velocity of the screens will also comply with the design through-screen velocity BTA alternative for impingement mortality at § 125.94(c)(2) without any additional modifications, which would be advantageous for the Station. The use of wedgewire screens is also consistent with PSNH's 2014 Engineering Response (AR-227), which proposed wedgewire screen technology as one alternative to comply with the impingement mortality BTA under the Final Rule. *See* Response to PSNH Comment V.B.3.

PSNH Comment VII.A.12

12. Page 92, fourth paragraph. Sampling was performed before condenser passage in the 2006-2007 entrainment characterization study because the requirements of the now suspended Phase II Rule (July 2004) specified that the 316(b) regulations governed cooling water intake structures, not condenser passage and thermal discharge.

EPA Response to PSNH Comment VII.12:

This is noted for the record. In any case, the asserted reason for the design of the study does not change the fact that it does not provide a valid comparison with actual conditions at the facility.

PSNH Comment VII.A.13

13. Page 93, second paragraph. The EPA states they accept previously provided survival and collection efficiency data for impingement of fish and shellfish at the Station, but they don't consistently use that data as presented in the 2008 Biological Report. Furthermore, the final §316(b) regulations allow exclusion of fragile species, which constitute about 20 percent of the Station's total annual impingement abundance and about 10 percent of the impingement survival abundance, and these organisms do not seem to have been excluded in the impingement mortality evaluations of Schiller Station performed by EPA. Finally, Green Crab (*Carcinus maenas*) should not be considered in any impingement or entrainment calculations or evaluation of the performance of technologies or operational measures to reduce entrainment or impingement due to their status as an invasive species.

EPA Response to PSNH Comment VII.A.13:

The Fact Sheet states "EPA reviewed Schiller's Impingement Efficiency and Survival Studies and found them to be reasonable and valid. Therefore, the impingement losses presented here reflect adjustments made based on the results of those studies." Fact Sheet at 93. The impingement losses presented in Tables 8-C and 8-D reflect Normandeau's adjustments for collection efficiency but not latent survival. According to Normandeau's 2008 Biological Report (AR-136), when adjusted for latent impingement survival on a seasonal basis, an estimated 978 of the 5,365 fish impinged (18%) would have survived impingement, resulting in total impingement mortality of 4,387 fish. Similarly, an estimated 8,549 of the 12,649 macrocrustaceans impinged (68%) would have survived impingement, resulting in total impingement mortality of 4,100 macrocrustaceans.[51] Ultimately, the results of the survival study indicate that there is still substantial impingement mortality at the CWISs, especially for fish.

The Final Rule excludes fragile species for assessing compliance with the impingement mortality alternatives at 40 C.F.R. § 125.94(c)(5), (6), and (7). For example, a facility may exclude fragile species from consideration when complying with the BTA for impingement mortality using a modified traveling screen under § 125.94(c)(5) and EPA excluded fragile species from the data considered as the basis of the 12-month percent impingement mortality standard at 40 C.F.R. § 125.94(c)(7). *See also* TDD for Final Rule at 11-3. However, the Final Rule does not require EPA to eliminate fragile species from consideration of the potential adverse environmental impacts from impingement. In fact, the Final Rule plainly authorizes the permitting authority to evaluate the need for additional requirements for the protection of fragile species, which necessarily requires enumeration of these species. *See* 40 C.F.R. § 125.94(c)(9). The Response to Comments for the Final Rule discusses the exclusion of fragile species from the numeric impingement performance standard and states "[f]ragile species are accounted in the baseline biological monitoring and are only excluded for measurement of compliance against the numeric standard (which is appropriate as the technology basis for the standard, modified traveling

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[51] The evaluation in the 2008 Biological Report considered the impingement of 8,924 green crabs and adjusted macrocrustacean impingement using a seasonal latent survival rate that included green crab. The commenter indicates that green crab should have been excluded from the analysis in the Fact Sheet (though, notably, Normandeau included this species in its own analysis in the 2008 Report). EPA did not have access to the specific calculations used to estimate latent survival and thus, these estimates include all macrocrustacean species.

screens with fish returns is largely not effective against fragile species).” Final Rule RTC at 275. If one were to ignore fragile species entirely when assessing potential impacts, the permitting authority might erroneously find that a facility that impinges a large number of fragile species would have no adverse impact. The Fact Sheet correctly assesses the potential impacts of impingement including all species.

As discussed above, the facility selects the impingement mortality compliance alternative under the Final Rule after the entrainment requirements are established by the permitting authority. *See* 40 C.F.R. § 125.94(b). When selecting a compliance alternative, the facility may exclude fragile species in some cases. The determination of the BTA for entrainment at Schiller Station, fine-mesh wedgewire screens, allows the facility to comply with the BTA for impingement mortality based on the design through-screen velocity without additional technology as long as the screens are operational. This technology is protective of most species, even fragile species, because it allows fish to avoid impingement rather than rely on capturing and returning fish (as with modified traveling screens, for instance). If PSNH chooses to comply with the impingement mortality BTA year-round using wedgewire screens based on through-screen velocity, there are no additional requirements for the facility. *See* Response to PSNH Comment V.B.3.

Finally, EPA agrees that entrainment and impingement of green crabs, an invasive species with demonstrated adverse ecological and economic impacts in New Hampshire estuaries, should not be considered an adverse environmental impact. Although the green crab is not one of the excluded species in the definition of “all life stages of fish and shellfish” in Final Rule, the permitting authority can exclude other nuisance species from the definition. *See* 40 C.F.R. § 125.92(b). In this Response to Comments, EPA has excluded green crab from the revised estimates of entrainment and impingement. See Responses to PSNH Comment V.B.2 and Response to Sierra Club Comment IV.B.1.

PSNH Comment VII.A.14

14. Pages 93 and 94, Table 8-A and 8-B of the draft fact sheet. The entrainment of fish (Table 8A) and macrocrustaceans (Table 8B) losses reported in these tables do not match the corresponding values presented in the 2008 Biological Report (Normandeau 2008). It is unclear what CWIS flows the abundance data presented in Tables 8A and 8B are based on. Table 3-8 and 3-13 of the 2008 Biological Report (Normandeau 2008) shows total annual entrainment abundance of fish (Table 3-8) and their adult equivalents (Table 3-13) for fish based on AIF during the 2006-2007 study at Units 4, 5 and 6 combined of Schiller Station as 145,554,178 total individuals among all species and life stages (Table 3-8), and 673,725 equivalent adults (Table 3-13). Similarly, for macrocrustaceans based on AIF during the 2006-2007 study at Units 4, 5 and 6 combined of Schiller Station, Table 3-10 of the 2008 Biological Report shows total annual macrocrustacean entrainment abundance as 1,305,064,062, and their equivalent adult entrainment abundance as 145,685 (Table 3-15).

EPA Response to PSNH Comment VII.A.14:

Enercon asserts that it is unclear what flows were used to calculate the entrainment abundance data in Section 8 of the Fact Sheet. The Fact Sheet at 93 states, “to be more conservative, EPA’s presentation of Schiller Station entrainment losses reflects the plant's design flow of 124.4 MGD, which represents a 7.3% increase over Normandeau's estimates using a 5-year average operating flow." Thus, the tables in Section 8 of the Fact Sheet are based on a flow of 124.4 MGD. As an example, the total annual entrainment in Table 3-8 (145,554,178 fish eggs and larvae) of the 2008 Biological Report (AR-136) was increased by 7.3% to yield an estimated annual entrainment of 156,179,633 fish eggs and larvae (as presented in Table 8-A). The entrainment estimates in the 2008 Biological Report are based on actual operating flows during the 2006-2007 study. In Response to PSNH Comment VII.A.1, EPA clarified that the DIF of the CWISs at Schiller Station, based on the capacity of the pumps, is 125.5 MGD.

PSNH Comment VII.A.15

Use of Equivalent Adult and Absolute Numbers

15. Page 95 and 96, Table 8-C and 8-D. Losses for impingement abundance values for fish and macrocrustaceans are not based on adult or age equivalents, and do not remove fragile species as specified by the §316(b) regulations. Furthermore, the values found in these tables do not match the 2008 Biological Report report for design or actual flows.

EPA Response to PSNH Comment VII.A.15:

In the responses to the comments above, EPA addressed how it considers "fragile species" in assessing the potential impacts from impingement versus evaluating compliance with one of the BTA standards for impingement mortality under the Final Rule and how the values in the Fact Sheet were calculated. Regarding adult or age equivalents, the Final Rule does not specify that impingement losses should be presented as adult equivalents. In fact, the impingement mortality performance standard at 40 C.F.R. § 125.94(c)(7) specifies "[a] facility must achieve a 12-month impingement mortality performance standard of all life stages of fish and shellfish of no more than 24 percent mortality, including latent mortality, for all non-fragile species together that are collected or retained in a sieve with a maximum opening dimension of 0.56 inches and kept for a holding period of 18 to 96 hours." The Final Rule here clearly anticipates that the BTA standard for impingement mortality will apply to all life stages of fish captured, not just the adult equivalent values. EPA also used the total number impinged, rather than adult or age equivalent value, in the statistical analysis supporting the impingement mortality performance standard. *See* TDD for the Final Rule, pp. 11-8 to 11-10. The Fact Sheet did not err by presenting the impingement values as total losses rather than as adult or age equivalents.

Enercon also comments that fragile species were not removed from Tables 8-C or 8-D of the Fact Sheet as specified by the Final Rule. As discussed in Response to PSNH Comment V.II.13 above, the Final Rule does not require EPA to remove fragile species from consideration of the adverse environmental impacts of impingement mortality. Fragile species are considered separately in the compliance alternatives for the BTA for impingement mortality under 40 C.F.R. § 125.94(c), but the Final Rule does not specify how EPA should treat fragile species in terms of adverse impact, which is the issue discussed in the section of the Fact Sheet to which Enercon refers. As the permitting authority is authorized to consider whether additional controls are necessary to protect fragile species under 40 C.F.R. § 125.94(c)(9), it follows that, at a minimum, impacts to fragile species must be assessed at some point in the determination. As such, EPA properly considered the loss of all organisms to impingement, including fragile species, when assessing adverse environmental impacts from the CWISs.

PSNH Comment VII.A.16

16. Page 115, third paragraph and Footnote 35: "PSNH's consultants estimated the number of eggs and larvae that would be excluded by wedgewire screens with different slot sizes (see Table 9-A above). However, these values are based on adult equivalents.[35] EPA considers adult equivalents, but also focuses on absolute loss numbers of eggs and larvae when making control decisions. Basing decisions solely on adult equivalents would ignore the valuable ecological role eggs and larvae play in the food chain."

"[35] *An adult equivalents analysis estimates the number of adult fish of a certain age that a particular number of eggs and larvae would produce based on certain assumptions about the normal development and survival of the early life stages of each species."*

The EPA supports the use of absolute loss numbers citing the valuable ecological role eggs and larvae play in the food chain. However, the eggs and larvae entrained by the Station are not consumed by the Station, but are returned to the Piscataqua River where their biomass and organic carbon will continue to play a role in the estuarine ecology. EPA does not assess the benefit these returned eggs and larvae have to the food web, but instead utilizes absolute numbers and not their equivalent adult values which misrepresent the contribution of different life stages to their assessment of impact the Station has on the Piscataqua River. As discussed in the Section 3.4 of the report above, impact evaluations and comparisons of technologies for reducing entrainment or impingement that act differentially on different life stages of organisms should all be based on equivalent adults.

Moreover, in assessing the use of wedgewire screens, the EPA relies on the equivalent adult calculations provided in Table 9-A of the Fact Sheet. Use of equivalent adult information is necessary as entrained organisms in different life stages are assigned different values in a benefits valuation study. In Tables 10-A and 10-B included later in the draft fact sheet, the EPA utilizes absolute loss values without addressing the difference in life stage value or the benefit of returned eggs and larvae to the Piscataqua River. Therefore, the conclusions reached by the EPA based on the use of absolute numbers solely need to be revisited to address these inconsistencies.

PSNH Comment VII.A.17

17. Page 134, Table 9-C. The comparisons being made as part of this table cannot be properly performed without using equivalent adults, due to different life stages present in the different months.

EPA Response to PSNH Comment VII.A.16 and 17:

EPA does not disagree that equivalent adult fish can be a useful metric for assessing the impacts of CWISs and the potential benefits of available technologies. For example, EPA has used adult equivalent estimates (in addition to individuals) to develop regional and national estimates of impingement and entrainment for use in the analysis of benefits. See, *e.g.*, 79 Fed. Red. at 48,403-5. In particular, standardizing estimates using common biological metrics allows comparison across species, years, facilities, and geographic regions and are suitable for use in a national economic benefits analysis. *See* Benefits Analysis for the Final 316(b) Existing Facilities Rule at 3-1. For the Final Rule as well as the Phase III Rule, EPA used age-1 equivalents, forgone fishery yield, and production forgone to assess the relative benefits of various options on a national basis. *See Id*. at Chapter 13.

It is not, however, the only, or even the best available metric to assess impacts from impingement and entrainment, particularly on a facility-specific basis. EPA recognizes this in the Final Rule RTC at 404, stating:

> Although commenters recognize the utility of age equivalency models, some noted that they do not take into account for ecological effects of CWIS operation beyond IM&E. Whenever possible, EPA took broader ecological impacts into account (e.g., the value to forage fish was recognized through the use of trophic transfer), though this was not possible in many cases. For example, EPA acknowledges that there are other effects of CWIS operation, including flow and thermal alteration, effects on non-aquatic organisms (e.g., birds), and the potential for impacts on decomposers. EPA agrees with Riverkeeper that these effects are poorly studied, are difficult to detect reliably, and may be hidden by other anthropogenic impacts (e.g., fishing, climate change, channelization, nutrient cycling, land use change, etc.).

See also Response to PSNH Comment V.B.2.c.

PSNH Comment VII.A.18

Representative Important Species (RIS) Comment

18. Page 57, Table 6-C. EPA's 1977 draft guidance document describes the following rationale for selecting representative important species (RIS): (1) it is not possible to study in great detail every species at a site; there is not enough time, money, or expertise; (2) since all species cannot be studied in detail, some smaller number will have to be chosen; (3) the species of concern are those casually related to power plant impacts; (4) some species will be economically important in their own right (e.g., commercial or sport fishes or nuisance species) and thus "important"; (5) some species, termed "representative", will be particularly vulnerable or sensitive to power plant impacts or have sensitivities of most other species and, if protected, will reasonably assure protection of other species at the site; (6) wide-ranging species at the extremes of their ranges would generally not be considered acceptable as "particularly vulnerable" or "sensitive" representative species, but they could be considered as "important"; (7) often, all organisms that might be considered "important" or "representative" cannot be studied in detail, and a smaller list (e.g., greater than one but less than 15) may have to be selected as the "representative and important" list; (8) often, but not always, the most useful list would include mostly sensitive fish, shellfish, or other species of direct use to man or for structure or functioning in the ecosystem; and (9) officially listed "threatened or endangered species" are automatically "important".

The list of 11 fish species and one macrocrustacean (American Lobster) identified by EPA in Table 6-C on Page 57 of the draft fact sheet contains too many fish species with duplicate life histories to be consistent with the rationale provided above. For example, EPA's Table 6C includes three clupeid fish species (Alewife, Blueback Herring and Atlantic Herring), and the two anadromous fish species (Alewife and Blueback Herring) are virtually indistinguishable by anglers, commercial fisherman, and fishing and harvest regulations, and these two "river herring" also share similar phylogeny with Atlantic Herring. To be consistent with EPA's rational for selecting RIS, we recommended that the following seven RIS be considered for Schiller Station as candidate RIS: Cunner, Rainbow Smelt, Atlantic Mackerel, Winter Flounder, Atlantic Sturgeon, Atlantic Herring, and American Lobster. Essential Fish Habitat (EFH) species can be addressed separately, but that EFH classification does not automatically make them RIS.

EPA Response to PSNH Comment VII.A.18:

The comment requests that EPA revise the Representative Important Species (RIS) List identified in Table 6-C of the Fact Sheet by removing the following five species: alewife, blueback herring, striped bass, bluegill and Atlantic cod. First, EPA generally does not revise a Fact Sheet accompanying a Draft Permit. Second, while a revised RIS List could be added to the record as part of this Response to Comments, EPA does not agree that removing the five species identified in the comment is necessary, appropriate, or consistent with the justification provided in the comment. EPA is given latitude in selecting the RIS species. There is no prohibition against including fish species with "duplicate life histories" or "similar phylogeny," as claimed as a justification for the species removal in the comment. In this case, for example, alewife, blueback herring and Atlantic herring, while all clupeid species, display different spawning times, different sensitivities to temperature, different out migration patterns, and different densities in the Piscataqua River (see Fact Sheet Section 8.2.3). These differences in life cycles and water temperature sensitivity are evidence that the selection of these three related species is not redundant. Striped bass, bluegill and Atlantic cod are even poorer candidates to meet the duplicate life histories justification suggested by PSNH, especially in regard to bluegill, the only freshwater resident species on the RIS. As a final note, even if the five species identified in the comment were removed from the RIS List, this action would not be cause to amend or affect the regulatory approach or limits of the Final Permit in any way. Taking this information into consideration, EPA has decided to make no adjustments to the RIS List.

PSNH Comment VII.A.19

Outfall Requirements

19. Page 20, Outfalls 002, 003, and 004: *"PSNH has requested that the temperature limits be increased from 95°F/25°C to 100°F/30°C."* This statement is also found on Page 77.

All listed temperature values should be in units of Fahrenheit, not Celsius.

EPA Response to PSNH Comment VII.A.19:

EPA has included units of Fahrenheit in the Final Permit.

PSNH Comment VII.A.20

20. Page 21, Internal Outfall 016: *"Based on the historical compliance record, PSNH requests the monitoring frequency for oil and grease, total suspended solids, iron and copper for Outfall 016 be reduced to monthly."*

Iron and copper limits no longer apply to Outfall 016 per Section 6.3.7 and 6.3.8.

EPA Response to PSNH Comment VII.A.20:

EPA agrees to reduce iron and copper monitoring to monthly for Outfall 016. This change is in addition to the segregation of non-chemical metal cleaning waste to Outfall 017 and/or the incorporation of a combined waste stream formula at Outfall 016, as described in more detail in the relevant comments above.

PSNH Comment VII.A.21

21. Page 29, Rain pH: *"Based upon historical compliance, PSNH requests the monitoring frequency at this outfall be reduced to quarterly. EPA has granted this request, as reflected in the draft permit."*

Page 20-21, Outfall 011: *"Rainfall pH is also recorded to compare to effluent readings. Based upon historical compliance, PSNH requests the monitoring frequency be reduced to quarterly and the pH sampling be reduced to a single grab from any of the three pipes."*

The monitoring frequency of rain pH per Page 6 of the Permit (Note 1) currently states, *"Rainfall pH shall be monitored when the discharge is monitored and shall be reported as an attachment to the monthly DMR."* However, the discharge limitations and monitoring requirements (DLMR) table on Page 5 of the Permit indicates that not all effluents are to be monitored quarterly. Thus, additional clarification needs to be added to the Fact Sheet and/or the Permit as to when rain pH for Outfall 011 should be monitored.

EPA Response to PSNH Comment VII.A.21:

The requirements to monitor rainfall pH at Outfalls 011, 013, and 018 in the Draft Permit were carried forward from the current (1990) permit. The current permit and Draft Permit authorized discharges of runoff from the yard drains, tank farms, and coal pile from these three outfalls. Based on comments submitted by PSNH indicating a preference to retain coverage for stormwater discharges at Schiller Station under MSGP Permit NHG053208, the Final Permit has eliminated coverage for stormwater discharges at 011 and 018 and eliminated Outfall 013 (which only discharges runoff) from the Final Permit. *See* Responses to PSNH Comments V.D.3, V.D.4, and V.D.7. The Final Permit requires that monitoring at Outfalls 011 and 018 be performed during dry weather. As such, the requirements to monitor rainfall pH, which were specific to the stormwater requirements and necessary to ensure that the pH of stormwater was within 0.5 standard units of rainfall, have been removed from the Final Permit. The elimination of rainfall pH monitoring from the Final Permit resolves the comments regarding monitoring frequency. Given that stormwater discharges will be authorized by MSGP NH053208, it is also reasonable to accomplish any related monitoring via the MSGP rather than the individual NPDES permit. EPA will explore establishing additional stormwater monitoring requirements, including rainfall pH, via the MSGP and/or through separate information requests under Section 308 of the CWA.

PSNH Comment VII.A.22

Pollutant Descriptions

22. Page 195, Effluent Characteristic table: This table lists "Total Residual Chlorine" as a pollutant, while all similar tables found in the body of the Fact Sheet and Permit list "Total Residual Oxidants". Revise for consistency.

EPA Response to PSNH Comment VII.A.22:

The Fact Sheet is not a draft document and therefore, will not be revised, However, this comment is noted for the record. The Final Permit correctly refers to Total Residual Oxidants.

PSNH Comment VII.A.23

23. Page 208: Same comment as above. Also, there is additional discussion below the table about total residual chlorine. This is inconsistent with similar discussions found in the Fact Sheet about the discharging of total residual oxidants. Revise for consistency.

EPA Response to PSNH Comment VII.A.23:

The Fact Sheet will not be revised, however, this comment is noted for the record. The Final Permit correctly refers to Total Residual Oxidants.

PSNH Comment VII.A.24

Financial Feasibility

24. Page 157: *"Closed-cycle cooling is an entrainment mortality reduction option open to Schiller Station. It is both technically and financially feasible."* Financially feasible is not defined by the EPA in this document.

EPA Response to PSNH Comment VII.A.24:

The Final Rule uses the words feasible and technically feasible throughout the preamble (without defining the term "feasible" itself) to refer to technologies that are also effective, widely available, and demonstrated for facilities nationally. *See, e.g.*, 79 Fed. Red. 48,303, 48,325, 48,

340. The Merriam-Webster Dictionary defines feasible as "capable of being done or carried out." In the Fact Sheet, EPA uses feasible to mean that the technology is capable of being installed and operated at the site ("technically feasible") and that the permittee is capable of bearing the costs of the technology ("financially feasible").

PSNH Comment VII.A.25

Estimating BTA Costs

25. Page 149: Cost figures should be presented in 2015 dollars.

EPA Response to PSNH Comment VII.A.25:

PSNH originally designated cost information to be Confidential Business Information (CBI). As such EPA was unable to release the figures and presented technology costs as a ratio of net present values (NPV) of each technology relative to net present value of Ristroph screens (used as an index). As such, the Fact Sheet did not present cost figures.

EPA converted cost values from 2008 dollars to 2013 dollars using the Construction Cost Index before calculating NPV. Had EPA adjusted cost values to 2015 dollars, it would not have changed the analysis because the Fact Sheet compared cost ratios rather than actual dollar values. Because the adjustment would have affected all cost values equally, the results would be the same regardless of which dollar year was used.

PSNH Comment VII.A.26

Fish Return Conduits

26. Page 104, Section d, second paragraph: There is no basis for stating that re-impingement of fish is likely to occur at Screen house #2.

EPA Response to PSNH Comment VII.A.26:

No site-specific study of re-impingement has been performed at Schiller Station by which to evaluate the likelihood of re-impingement (*i.e.*, there is equally no basis to assume that re-impingement does not occur). EPA recognizes that the impacts of re-impingement are not precisely known; however, given that, at some tidal stages, the outlet of the fish return trough is directly upstream of the intake opening to Screen House #2, fish exiting the sluiceway will, at a minimum, be re-exposed to the intake. In any case, the likelihood of re-impingement does not change the determination of the BTA in this case, nor does the comment suggest that a change to any permit requirement is warranted.

PSNH Comment VII.A.27

Editorial

27. The following are editorial / formatting comments found throughout the document:

- There is extra space between the Section 6.3.4 heading and the preceding paragraph.
- Page 59, Striped Bass: Both of the parenthetical citations in this paragraph have periods before and after the parenthesis. The period before the parenthesis can be removed.
- Page 60, Atlantic Cod: *"Adapted for bottom feeding, they inhabit rocky bottoms but may occasional feel on herring in the water column."*
  - Change to "…but may occasionally feed on herring…"
- Page 61, American Lobster: See Comment a. above regarding one parenthetical citation in this paragraph.
- Page 93: *"Entrainment losses of ichthyoplankton peaked in July, with a much smaller peak in the winter (January-March) (Figure 8-1)."*
  - Figure 8-1 shows peaking of ichthyoplankton in June, not July. Update throughout to reflect peaking in June.
- Page 170: *"The Draft Permit includes the following compliance schedule at Part I.A.14.b:"*
  - I.A.14.b should be I.A.13.b.
- Page 210, Heavy Metals: This paragraph talks about the discharge of non-chemical metal cleaning waste into Outfall 016A.
  - Outfall 016A should be Outfall 017 per Section 6.3.7 and 6.3.8.
- Figure 6-2 on Page 52 should be presented as delta-T above ambient in three planes (i.e., near-surface, mid, and near-bottom) to better align with the fact sheet text and permit limits.

EPA Response to PSNH Comment VII.A.27:

The Fact Sheet will not be revised, however, this comment is noted for the record. EPA notes that the suggested editorial revisions for the Fact Sheet would not affect the Final Permit conditions nor does the commenter claim as such.

PSNH Comment VII.A.28

Permit

Outfall Requirements

1. Page 5: *"The effluent from 3 individual pipes combine to create the culverted outfall."*

   A similar statement is needed in the paragraph preceding the DLMR table for Outfall 018 found on Page 11 of the Permit.

EPA Response to PSNH Comment VII.A.28:

This language has been added to the relevant section of the Final Permit for Outfall 018.

PSNH Comment VII.B

Other Exhibits include:

- Exhibit 2 Evaluation of Alternative Intake Technologies at Indian Point Units 2 & 3, prepared for Entergy Nuclear Indian Point 2, LLC, and Entergy Nuclear Indian Point 3, LLC by Enercon Services, Inc., February 12, 2010.
- Exhibit 3, Memorandum to Bruce P. Smith, EPA Enforcement Division Region 111 from J. William Jordan, EPA Permit Assistance and Evaluation Division, Response to Request for Interpretation of the Chemical Effluent Limitation Guidelines for the Steam Electric Power Generation Industry, June 17, 1975.
- Exhibit 4, US EPA Fact Sheet, Draft National Pollutant Discharge Elimination System (NPDES) Permit to Discharge to Waters of the United Stations, NPDES Permit No. NH0001473, PSNH, Schiller Station, Portsmouth, NH, June 22, 1990.
- Exhibit 5, Response to Comments Reissuance of NH0001473, PSNH, Schiller Station, for Comment Period, July 3, 1990 to August 1, 1990.
- Exhibit 6, Fact Sheet, Draft National Pollutant Discharge Elimination System (NPDES) Permit to Discharge to Waters of the United States, Permit NH0001465, PSNH, Merrimack Station, Bow, NH, (incomplete and undated).
- Exhibit 7, Excerpt of Fact Sheet, Draft National Pollutant Discharge Elimination System (NPDES) Permit to Discharge to Waters of the United States, Permit NH0001465, PSNH Merrimack Station, Bow, Outfalls 003A and 003B, (undated).
- Exhibit 8, Response to Comments, Reissuance of Permit No. NH0001465, PSNH Merrimack Station, Bow, NH, June 24, 1992.

EPA Response to PSNH Comment VII.B:

Exhibits 2 through 8 have been reviewed and considered in the relevant responses by EPA above, but were not reproduced in this document.

SUPER LAW GROUP LLC SIERRA CLUB

Sierra Club Comment I. Executive Summary

Our chief concern is that the antiquated once-through cooling system for Schiller's electricity-generating turbines has the capacity to draw more than 150 million gallons of water per day ("MGD") out of the Piscataqua River.[8] According to your office, the once-through cooling system also collects and kills nearly 1.7 billion aquatic organisms annually. [9] The cooling system crushes larger fish and other animals against the intake structure (impingement) and sucks smaller organisms through the cooling water intake system (entrainment). It then discharges heated, chemically treated water that further harms fish, eelgrass, and other organisms in the Piscataqua River.

According to PSNH's own studies, more than 42 taxa of fish and macrocrustaceans are killed at Schiller, including at least three species listed as "species of concern" by the National Marine Fisheries Service: rainbow smelt, alewife and blueback herring. In addition, three species federally-listed as endangered -shortnose sturgeon, Atlantic sturgeon and Atlantic salmon -may be adversely affected by Schiller's intake structures. To date, EPA has not discussed endangered Atlantic salmon in the permit record.

These harms are unacceptable and are not adequately addressed by the EPA's decision to select cylindrical wedgewire screens as the Best Technology Available. To minimize Schiller's adverse environmental impacts, as required by CWA § 316(b), EPA should require PSNH to convert Schiller to a closed-cycle cooling system that will virtually eliminate these problems. As these comments and accompanying expert reports demonstrate, the aquatic impacts of the plant's existing once-through cooling system are significant and detrimental, the Clean Water Act ("CWA") requires that these impacts be minimized through the permit renewal process, and, consistent with previous determinations by EPA and other permitting authorities, the installation of closed-cycle cooling is both necessary to minimizing these impacts and is technically feasible and affordable at the plant.

If EPA instead selects cylindrical wedgewire screens as BTA in Schiller's final NPDES permit, then Sierra Club proposes that EPA include a water withdrawal limit in the permit that replicates the current low-capacity factor conditions at Schiller. Because EPA proposed wedgewire screens in light of these conditions, an enforceable water withdrawal limit will ensure that the anticipated environmental benefits are fully realized going forward.

Notwithstanding Sierra Club's disagreement with the proposed BTA determination, Sierra Club agrees with EPA's decision to set a through-slot velocity limit on any screen to be used (including the screens for a closed-cycle cooling system using the river for makeup water). As discussed below and in the attached report from Petrudev, Sierra Club believes that the correct velocity limit to protect the species adversely affected by Schiller is 0.2 fps, and not 0.5 fps. Further, to make the velocity requirement more than a mere aspiration, Sierra Club proposes that the final NPDES permit include required continuous through-slot velocity monitoring. Given the fouling risks associated with cylindrical wedgewire screens, a monitoring requirement will make sure that the screens are operating as designed.

Finally, EPA should not issue a final permit without terminating or incorporating currently unpermitted discharges associated with Schiller's onsite landfill. For decades, the now-inactive landfill received harmful industrial waste streams, most of which remain in place today. The permittee's own monitoring data show that leachate from the landfill has migrated through groundwater beyond the landfill perimeter. Given the short distance and prevailing direction of groundwater flow (i.e. toward the river), there is an extremely high likelihood that contaminated leachate from the landfill is reaching the Piscataqua River, via hydrologically connected groundwater, meaning that landfill is an unpermitted point source of discharge to the Piscataqua.

(footnotes start at #8 - #1 through 7 are in cover letter)

[8] EPA Region 1, Schiller Station Draft Authorization Discharge Under the National Pollutant Discharge Elimination System NPDES Permit NH0001473 – Fact Sheet at 18 (Oct. 30, 2015) (hereinafter "Schiller Fact Sheet").

[9] *Id.*

EPA Response to Sierra Club Comment I. Executive Summary:

Sierra Club's Comment I is a summary of comments provided in more detail in its comments included as Section IV, below. Sierra Club begins by stating that its "chief concern is that the antiquated once-through cooling system for Schiller's electricity-generating turbines has the capacity to draw more than 150 million gallons of water per day ("MGD") out of the Piscataqua River." The Fact Sheet at 18 incorrectly states the total maximum design flow of the two cooling water intake structures (CWISs) as 150 MGD. Based on the capacity of the circulating water and salt water pumps suppling Units 4, 5, and 6, the total maximum design capacity of the CWISs is 125.5 MGD. *See* AR-140 at 15-16. *See also* Response to PSNH Comment VII.A.1. Sierra Club also states that, according to the Fact Sheet at 18, "the once-through cooling system also collects and kills nearly 1.7 billion aquatic organisms annually." The Fact Sheet at 18 does not include a discussion of the number of organisms impinged; however, Tables 8A through 8D indicate that, at the design flow of the facility, Schiller Station impinges and entrains a combined total of 1.56 billion fish and macroinvertebrates. *See* Fact Sheet at 93-96. Tables 10A and 10B indicate that combined impingement and entrainment results in the potential loss of 1.6 billion aquatic organisms annually. *See Id*. at 151, 153. EPA is not clear how Sierra Club calculates a value of 1.7 billion organisms but does not dispute the fact that entrainment and impingement losses at Schiller Station represent a substantial and unacceptable adverse environmental impact on the Piscataqua River. *See, e.g., Id*. at 97, 105, 158.

EPA did consider the effects of Schiller Station's CWISs on shortnose sturgeon and Atlantic sturgeon. Under the Endangered Species Act (ESA), shortnose sturgeon are listed as threatened. Atlantic sturgeon have been divided into five distinct population segments. Four of the population segments are listed as endangered and one is listed as threatened. Atlantic sturgeon from any of the five populations may be present in the Piscataqua River. *See* Fact Sheet at 174, Attachment E., AR-378 and AR-379. In addition, EPA completed consultation on critical habitat for Atlantic sturgeon in the Piscataqua River after its designation on August 17, 2017. *See* 82 Fed. Reg. at 39,160 and AR-379. EPA did not consider impacts to the listed Gulf of Maine distinct population segment of Atlantic salmon because it is not present in the Piscataqua River;

however, EPA did consider impacts to non-listed Atlantic salmon in its assessment on Essential Fish Habitat. *See* Response to Sierra Club Comment IV.D and Fact Sheet at 173, Attachment D.

Sierra Club states that closed-cycle cooling should be selected as the BTA for Schiller Station. EPA maintains that, after weighing all the relevant factors, wedgewire screens is the BTA for Schiller Station. EPA responds to Sierra Club's specific comments on closed-cycle cooling in Response to Sierra Club Comment IV.A. Sierra Club comments that if wedgewire screens is selected as the BTA, the Final Permit must include a water withdrawal limit and a through-screen velocity of 0.2 feet per second (fps), which should be continuously monitored. EPA has considered these comments and responds in detail in Response to Sierra Club Comment IV.B.3 (water withdrawal limit), IV.B.4 (through-screen velocity), and IV.B.5 (velocity monitoring). Finally, Sierra Club comments that the Final Permit must incorporate or terminate unpermitted discharges associated with the landfill. EPA has responded to this comment in Response to Sierra Club Comment IV.E.

Sierra Club Comment II. Background

Sierra Club Comment II.A The Piscataqua River

Schiller Station is located on the southwestern bank of the Piscataqua River, a 12-mile-long (19 km) tidal estuary that marks the boundary between coastal New Hampshire and Maine. The river is formed at the confluence of the Cocheco River and the Salmon Falls River and runs southeastward until it empties into the Atlantic Ocean.[10] The Piscataqua is the gateway for all organisms migrating to and from the Great Bay and Little Bay estuaries.

The Piscataqua River is important for diadromous fish species. The river also provides a variety of social, recreational and economic benefits including fishing, business, boating, and whale watching. As an estuarine environment mixing freshwater and saltwater and receiving flow from the Great Bay and Little Bay estuaries, the Piscataqua River is highly productive, ecologically important and sensitive. Historically, the Piscataqua River has provided dense eelgrass habitat and provided breeding grounds and nurseries, nutrients, and food for a diverse range of aquatic species including at least 50 fish species and at least nine "macro crustaceans:" American lobster, horseshoe crabs, and seven species of true crabs. [11]

Of the species of fish and crustaceans known to inhabit the area around Schiller, the eggs of at least 21 different species of fish and the larvae of 27 species have been recorded killed at Schiller, along with the larvae of eight of the nine macro-crustacean species found in the area and juveniles and adults from five of the nine macro-crustacean species. [12] In other words, Schiller kills various life stages of the majority of species for which biologists have conducted sampling.

[10] Petrudev Report at 1-1.

[11] Petrudev Report at 2-2 -2-3.

[12] *Id*.

Sierra Club Comment II.B Schiller Generating Station and its Current Cooling Water Intake System

Schiller Station is a 163 megawatt (MW) facility that consists of: two 48 MW coal-fired units, Units 4 and 6, which use oil as a back-up fuel; one 48 MW wood-fired unit, Unit 5; and one 19 MW combustion turbine. [13] Units 4, 5, and 6 began commercial operation in the 1950s.

Over the last several years, Schiller's coal burning units (units 4 and 6) have operated at a reduced capacity factor. While Schiller's wood-burning unit continues to operate at a capacity factor of around 80%, the capacity factors for Units 4 and 6 have been significantly lower (16.1% and 16% respectively, since 2011).[14]

Units 4, 5, and 6 employ once-through cooling systems drawing through two cooling water intakes with a total maximum design intake flow of 125 million gallons per day (MGD). The estimated design heat rejection rate of Schiller's once-through cooling system is 759 MMBtu/hr. [15] All of this heat is discharged back into the Piscataqua River.

[13] Schiller Fact Sheet at 5.

[14] Schiller Fact Sheet at 139

[15] Powers Report at 2.

Sierra Club Comment II.C Current Regulation of Cooling Water Intakes at Schiller

On September 11, 1990, EPA Region 1 issued NPDES Permit No. NH0001473 to PSNH for Schiller Station, superseding the permit issued on December 31, 1984, and authorizing the continued operation of Schiller's once-through cooling system. [16] The Region modified the permit on May 31, 1991, and the permit expired on September 30, 1995.[17]

The 1990 permit authorized the use of the once-through cooling system, which is equipped with trash racks, intake screens, and a fish return system that uses 40 PSI of water pressure to blast organisms off the screens. [18] The 1990 permit recorded EPA's determination, based on then-current engineering judgment, that Schiller employed the best technology available for minimizing adverse environmental impact. [19] Since 1990, however, EPA has learned a great deal more about the severe impacts of impingement and entrainment on aquatic communities and endangered species, and has extensively studied a wide range of fish protection technologies. Sierra Club agrees with EPA that the 1990 BTA determination is severely outdated, and needs dramatic improvement.

For the past eighteen-and-a-half years, the expired 1990 permit has been administratively continued. Since December 2004, Region 1 and PSNH have exchanged correspondence and other documentation concerning PSNH's renewal application. In light of significant changes to Schiller's operation over the preceding 15 years, EPA asked PSNH to submit a new NPDES renewal application and related materials.

In 2008, PSNH submitted a study on the feasibility of various options to reduce impingement and entrainment at Schiller. PSNH and its consultants found that:

> the use of mechanical draft cooling towers in a closed-cycle cooling configuration was determined to be technologically feasible at Schiller Station and potentially provide the most biological benefits of the various technologies and operational measures evaluated…[20]

Still, PSNH argued against the use of cooling towers at Schiller, on the grounds that "the initial and ongoing costs are both wholly disproportionate to these benefits." [21] PSNH claimed that the best technology available at Schiller is a system of cylindrical wedgewire screens, with a through slot velocity of not more than 0.5 feet per second (fps), although PSNH did not determine in its study what size of slot and what materials would prove feasible at Schiller. [22]

In 2010, EPA asked PSNH to explain how it had reached the conclusion that cooling towers were not the best technology available because the costs of cooling towers were wholly disproportionate to the environmental benefits. PSNH explained that its view was based "solely on a comparison of the capital costs of the various technologies and their respective I&E performance." [23] As discussed further below, however, neither PSNH's estimates of the costs or of the environmental benefits are believable.

Schiller's arguments notwithstanding, EPA preliminarily determined, "based on Schiller's October 2008 response, that closed-cycle cooling is the Best Technology Available (BTA) for Schiller Station." [24] Sierra Club strongly supports EPA's preliminary determination that closed-cycle cooling is the BTA at Schiller and urges EPA to carry it forward into a final NPDES permit.

[16] *See* EPA Region 1, Schiller Authorization to Discharge Under the National Pollutant Discharge Elimination System NH0001473 (Sept. 11, 1990) (the "1990 Permit").
[17] Schiller Fact Sheet at 6.
[18] *See* 1990 Permit at 2; see also PSNH (prepared by Enercon Services, Inc. and Normandeau Associates, Inc.), *Response to United States Environmental Protection Agency CWA §308 Letter, PSNH Schiller Station Portsmouth, New Hampshire* at 4-12 (Oct. 2008) ("316(b) Report").
[19] See 1990 Permit at 3.
[20] 316(b) Report at v.
[21] *Id.*
[22] *Id.*
[23] Letter from Linda T. Landis, Senior Counsel, PSNH to Stephen Perkins, Director, Office of Ecosystem Protection, US EPA Region 1 at 3 (June 17, 2010).
[24] See Letter from Stephen S. Perkins, EPA Region 1 to William H. Smagula, PSNH Generation, regarding Information Request for NPDES Permit Re-Issuance, NPDES Permit No: NH0001473 at 5 (May 4, 2010) ("Perkins Letter"). EPA noted that its preliminary determination to require Schiller to install closed-cycle cooling was made "in the absence of any site specific information regarding the 'availability' of wedgewire screens for use at Schiller Station."

EPA Response to Sierra Club Comments II.A, II.B, and II.C

EPA has considered the commenter's characterization of the Piscataqua River (in Comment II.A), Schiller Station's existing cooling water intake system (in Comment II.B)[52], and background information pertaining to determination of the best technology available (BTA)

[52] EPA notes that Sierra Club correctly states the total design flow of the CWISs as 125 MGD in Comment II.B.

under Section 316(b) of the Clean Water Act (CWA) (Comment II.C). More detailed comments about the present determination under CWA § 316(b) are discussed and responded to below.

EPA generally agrees with the comment's characterization of the Great Bay Estuary as a highly productive, ecologically important and sensitive habitat. The Piscataqua River is also a productive shipping channel including seven major commercial terminals along the south bank of the river in Portsmouth and Newington, NH. *See* AR-409.

Sierra Club comments that the 1990 BTA determination is "severely outdated, and needs dramatic improvement." With any NPDES permit issuance or reissuance, EPA is required to evaluate or re-evaluate compliance with applicable standards, including those specified in Section 316(b) of the CWA, 33 U.S.C. § 1326, cooling water intake structures. *See* Fact Sheet at 78. As the Fact Sheet (at 92-97) explains, in the site-specific case of Schiller Station, EPA considers impingement and entrainment losses from the current operation of the CWISs to be adverse environmental impacts and CWA § 316(a) requires that the design, construction, location, and capacity of the cooling water intake system reflect the best technology available for minimizing these adverse environmental impacts. *See also Id*. at 105 ("these aspects of the CWIS do not reflect the BTA for minimizing adverse environmental impacts (specifically entrainment and impingement)"). At the same time, even though biological monitoring at the CWISs suggests that Schiller Station likely impinges and entrains a diverse assortment of life stages and species, the available information is insufficient to demonstrate whether these losses have caused or contributed to either a particular reduction in the Great Bay estuary's populations of the affected species or an imbalance in the overall assemblage of aquatic organisms in the estuary. *See Id*. at 97.

While EPA generally agrees with Sierra Club's characterization of PSNH's 2008 Engineering Response (AR-140), PSNH did not claim that wedgewire screens are the BTA for Schiller Station. Rather, the Report states that "[b]ecause of the favorable CWIS and river conditions, fine mesh wedgewire screens are one of the highest ranked of the alternative CWIS technologies evaluated in this Report" (2008 Response at v) and "if reductions in impingement and entrainment beyond those currently attained by the Station are deemed necessary, the addition of fine mesh screens is the optimum technology currently available" (*Id.* at 109).

EPA notes that the determination under consideration in the following comments and responses is the BTA for entrainment in the Draft Permit, which EPA concluded was fine-mesh wedgewire screens. This determination was based primarily on information submitted by PSNH in 2008 and 2014 and was made in light of new regulations that establish permitting requirements for cooling water intake structures at existing facilities (the "Final Rule") and that became effective on October 14, 2014. *See also* Response to Sierra Club Comment IV.A. The Final Rule requires the permitting authority to consider, among other factors, social costs and benefits when establishing site-specific entrainment requirements. *See* 79 Fed. Reg. 48,300. EPA responds in detail to Sierra Club's issues with PSNH's estimates of the costs and benefits of closed-cycle cooling in Responses to Sierra Club Comment IV.A.2.a and b., below.

Sierra Club Comment II.D Impingement and Entrainment

Power plants, through their cooling water intakes, cause massive adverse environmental impacts to populations of fish and other aquatic organisms. At Schiller, adverse impacts result from both impingement (organisms striking and being caught against the intake screens) and entrainment (organisms being sucked into the plant's cooling water intakes). The existing cooling system, with its 3/8 inch traveling screens and through-screen velocities up to 1.38 fps, [25] does not minimize significant adverse environmental impacts on the aquatic communities in the Piscataqua River. A large variety of fish and macrocrustaceans of all life stages are present in the Piscataqua River in the vicinity of Schiller Station. All of these organisms are or may be negatively impacted by Schiller's cooling water system.

[25] *See* 316(b) report at 6 & 12.

Sierra Club Comment II.D.1 Fish

At least 46 fish species have been recorded in the vicinity of Schiller Station based on entrainment and impingement monitoring conducted in 2006-2007 by PSNH's consultant Normandeau Associates .[26] Fish species comprise resident and seasonal fish, as well as migratory (e.g., anadromous, catadromous) fish. Normandeau estimated that over 145 million fish are entrained and 5,365 fish are impinged at Schiller annually. [27] Moreover, due to several shortcomings in Normandeau's monitoring, the extent of impacts from operations at Schiller is systematically underestimated. Indeed, EPA estimates annual impingement and entrainment mortality at 5,557 and 156 million. [28] Petrudev's attached report suggests that it might be even greater.

In addition to the fish species recorded near Schiller through Normandeau's monitoring, the following fish species are also present in the Piscataqua River according to the New Hampshire Fish and Game Department, the National Marine Fisheries Service (NMFS), and the non-profit conservation organization NatureServe [29]:

- American shad (*Alosa sapidissima*);
- Sea lamprey (*Petromyzon marinus*);
- Brown trout (*Salmo trutta*);
- Brook trout (*Salvelinus fontinalis*);
- Rainbow trout (*Oncorhynchus mykiss*);
- Atlantic salmon (*Salmo salar*) – Gulf of Maine Distinct Population Segment is endangered under the federal Endangered Species Act (ESA);
- Atlantic sturgeon (*Acipenser oxyrinchus oxyrichnus*) – Gulf of Maine Distinct Population Segment is listed as threatened under the federal ESA; and,
- Shortnose sturgeon (*Acipenser brevirostrum*) – listed as endangered under the federal ESA.

The endangered Atlantic salmon has been extirpated as a breeding population in much of its historic range, including the Piscataqua River and Great Bay estuary. [30] Historically, the Cocheco and Lamprey rivers were home to major runs of the Atlantic salmon. [31] Both of these rivers can only be accessed by fish that first pass Schiller on the Piscataqua River, and migrating fry journeying to the ocean must also pass Schiller. Efforts to restore spawning populations of Atlantic salmon in New Hampshire and Connecticut have been underway for nearly 40 years. [32] NMFS has designated the Piscataqua River, the Great Bay estuary, and its tributary rivers such as the Cocheco and the Lamprey Rivers essential fish habitat for Atlantic salmon. [33]

The Atlantic Sturgeon Gulf of Maine Distinct Population Segment (DPS) is listed as threatened under the federal Endangered Species Act. [34] In 2007, in the fact sheet supporting a draft NPDES permit for the Newington Energy Facility (a power plant less than a mile upstream of Schiller), EPA acknowledged that Atlantic sturgeon had been captured in the Piscataqua River in the past. [35] That same year, NMFS published a status review of Atlantic Sturgeon which noted that the recorded catch included "a large gravid female Atlantic sturgeon (228 cm TL) weighing 98 kg (of which 15.9 kg were eggs)" at the head-of-tide in the Salmon Falls River in 1990.[36] But the review went on to note that since 1990 there had been no further reported catches and concluded that, as a breeding population, the Atlantic sturgeon is extirpated in the Great Bay.

Recovery of a breeding population of Atlantic sturgeon in its historic habitat – including the Piscataqua River and its tributaries – is a priority under the Endangered Species Act. In 2013, in its final listing rule for Atlantic sturgeon, NMFS stated that Atlantic sturgeon are present in the Piscataqua River. [37] The capture of a large gravid female less than 25 years ago leaves hope that these long-lived fishes are still capable of repopulating this historic habitat.

NMFS has listed the shortnose sturgeon as an endangered species and has determined that the species is found in the Piscataqua River. [38] The NMFS' Recovery Plan for shortnose sturgeon specifically identifies impingement and entrainment at cooling water intakes as a source of shortnose sturgeon mortality. [39] EPA also has concluded that juvenile and adult stages of shortnose sturgeon are found near Schiller. [40] The attached report from Petrudev notes that, although shortnose sturgeon were not recorded during entrainment and impingement monitoring at Schiller, the sampling methods and approach used in Schiller's monitoring likely are not robust enough to adequately sample this species given their expected low abundance. Additionally, Petrudev notes that Schiller's last impingement and entrainment study involved a low sampling frequency during the period when shortnose sturgeon larvae would be most susceptible to entrainment. [41]

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[26] Petrudev Report at 2-1.

[27] Detailed results related to entrainment and impingement studies are presented in Sections 2.2 to 2.4 of the attached Petrudev Report.

[28] Schiller Fact Sheet at 94 & 96.

[29] NatureServe Explorer, http://www.natureserve.org/explorer/servlet/NatureServe?init=Species (last visited Jan. 25, 2016).

[30] *See* NMFS and FWS, Final Recovery Plan for the Gulf of Maine Distinct Population Segment of Atlantic Salmon *(Salmo Salar*) at 1-5 (Nov. 2005).

[31] *See id.* at 1-6.

[32] *See id.* at 1-5.

[33] *See* Atlantic Salmon Biological Review Team, Status Review for Anadromous Atlantic Salmon (*Salmo Salar*) in the United States at 149 (2006), available at http://www.nmfs.noaa.gov/pr/pdfs/statusreviews/atlanticsalmon.pdf (last visited on Jan. 25, 2016) ("Essential fish habitat for Atlantic salmon is described as all waters currently or historically accessible to Atlantic salmon

within the streams, rivers, lakes, ponds, wetlands, and other water bodies of Maine, New Hampshire, Vermont, Massachusetts, Rhode Island and Connecticut and that meet conditions for eggs, larvae, juveniles, adults and/or spawning adults.")

[34] *See* Petrudev Report at 2-21.

[35] *Id*.

[36] Atlantic Sturgeon Status Review Team, Status Review of Atlantic Sturgeon (*Acipenser oxyrinchus oxyrinchus*) at 10 (2007), available at http://www.nmfs.noaa.gov/pr/pdfs/statusreviews/atlanticsturgeon2007.pdf (last visited on Jan. 25, 2016).

[37] *See* Petrudev Report at 2-21.

[38] *See id*. at 2-20.

[39] *See id*.

[40] *See* EPA Region 1, Draft National Pollution Elimination System (NPDES) Permit to Discharge to Waters of the United States Pursuant to the Clean Water Act (CWA) NH0023661 – Fact Sheet at 31021 (2007). ("PSNH Newington Fact Sheet").

[41] *See* Petrudev Report at 2-4.

Sierra Club Comment II.D.2 Macrocrustacea

Schiller has entrained or impinged several crab species and a lobster species. Normandeau estimated that over 1.3 billion macrocrustaceans are entrained and 12,649 macrocrustaceans are impinged annually. [42] EPA's estimates are even higher: 1.4 billion for entrainment and 13,536 macrocrustaceans for impingement. [43] The most commonly impinged species at Schiller are green crab, Atlantic rock crab and American lobster. [44]

By PSNH's estimates, Schiller impinges and entrains more than 145 million individual fish, eggs, and larvae annually from more than 35 taxa, as well as 1.3 billion individual macro-crustaceans from at least seven taxa. [45] Petrudev has reviewed the impingement and entrainment studies submitted by PSNH and concluded that, using PSNH's figures, a closed cycle cooling retrofit would save approximately 1.3 billion animals every year. [46] EPA's higher estimates for aquatic life mortality lend additional support to Petrudev's conclusion and would require an upward adjustment in Petrudev's estimates.

[42] Petrudev Report at 2-4.

[43] Schiller Fact Sheet at 95-96

[44] Id. at 96.

[45] See Petrudev Report at 2-4.

[46] See id. at Table 6.2

EPA Response to Sierra Club Comments II.D (Impingement and Entrainment)

Sierra Club provides background on the impingement and entrainment at Schiller Station and the biological community present in the Piscataqua River. Sierra Club both summarizes the estimates of entrainment and impingement presented in the Schiller Station Fact Sheet and provides background on additional species, including species listed as threatened or endangered under the Endangered Species Act (ESA) or for which essential fish habitat (EFH) has been designated under the Magnuson-Stevens Fishery Conservation and Management Act (the Magnuson Act). Regarding the ESA, EPA included an assessment of potential impacts on ESA listed species. *See* Attachment E of the Fact Sheet and EPA Request for Concurrence Letter dated December 15, 2017 (AR-378). EPA has completed an ESA section 7 consultation with the

National Marine Fisheries Service (NMFS). *See* NMFS Concurrence Letter, dated January 2, 2018 (AR-379).

As a point of clarification in response to the Sierra Club comment above, EPA stipulates, and NMFS concurs, that endangered Atlantic salmon are not present in the Piscataqua River. The Gulf of Maine DPS of Atlantic salmon is listed as endangered under the ESA, but these wild salmon are not found in the Pisacataqua River. The Gulf of Maine DPS is found in the freshwater range covering the watersheds from the Androscoggin River northward along the Maine coast to the Dennys River. Thus, the ESA consultation for the Schiller Station NPDES permitting action did not include Atlantic salmon.

EPA also satisfied its EFH consultation requirements under the 1996 Amendments (PL 104-267) to the Magnuson Act (16 U.S.C. §1801 et seq. (1998)) through the analysis in Attachment D of the Fact Sheet and a letter submitted to NMFS, dated November 19, 2015 (AR-310). Additionally, EPA has responded to specific comments submitted by Sierra Club pertaining to ESA and EFH issues in Responses to Comments IV.D.1 and 2.

Normandeau estimated that over 145 million fish are entrained and 5,365 fish are impinged at Schiller annually. *See* AR-136 at 73 and 123. Sierra Club suggests that, due to several shortcomings in its Normandeau's monitoring, the impacts from operations at Schiller are systematically underestimated by Normandeau. As Sierra Club states, EPA estimates annual fish impingement and entrainment mortality at 5,557 and 156 million. *See* Fact Sheet at 94-95. Sierra Club also comments that Schiller impinges and entrains 1.3 billion individual macrocrustaceans from at least seven taxa. *See* Fact Sheet at 94-96. Sierra Club comments that review and analysis submitted by Petrudev concluded that closed cycle cooling would save approximately 1.3 billion animals every year. *See* Petrudev Table 6-2. Sierra Club notes that the higher mortality estimates for aquatic life in the Fact Sheet support Petrudev's conclusion that estimated losses might be even greater.

EPA agrees with Sierra Club that the operation of CWISs at Schiller Station results in the entrainment of hundreds of millions of fish eggs and larvae and over one billion macrocrustacean larvae each year, and that these losses constitute an adverse environmental impact that must be addressed with the best technology available. EPA also notes that Normandeau's estimated entrainment losses are slightly lower than the estimates presented in Section 8.0 of the Fact Sheet because EPA's estimates are based on the design intake flow while Normandeau's estimates are based on actual cooling water flows during the monitoring study (ranging from a low of 88.0 MGD in March to 124.4 MGD). *See also* Response to PSNH Comment VII.A.14.

In responding to comments, EPA discovered an error in Table 10-B of the Fact Sheet Table (at 153) that resulted in a substantial overestimate of the numbers of fish eggs and larvae that would be saved annually for each of the technologies. When calculating the monthly entrainment losses for fish eggs and larvae, EPA estimated entrainment losses for each unit separately based on the maximum permitted flow at each unit and the estimated total monthly entrainment abundance presented in Table 3-8 of Normandeau's 2008 Biological Report (AR-136). EPA inadvertently transcribed the total combined entrainment at Units 4, 5, and 6 as the total entrainment for Unit 6 in its spreadsheet, which resulted in double-counting the entrainment at Units 4 and 5. As a result, the annual fish entrainment mortality in Table 10-B of the Fact Sheet was estimated to be 254,586,934, but the actual estimated total annual fish entrainment mortality (based on monthly entrainment abundance) is about 146,841,244 eggs and larvae. The annual entrainment value of 146.8 million was calculated using the estimated monthly entrainment abundance and permitted flow.

The estimate of 147 million fish eggs and larvae entrained annually is lower than the annual entrainment value referenced in the comment and presented in Section 8.0 of the Fact Sheet (156 million) because that value does not account for seasonal differences in entrainment (*i.e.*, that entrainment abundance in naturally higher in some months than others). In other words, the value presented in Section 8.0 of the Fact Sheet was calculated by adjusting Normandeau's annual entrainment value by 7.3% to account for the difference in actual flow during the study versus the permitted (design) flow on an annual basis. However, this method results in a slight overestimate of entrainment because the months in which there is the highest difference between actual operating flow and permitted flow during the study (October and November 2006, March, April, and September 2007) are also months that contributed relatively less to total annual entrainment. Conversely, the months with the highest densities (June and July) are the same months in which the CWISs were operating at permitted flow. As an example, in June 2007, Unit 4 entrained an estimated 15.5 million fish eggs and larvae operating at an average intake flow of 40.8 MGD, which is equal to design capacity. Adjusting total annual entrainment upwards by 7.3% results in an overestimate of entrainment abundance for this month because no adjustment is needed to account for the difference in design and actual flow in June.

EPA determined that there are significant differences between the biological effectiveness of closed-cycle cooling and wedgewire screens as it relates to entrainment mortality of fish eggs and larvae. The Fact Sheet states:

> EPA estimated that closed-cycle cooling can reduce entrainment mortality for fish eggs and larvae by as much as 97%, whereas the wedgewire screen options with the three smallest slot sizes are estimated to reduce such entrainment mortality by 37%, 44%, or 49%, respectively. The closed-cycle cooling option, however, is estimated to cost nearly 40 times more than any of the wedgewire screen options…Thus, closed-cycle cooing is the best performing technology for reducing entrainment mortality, but the wedgewire screen options will also achieve substantial entrainment mortality reductions and will do so at far lower costs.

Fact Sheet at 155. In this way, EPA based its determination of the BTA for entrainment at Schiller Station on the relative biological effectiveness and costs of wedgewire screens as compared to closed-cycle cooling and not merely on a difference in the absolute numbers of organisms entrained.[53] The calculation error systematically overestimated the number or organisms saved for all technologies equally – in other words, the relative efficacy of the technologies was the same despite the overestimate in the number of organisms. For these

[53] Sierra Club raises concerns that the biological efficacy for closed-cycle cooling should be 100% due to the availability of grey water for the make-up volume (versus 97% with seawater as the make-up volume). EPA has addressed this comment on the efficacy of closed-cycle cooling below.

reasons, the calculation error in Table 10-B does not affect EPA's determination of the BTA for entrainment mortality, which concluded:

> Although the benefits will not be as great or as certain as the benefits that closed-cycle cooling would achieve, the fine-mesh wedgewire option, with the exception of the 1.0 mm slot size option, can also achieve substantial entrainment mortality benefits at far less expense…EPA finds that closed-cycle cooling would cost 40 times more than the wedgewire screen option. EPA concludes that such costs are not in this case warranted for the additional margin of entrainment mortality reduction that closed-cycle cooling would achieve.

Fact Sheet at 157. EPA recognizes that Sierra Club has raised a number of issues about this determination, including whether, or how, EPA should consider the relative costs and benefits of the available technologies, and what those estimated costs and benefits should be. EPA has considered and responded to the comments raised by Sierra Club below. Here, EPA means only to correct a technical error from the Fact Sheet and to maintain that the technical error would not have altered the determination in the Draft Permit.

In addition, in responding to comments on the Draft Permit, EPA has reconsidered two factors related to entrainment of macrocrustaceans: 1) the inclusion of green crab (*Carcinus meanas*) in the estimates of impingement and entrainment losses at Schiller Station; and 2) the effectiveness of wedgewire screens to reduce entrainment mortality for macrocrustaceans. Green crab are invasive species that have been shown to have adverse ecological and economic impacts in the Region. *See* Responses to PSNH Comments V.B.2 and VII.A.13, as well as to Sierra Club Comment IV.B.1. As a result, EPA has dropped this species from its estimates of entrainment losses because the loss of these individuals would not necessarily constitute an adverse environmental impact on the aquatic community of the Piscataqua River. In addition, in responding to Sierra Club's comments on the Draft Permit, EPA has reconsidered the potential effectiveness of CWW screens for macrocrustacean entrainment and has decreased the estimated effectiveness for the reduction in macrocrustacean mortality from 100% to 80%. *See* Response to Sierra Club's Comment IV.B.1.

The corrected values for Table 10-B in the Fact Sheet, reflecting the correction in total annual entrainment mortality, elimination of green crab individuals, and adjustment in effectiveness of wedgewire screens for macrocrustaceans, are presented in Table 2, below.

Table 2. Comparison of entrainment mortality reduction for Schiller Station's existing cooling water intake structure and available BTA options.

	Annual Fish and Macrocrustacean Entrainment Mortality	Estimated % Reduction in Fish Entrainment Mortality	Estimated % Reduction in Macrocrustacean Entrainment Mortality	Estimated Annual Number of Fish Eggs and Larvae Saved	Estimated Annual Number of Macrocrustacean Larvae Saved
No Action	740,076,249	0	0	0	0
Mechanical Draft Cooling Towers	22,942,364	96.9	96.9	142,289,165	574,844,720
Wedgewire Screen 1.0 mm	256,677,770	6	80	8,810,475	474,588,004
Wedgewire Screen 0.8 mm	211,156,985	37	80	54,331,260	474,588,004
Wedgewire Screen 0.69 mm	200,878,098	44	80	64,610,147	474,588,004
Wedgewire Screen 0.6 mm	193,536,035	49	80	71,952,210	474,588,004
Ristroph Screens	740,076,249	0	0	0	0

Sierra Club Comment II.E. Cooling Water Intake Regulation in the Draft NPDES

Despite EPA's preliminary determination that closed-cycle cooling is the BTA at Schiller, in the Draft Permit, EPA rejected closed-cycle cooling as BTA for minimizing adverse environmental impacts, after recognizing both that closed cycle cooling is the most effective technology for minimizing impingement and entrainment mortality, and after finding that converting Schiller from open-cycle to closed-cycle cooling is both technically and financially feasible. [47]

Instead, EPA has proposed use of cylindrical wedgewire screens, finding that, with an intake velocity kept below 0.5 fps and a screen-slot size below 0.8 mm, this technology could achieve between 80-95% impingement reduction. [48] For entrainment, the level of reduction achievable with wedgewire screens will depend on the screen-slot size installed at Schiller. The draft permit requires Schiller to conduct pilot testing to determine, from the different screen slot-sizes, the optimal slot-size (0.6 mm; 0.69 mm; and 0.80 mm). EPA estimated that a 0.8 mm slot size would reduce fish entrainment mortality by 37 %, the 0.69 mm slot-size by 44%, and the 0.6 slot-size by 49%.[49]

EPA estimates that all slot sizes would reduce macro-crustacean entrainment mortality by 100%. As discussed below, this is perhaps the single most critical assumption in EPA's entire BTA analysis, and EPA has absolutely no support for the proposition.

Even with the 100% macro-crustacean entrainment survival assumption, EPA's total estimate is that cylindrical wedgewire screens would reduce total impingement and entrainment mortality by 92%. By contrast, EPA estimated that mechanical draft wet cooling towers would reduce entrainment and impingement by 96.9 to 100%.[50] As discussed below, the correct figure for cooling towers is 100% because EPA has already determined that use of grey water for makeup is an "available" technology, and thus a cooling tower need not draw any water from the Piscataqua at all.

[47] Schiller Fact Sheet at 202.

[48] Draft Permit at 15; Schiller Fact Sheet at 113.

[49] Schiller Fact Sheet at 110.

[50] Id. at 145.

EPA Response to Sierra Club Comments II.E (Cooling Water Intake Regulation)

In Comment II.E, Sierra Club briefly summarizes its understanding of the BTA determination for entrainment presented in the Fact Sheet. *See* Fact Sheet at 153-55. Sierra Club comments that "the single most critical assumption" of EPA's BTA analysis is that wedgewire screens will reduce macrocrustacean entrainment by 100%, for which it asserts that EPA has no support. EPA disagrees with this comment.

As explained in Response to Sierra Club Comment IV.B.1, below, macrocrustacean larvae, unlike early life stages of fish, are relatively large and possess hard exoskeletons which can provide a degree of protection if contacting the screens. Further, field and laboratory studies have observed relatively high survival of certain larval macrocrustaceans at fine-mesh screens. Based on these factors, EPA expects that wedgewire screens will effectively reduce entrainment mortality for macrocrustacean larvae, however, in response to Sierra Club's comments, EPA has re-assessed the effectiveness of the screens assuming an 80% (rather than a 100%) reduction in entrainment mortality. *See also* Response to Sierra Club Comment II.D.

In any case, EPA disagrees that the exact estimated reduction in entrainment of macrocrustaceans is "critical" to the BTA determination because the determination focused on the reductions in entrainment of early life stages of fish more than macrocrustaceans. See Fact Sheet at 155, 157. EPA responds in more detail to this comment in Response to Sierra Club Comment IV.B.1, below.

Sierra Club also comments that the correct entrainment reduction estimate for closed-cycle cooling is 100%, not 97% as EPA estimated, because gray water is available as make-up water for the closed-cycle cooling towers and would eliminate the need for seawater withdrawals. While the Pierce Island Wastewater Treatment Plant generates sufficient wastewater potentially to meet the make-up water needs for closed-cycle cooling, "additional investigations and arrangements would be necessary to determine the feasibility of this option." Fact Sheet at 145. EPA did not determine that gray water *is* available for cooling tower make-up water, but considered it "to be a potential BTA" and that wet cooling towers "could reduce entrainment and impingement by approximately 95 percent, and by as much as 100 percent if gray water was used for make-up water." Fact Sheet at 146. Analysis of closed-cycle cooling at entrainment reductions of 97% is consistent with the Final Rule, which identifies closed-cycle cooling as the best performing technology even at expected flow reductions of 95-97%. EPA has responded to this comment about the possibility of using gray water in more detail in Response to Sierra Club Comment IV.A.2.c.

Sierra Club Comment II.F Thermal Discharges

Schiller is located on a stretch of the Piscataqua River that is dredged for navigation and heavily used by other industrial facilities that consume river water. Next door on Gosling Road sits the PSNH Newington generating station. PSNH Newington is a 420 MW gas and oil fueled power plant.[51] The PSNH Newington NPDES permit [52] authorizes Newington to operate a once-through cooling water intake system that withdraws up to 324.6 MGD of cooling water to the Piscataqua River and discharges a similar volume of heated water back into the river.

The Newington discharge canal is approximately 1400 feet upriver from the nearest of Schiller's three thermal discharge outfalls (and less than 2000 feet from the farthest of Schiller's outfalls). The Newington NPDES permit establishes a thermal discharge mixing zone that allows for a thermal plume occupying up to 25 acres of the river at an increased temperature (ΔT) of 4 ºF (2.2 ºC); and a 60-acre area with a ΔT of 1.5 ºF (0.83 ºC). Depending on tide conditions, these large mixing zones can easily overlap all of Schiller's discharge points and plumes. If Schiller and PSNH Newington are running simultaneously during peak demand periods, they can withdraw (and discharge) about 450 MGD from the Piscataqua.

A few miles upstream of Schiller is another power plant, the Newington Energy Facility, operated by Newington Energy, LLC (and owned by Essential Power, LLC).[53] Newington Energy Facility is a combined-cycle natural gas plant that uses mechanical draft cooling towers rather than a once-through cooling system. In the Newington Energy Facility's NPDES Permit, EPA reviewed then-listed federal endangered and threatened species and indicated that juvenile and adult stages of shortnose sturgeon have the potential to be found near the Newington Facility. [54] The existence of Newington Energy Facility is interesting not only because it is located near to Schiller, but because it is a 525 MW power plant yet, thanks to the use of cooling towers, it draws only 10.8 MGD of water from the Piscataqua, compared to 324.6 MGD at PSNH Newington and another 150 MGD at Schiller.

In order to generate power, Schiller must dispose of millions of BTUs of waste heat every year. Under its current permit, Schiller is authorized, by way of a CWA § 316(a) variance, to discharge 150 million gallons of cooling water daily at a differential above ambient water temperatures (ΔT) of up to 25º F, and at a maximum temperature of 95º F. [55] Further, the discharge cannot cause water temperatures in excess of 84º F outside of a zone 200 feet in any direction from the discharge. In 2010, along with a new application to renew the NPDES permit, EPA asked PSNH to submit data about Schiller's thermal discharge .[56]

EPA has concluded that Schiller's existing thermal discharge has not caused appreciable harm to the balanced, indigenous population (BIP) of shellfish, fish and wildlife in the Piscataqua River. Thus, EPA has proposed to retain the 316(a) variance in the current permit. However, in reaching this conclusion, EPA failed to engage in a complete "cumulative impacts" analysis, examining how the impacts of Schiller's thermal discharge will interact with other significant impacts, like climate change, on affected species.

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[51] PSNH Newington's generating capacity is variously reported by different sources as 400 MW, 406 MW, and 420 MW. Sierra Club uses the figure provided in the NPDES permit of 420 MW.

[52] EPA Region 1, PSNH-Newington Station Authorization to Discharge Under the National Pollutant Discharge Elimination System Permit No. NH0001601 (Sept. 30, 1993), Available at http://www.epa.gov/region1/npdes/permits/finalnh0001601permit.pdf (last visited on Jan. 25, 2016).

[53] Petrudev Report at 2-21.

[54] EPA Region 1, EP Newington Energy Facility Authorization to Discharge Under the National Pollutant Discharge Elimination System at 26 (Permit No. NH0023361) (Oct. 25, 2012) available at http://www3.epa.gov/region1/npdes/permits/2012/finalnh0023361permit.pdf (last visited on Jan. 25, 2016).

[55] *See* 1990 Permit at 7-11 (setting flow and temperature effluent limitations for outfalls 001 to 004).

[56] *See* Perkins Letter at 2-4.

EPA Response to Comment II.F. Thermal Discharges and Cumulative Impacts

EPA has considered the commenter's characterization of the environmental setting of the Schiller Station facility and its thermal discharge. The Agency agrees with the commenter that cumulative impacts of the thermal discharge and other adverse effects on the BIP should be considered in an evaluation under CWA § 316(a). *See Fact Sheet*, p. 15. EPA does not, however, agree that its consideration of cumulative impacts was insufficient in this case. In Response to Sierra Club Comment IV.C.1.c.(4), EPA responds in detail to the comment that cumulative impacts from other thermal dischargers in the Piscataqua River must be assessed for the Schiller CWA § 316(a) analysis. In Response to Sierra Club Comment VI.C.1, EPA responds to the comment that the Agency failed to undertake a "complete" cumulative impacts analysis.

EPA notes that the data does not support the commenter's statement that "[d]epending on tide conditions, these large mixing zones [from PSNH Newington Station] can easily overlap all of Schiller's discharge points and plumes." Data was collected by an array of fixed, continuous temperature monitors placed in the Piscataqua River at different depths and locations near the Schiller Station outfalls from August 15, 2010, through November 14, 2010 (*see* Section 6.4.3 of the Fact Sheet). Analysis of the temperature records from these monitors did not show the thermal plume from Newington Station reaching the monitors near Schiller Station. Furthermore, thermal data collected on a reasonably worst-case summer monitoring day (August 31, 2010) still showed two distinct, non-overlapping thermal plumes from PSNH Newington Station and Schiller Station (Section 6.4.3 of the Fact Sheet). The temperature information collected in 2010 does not support the commenter's suggestion that the thermal plume from Newington Station can "easily overlap" Schiller Station's discharge points and plumes.

Contrary to this comment, EPA took other impacts, including the thermal discharges from upstream power plants, into account in determining that Schiller Station's thermal discharge, as limited by the Final Permit's conditions, would satisfy the requirements of CWA § 316(a). *See* Fact Sheet, Sections 6.4.3 and 6.4.4.

Sierra Club Comment II.G (none)

Sierra Club Comment II.H Coal Ash Landfill

An inactive coal ash landfill occupies two acres on the southeastern portion of the Schiller site, several hundred yards from the banks of the Piscataqua River. [57] From 1949 until 1979, the landfill received various wastes. According to an environmental review conducted for PSNH, this unlined landfill is known to contain fly ash, waste oil, and 55-gallon steel drums. [58] Given its age and the needs of a power plant, the landfill may also contain used solvents and PCB-laden transformer fluids. During the closure and capping of the landfill, which occurred between 1980 and 1982, certain asbestos containing materials were removed, but any remaining harmful or toxic materials remain on site. [59] The landfill remains an inadequately characterized and monitored liability.

There is evidence that leachate from the landfill has reached groundwater and migrated beyond the perimeter of the landfill. PSNH installed four groundwater monitoring wells, which it only monitors annually. Groundwater monitoring in July 2013 detected levels of manganese above ambient levels and groundwater quality standards. [60] Given the very close proximity between the landfill and the Piscataqua River, and the prevailing direction of groundwater flow to the river, there is a reasonable likelihood that pollutants from the landfill are reaching surface water via hydrologically connected groundwater.

[57] ESS Group, PSNH Generating Asset Environmental Review at 11 (Mar. 31, 2014) (hereinafter "ESS Environmental Review).
[58] *Id*. at 15.
[59] *Id*.
[60] *Id*.

EPA Response to Sierra Club Comment II.H (Coal Ash Landfill):

See Response to Sierra Club Comment IV.E.

Sierra Club Comment III. Applicable Legal Requirements

In enacting the Clean Water Act, Congress established as a national goal the elimination of all discharges of pollution into navigable waters. [61] In furtherance of the goal of eliminating all discharges into waters of the United States, the CWA provides that no pollutant may be discharged from any point source without a NPDES permit. Any failure to comply with a permit "constitutes a violation of the Clean Water Act." [62] The NPDES permit program is thus an integral part of the CWA's plan to eliminate pollution discharges, and to restore and maintain the health and integrity of the nation's waters. [63]

In New Hampshire, EPA's Regional Office is the NPDES permitting authority. As the New Hampshire Code of Administrative Rules, Part Env-Wq 301 acknowledges, New Hampshire's state water permitting regulations do not apply to "[facilities] that require both a state discharge permit and a federal National Pollutant Discharge Elimination System (NPDES) permit under Section 402 of the Clean Water Act, which are subject to regulations adopted by EPA under 40 CFR, including but not limited to 40 CFR 122 and 125." [64]

[61] See 33 U.S.C. § 1251(a)(1).
[62] 40 C.F.R. § 122.41(a).
[63] See 33 U.S.C. § 1342 (establishing permit program requirements).
[64] See N.H. Code of Admin. Rules Part Env-Wq 301.02(b).

Sierra Club Comment III.A Technology Requirements

The CWA requires that NPDES permits include effluent limits based on the performance achievable through the use of statutorily-prescribed levels of technology that "will result in reasonable further progress toward the national goal of eliminating the discharge of all pollutants." [65] Technology-based effluent limitations ("TBELs") constitute a minimum level of controls that must be included in a NPDES permit "regardless of a discharge's effect on water quality." [66]

For sources constructed prior to the passage of the Federal Water Pollution Control Act of 1972 such as Schiller, discharges of pollutants must be eliminated or controlled through application of Best Available Technology ("BAT").[67] In accordance with the CWA's goal to eliminate all discharges of pollutants, 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 technologically and economically achievable…"[68]

The requirement to meet the BAT standard is ongoing; it compels polluting industries to meet ever more stringent limitations on the path towards complete elimination of water pollution. [69] With each renewal of a NPDES permit, the permitting agency must reconsider whether further pollution reductions are attainable. The goal of the law is continuous, rapid improvement:

> 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. 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. [70]

EPA often codifies effluent limitation guidelines that reflect the BAT standards for particular discharges, pollutants, and activities found in a category of point sources. These guidelines become the floor – the minimum level of control that must be imposed in a NPDES permit. But where EPA has not set effluent limitation guidelines for a pollutant or source or particular activity, or where such guidelines are inadequate, a state-permitting agency must promulgate permit effluent limitations, in accordance with BAT, on a case-by-case basis. [71] In seeking out the best available technology that is economically achievable, the agency must consider the best state of the art practices in the industry and beyond. "Congress intended these [BAT] limitations to be based on the performance of the single best-performing plant in an industrial field." [72]

A technology is considered "available" where there is, has been, or could feasibly be use within an industry. Courts have explained that even where "no plant in a given industry has adopted a pollution control device which could be installed does not mean that the device is not 'available,'" thus ensuring that industry cannot game the system by all agreeing to not adopt the latest, best pollution control technology. [73]

Likewise, a technology is "economically achievable" under the BAT standard if it is affordable for the best-run facility within an industry. [74] "BAT should represent a commitment of the maximum resources economically possible to the ultimate goal of eliminating all polluting discharges.

[65] 33 U.S.C. § 1311(b)(2)(A)(i), see also id. § 1311(b)(1)(A).

[66] Am. Petroleum Inst. v. EPA, 661 F.2d 340, 344 (5th Cir. 1981).

[67] *See* 33 U.S.C. § 1311(b)(2)(A).

[68] 33 U.S.C. § 1311(b)(2)(A).

[69] *See NRDC v. EPA*, 822 F.2d 104, 123 (D.C. Cir. 1987).

[70] *Kennecott v. EPA*, 780 F.2d 445, 448 (4th Cir. 1985), citing 1 *Legislative History of the Federal Water Pollution* Control Act of 1972, 798 (Committee Print compiled for the Senate Committee on Public Works by the Library of Congress), Ser. No. 93-1 (1973).

[71] *See* 40 C.F.R. § 125.3(c)(2) & (3); *see also Texas Oil & Gas Ass'n v. EPA*, 161 F.3d 923, 928-29 (5th Cir. 1998).

[72] *Chem. Mfrs. Ass'n v. EPA*, 870 F.2d 177, 226 (5th Cir. 1989).

[73] *Hooker Chems. & Plastics Corp. v. Train*, 537 F.2d 620, 636 (2d Cir. 1976).

[74] *See, e.g., Reynolds Metals Co. v. EPA*, 760 F.2d 549, 562 (4th Cir. 1985); *Tanner's Council of Am. v. Train*, 540 F.2d 1188, 1191-92 (4th Cir. 1976).

[75] *Natural Res. Def. Council v. EPA*, 863 F.2d 1420, 1426 (9th Cir. 1988) (quotations omitted); see also *EPA v. Nat'l Crushed Stone Ass'n*, 449 U.S. 64, 74-75 (1980) (if a discharger of pollutants can afford the best available technology, then it must meet, and should not be allowed a variance from, stringent BAT limits).

Sierra Club Comment III.B Water Quality Requirements (p 12)

One of the most important functions that a state performs under the Clean Water Act is to promulgate water quality standards. [76] Water quality standards consist of both "designated 'uses' for a body of water (e.g., public water supply, recreation, agriculture) and a set of 'criteria' specifying the maximum concentration of pollutants that may be present in the water without impairing its suitability for designated uses." [77] Although EPA is the NPDES permitting authority in New Hampshire, the state plays a vital role in establishing water quality standards for the Piscataqua River and the Great Bay Estuary. [78]

The designated uses of the Piscataqua River in the vicinity of Schiller include: aquatic life, public water supplies after adequate treatment, fish consumption, primary contact recreation, secondary contact recreation, shellfishing, and wildlife. [79] Unfortunately, this segment of the river is impaired for aquatic life, fish consumption, primary contact recreation, secondary contact recreation and shellfishing. [80]

After application of the most stringent treatment technologies available under the BAT standard, if a discharge causes or contributes, or has the reasonable potential to cause or contribute to a violation of water quality standards, the permitting agency must also include any limits in the NPDES permits necessary to ensure that water quality standards are maintained and not violated.[81] This obligation includes compliance with both narrative and numeric water quality standards.[82]

[76] *See* 33 U.S.C. §§ 1313(a)-(c) (requiring states to adopt water quality standards and requiring EPA to set water quality standards when states fail to do so).

[77] *American Paper Inst. v. EPA*, 996 F.2d 346, 349 (D.C. Cir. 1993); *see* 33 U.S.C. § 1313(c)(2)(A).

[78] *See* New Hampshire R.S.A. §§ 485-A:8 and 485-A:9 (establishing water quality standards for various classes of waters and procedures for classifying water bodies). See also NH. Code of Admin. Rules Part Env-Wq. 1700 *et seq.* ("Surface Water Quality Regulations").

[79] *See* New Hampshire R.S.A. §§ 485-A:8(II) (Class B waters "shall be considered as being acceptable for fishing, swimming and other recreational purposes and, after adequate treatment, for use as water supplies."); see also NH. Code of Admin. Rules Part Env-Wq. 1703.01(c) ("All surface waters shall provide, wherever attainable, for the protection and propagation of fish, shellfish and wildlife, and for recreation in and on the surface waters.").

[80] *See* 2008 Waterbody Report for Lower Piscataqua River-South, available at http://iaspub.epa.gov/tmdl_waters10/attains_waterbody.control?p_au_id=NHEST600031001-0202&p_cycle=2008&p_state=NH&p_report_type=#attainments (last visited on Jan. 25, 2016).

[81] 40 C.F.R. § 122.44(d). These limits are generally referred to as Water Quality Based Effluent Limits ("WQBELs"). "[T]he permit must contain effluent limits" for any pollutant for which the state determines there is a reasonable potential for the pollutant to cause or contribute to a violation. Id. § 122.44(d)(1)(iii); see also *Am. Paper Inst. v. EPA*, 996 F.2d 346, 350 (D.C. Cir. 1993); *Waterkeeper Alliance, Inc. v. EPA*, 399 F.3d 486, 502 (2d. Cir. 2005). New Jersey has incorporated this federal requirement into state law. See N.J.S.A. § 58:10A-6(f) ("A permit issued by the department…shall require the permittee…such further discharge restrictions and safeguards against unauthorized discharge as may be necessary to meet water quality standards…)

[82] 40 C.F.R. § 122.44(d)(1).

EPA Response to Sierra Club Comments III.A and III.B:

In Comments III.A (Technology Requirements) and III.B (Water Quality Requirements), Sierra Club summarizes its understanding of the requirements under the Clean Water Act and implementing regulations for NPDES permits as well as requirements under the State of New Hampshire Surface Water Quality Standards. EPA has addressed these general points in detail the Fact Sheet and elsewhere in these Responses to Comments.

Sierra Club Comment III.C Cooling Water Systems

Section 316(b) of the CWA requires that the "location, design, construction, and capacity of cooling water intake structures reflect the best technology available for minimizing adverse environmental impact." [83] As with all technology-based standards, dischargers must comply with Section 316(b)'s technology-based effluent limitations immediately, meaning that Schiller should have been brought into compliance long ago. The plant now must be brought into compliance with Section 316(b) "as soon as possible," and, in the interim, must be subject to "interim requirements and dates for their achievement." [84]

In 2004, EPA published regulations designed to implement Section 316(b) at existing power plants like Schiller. Following legal challenges, however, the Second Circuit remanded numerous aspects of the rule to the EPA. [85] The U.S. Supreme Court reviewed the Second Circuit's decision on the limited issue of whether Section 316(b) authorizes EPA to consider costs in relation to benefits. [86] Other aspects of the Riverkeeper II decision were not addressed by the Supreme court's review. In response to the Second Circuit's remand of extensive portions of the rule, EPA withdrew the entire regulation for existing facilities so that it could revise the rule to be consistent with the Clean Water Act. [87]

EPA's new CWA § 316(b) regulations became effective on October 14, 2014, setting national requirements under Section 316(b) for cooling water intake structures at existing facilities. For entrainment control, the new regulations are not a significant departure from the site-specific

Best Professional Judgement process that controlled BTA determinations in prior decades. The new regulations still require the permit writers to engage in a case-by-case BTA selections, but the new rule specifies five factors that the permit writer must consider in establishing the site-specific entrainment standard:

> (i) Numbers and types of organisms entrained… (ii) Impact of changes in [air] emissions … associated with entrainment technologies; (iii) Land availability inasmuch as it relates to the feasibility of entrainment technology; (iv) Remaining [facility] useful plant life; and (v) Quantified and qualitative social benefits and costs of available entrainment technologies when such information on both benefits and costs is of sufficient rigor to make a decision. [88]

In addition, the Rule provides that the BTA decision "may" also be based on six additional factors "to the extent the applicant submitted information…on these factors" [89] and may also be based on any "additional information" requested by the permit writer. [90] The six additional factors are:

> (i) Entrainment impacts on the waterbody; (ii) Thermal discharge impacts; (iii) Credit for reductions in flow associated with the retirement of units occurring within the ten years preceding October 14, 2014; (iv) Impacts on the reliability of energy delivery within the immediate area; (v) Impacts on water consumption; and (vi) Availability of process water, gray water, waste water, reclaimed water, or other waters of appropriate quantity and quality for reuse as cooling water. [91]

The rule provides also that "[t]he weight given to each factor is within the Director's discretion based upon the circumstances of each facility." [92]

To control impingement, the new regulations designate a set of "pre-approved" technologies that a facility can implement to satisfy the BTA standard. The regulations also allow a facility to use other technologies to meet the BTA standard if it can show that they will perform sufficiently. [93] Approval of such an alternative technology would require the permit writer to make a site-specific decision. Because the current permit proceeding began prior to October 14, 2014, EPA may base its site-specific BTA determination for entrainment on some or all of the factors specified in 40 C.F.R. §§ 125.98(f)(2) and (3), and discussed above. Likewise, EPA has discretion to base the BTA determination for reducing impingement mortality on the BTA standards for impingement mortality at § 125.94(c), in the new regulations.

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[83] 33 U.S.C. § 1326(b).

[84] 40 C.F.R. § 122.47(a); see also 33 U.S.C. § 1311(b).

[85] See Riverkeeper Inc. v. U.S. Envtl. Prot. Agency ("Riverkeeper II"), 475 F.3d 83 (2d Cir. 2007).

[86] Entergy Corp. v. Riverkeeper, Inc., 556 U.S. 208 (2009).

[87] See EPA, National Pollutant Discharge Elimination System—Suspension of Regulations Establishing Requirements for Cooling Water Intake Structures at Phase II Existing Facilities; Suspension of Final Rule, 72 Fed.

Reg. 37,107 (July 9, 2007).

[88] 40 CFR § 125.98(f)(2).

[89] 40 CFR § 125.98(f)(3).

[90] 40 CFR § 125.98(i).

[91] Id.

[92] 40 CFR § 125.98(f)(3) (emphasis added).

[93] See 40 C.F.R. §§ 125.94(c)(6) and (7).

EPA Response to Sierra Club Comment III.C Cooling Water System Requirements:

EPA has reviewed and considered this somewhat general comment regarding the regulation of cooling water intake structures under Section 316(b) of the CWA. As the comment states, on August 15, 2014, EPA promulgated final regulations to reduce impingement and entrainment of fish and other aquatic organisms at CWISs used by certain existing power generation and manufacturing facilities for the withdrawal of cooling water from waters of the United States, including Schiller Station. See 79 Fed. Reg. 48,300. This Final Rule completed EPA's response to the remand of the 2004 Phase II Rule (for existing power plants) and 2006 Phase III Rule (for existing manufacturing facilities). EPA withdrew the Phase II Rule to allow the Agency to consider how best to respond to the Second Circuit's decision in *Riverkeeper II* to remand key provisions of the Rule, including the determination of BTA and the performance standard ranges, with the exception of 40 C.F.R. § 125.90(b) (directing permitting agencies to establish requirements on a case-by-case, best professional judgment basis). *See* 72 Fed. Reg. at 37,108, 79 Fed. Reg. at 48,317. *See also* Fact Sheet at 79-81.

For the control of impingement mortality, existing facilities subject to the Final Rule must comply with one of seven alternatives identified in the national BTA standard at 40 C.F.R. § 125.94(c). Three options are essentially "pre-approved" technologies in that they require no, or only minimal, additional demonstration of performance (40 C.F.R. § 125.94(c)(1), (2), and (4)). *See* 79 Fed. Reg. at 48,321. Three additional options (40 C.F.R. § 125.94(c)(3), (5), and (6)) require more detailed information to be submitted about the technology's performance before the permitting authority may specify that technology as the approved BTA for the control of impingement mortality. *Id*. Under the seventh alternative (40 C.F.R. § 125.94(c)(7)), the permittee must perform ongoing biological monitoring to demonstrate that the 12-month impingement mortality performance standard is met. *Id*.

The Final Rule does not prescribe a single nationally applicable entrainment performance standard but instead requires the permitting authority to establish the BTA requirement for entrainment reduction for each facility on a site-specific basis. *See* 79 Fed. Reg. at 48322. As Sierra Club points out, the Final Rule's site-specific entrainment requirements are, in a sense, similar to the case-by-case, BPJ basis for establishing BTA under § 125.90(b). *See* 40 C.F.R. §§ 125.94(d) and 125.98(f). However, while § 125.90(b) provided no guidance on how to establish requirements on a case-by-case basis, the Final Rule establishes an overarching regulatory framework under which the permitting authority will establish BTA entrainment requirements on a site-specific basis following prescribed procedures and applying specified factors for decision-making identified at 40 C.F.R. § 125.98(f)(2) and (3). *See* 79 Fed. Reg. at 48342. In prescribing specific factors to be evaluated in determining the entrainment BTA, the Final Rule represents a substantial departure from the case-by-case decisions made prior to its promulgation. *See also* Fact Sheet at 81-84.

Sierra Club correctly identifies that the determination for Schiller Station, which began prior to the promulgation of the Final Rule, is an ongoing permit proceeding under 40 C.F.R. § 125.98(g). As such, EPA may proceed with a BTA determination without requiring the facility to submit the information required in 40 C.F.R. § 122.21(r), and the determination *may* be based on some or all of the factors at 40 C.F.R. § 125.98(f)(2) and (3) and the BTA standard for impingement mortality at 125.94(c). *See* Fact Sheet at 84. In this case EPA did consider the factors and standards specified in the Final Rule. *See* Fact Sheet at 156.

Sierra Club Comment III.D Thermal Discharges

EPA acknowledges that "thermal pollution has long been recognized to cause harm to the structure and function of aquatic ecosystems."[94] Accordingly, the Clean Water Act defines heat as a pollutant subject to technology-based BAT limits.[95] As discussed above, BAT is a stringent standard that relentlessly pursues the elimination of pollution, including thermal pollution.

In addition, states are required to identify waterbodies for which technology-based thermal controls are insufficient "to assure protection and propagation of a balanced indigenous population of shellfish, fish, and wildlife" and impose more stringent "total maximum daily thermal loads" and water quality-based effluent limitations for heat in order to ensure that the receiving water meets water quality criteria.[96]

In New Hampshire, for Class B waters like the Piscataqua River, "[a]ny stream temperature increase associated with the discharge of treated sewage, waste or cooling water, water diversions, or releases shall not be such as to appreciably interfere with the uses assigned to this class."[97] The uses assigned to the Piscataqua include "the protection and propagation of fish, shellfish and wildlife…."[98]

Conversely, Section 316(a) of the Clean Water Act also authorizes permitting agencies to issue a variance that lowers the level of thermal pollution control required in a NPDES permit. The variance is only available if the discharger of thermal pollution source is able to demonstrate that the proposed technology-based BAT limitation would be more stringent than necessary to protect a balanced, indigenous population of fish, shellfish and wildlife.[99] In seeking to obtain or to renew such a "thermal discharge variance" under Section 316(a), the polluter bears the burden of proving that the alternative limit it seeks will assure protection of a balanced indigenous population of shellfish, fish and wildlife considering the "cumulative impact of its thermal discharge together with all other significant impacts on the species affected."[100] If the polluter does not carry its burden of proof, no variance to BAT limits can be included in the NPDES permit.[101]

A "balanced, indigenous population" is defined by EPA regulations to mean "a biotic community typically characterized by diversity, the capacity to sustain itself through cyclic seasonal changes, presence of necessary food chain species and by a lack of domination by pollution tolerant species."[102] To determine what a balanced indigenous population looks like, the permitting authority must consider what species would inhabit the receiving water body if it were not degraded by thermal discharges.[103]

In assessing the impact of a cooling water system on a waterbody, it is important to always compare the current condition of the waterbody with its condition before the cooling water intakes caused appreciable harm, because disruptions to the indigenous ecosystem that occurred decades ago may persist until now – and may still be redressable if the cooling water system is adequately controlled. Thus, for example, in drafting a NPDES permit for the Merrimack power plant in New Hampshire, EPA referred back to a 1979 report on entrainment and impingement because "any adverse effects of [entrainment] upon the indigenous fish community probably would have occurred within the first few years of operation [when] . . . the station may have induced additional mortality upon the parent stock populations, and therefore reduced reproductive potential and subsequent standing crops."[104] Similarly, at Schiller, the relevant comparison point is not the Piscataqua today, but the Piscataqua as it was many decades ago.

This focus on restoring the Piscataqua to its historic health implements the Clean Water Act's goal of restoring "the chemical, physical, and biological integrity of the Nation's waters. [105]

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[94] National Pollutant Discharge Elimination System – Cooling Water Intake Structures at Existing Facilities and Phase I Facilities, 76 Fed. Reg. 22174, 22,246 (proposed Apr. 20, 2011).

[95] *See* 33 U.S.C. §§ 1311(b)(2)(F) (requiring that BAT effluent limitations be established for all non-toxic pollutants by 1989), 1362(6) (defining "pollutant" to include heat); see also N.J.S.A. § 58:10A-3(n) (defining "pollutant" to include "thermal waste").

[96] 33 U.S.C. § 1313(d) (requiring states to identify bodies of water for which technology-based thermal controls are insufficiently stringent and to impose "total maximum daily thermal loads" to protect these waters); *see also id.* §1312 (requiring imposition of water quality-based effluent limitations on the discharge of pollutants when necessary to meet water quality standards).

[97] N.H. R.S.A. § 485-A:8(II).

[98] N.H. Code of Admin. Rules Part Env.-Wq. 1703.01(c).

[99] *See* 33 U.S.C. § 1326(a).

[100] 40 C.F.R. § 125.73(a); *see also* Memorandum from James A. Hanlon, US EPA, to Directors of EPA Regional Water Divisions, regarding Implementation of Clean Water Act Section 316(a) Thermal Variances in NPDES Permits (Review of Existing Requirements) (Oct. 28, 2008), available at http://www.epa.gov/region1/npdes/merrimackstation/pdfs/ar/AR-338.pdf (last visited on Jan. 25, 2016) (emphasizing that polluters have the burden of proof and must support a variance request with cumulative impact analysis) (hereinafter "Hanlon Thermal Memo").

[101] *See* Hanlon Thermal Memo at 2.

[102] 33 U.S.C. § 1326(a); *see also* 40 C.F.R. §§ 125.58(f), 125.71(c) (both defining a balanced indigenous population in similar terms).

[103] *In re* Dominion Energy Brayton Point, L.L.C., 12 E.A.D. at 555-58.

[104] *See, e.g.*, EPA Region 1, Clean Water Act NPDES Permitting Determinations for the Thermal Discharge and Cooling Water Intake Structures at Merrimack Station in Bow, New Hampshire (NPDES Permit No. NH 0001465) at 337 (hereinafter "Merrimack Determination").

[105] 33 U.S.C. § 1251

EPA Response to Sierra Club Comment III.D Thermal Discharges Requirements:

EPA has reviewed and considered this somewhat general comment regarding the regulation of the thermal discharges under the CWA. The commenter states that "EPA acknowledges that 'thermal pollution has long been recognized to cause harm to the structure and function of aquatic ecosystems.'" More accurately stated, EPA has long recognized that thermal pollution *can, under some circumstances,* cause these types of ecological damage. Whether a thermal discharge is or is not causing such harm in a particular case will depend on the facts of that case, including the magnitude of the thermal discharge, the characteristics of the receiving water, and the characteristics of the assemblage of organisms residing in, or transiting through, that receiving water. In some cases, a thermal discharge may not cause serious ecological harm despite not meeting technology-based and/or water quality-based effluent limits. As a result, Congress enacted CWA § 316(a), which allows thermal discharge limits to be set at levels less stringent than would be mandated by the otherwise applicable technology-based and water quality-based requirements if such less stringent limits would nevertheless assure the protection and propagation of the BIP of the receiving waters. Similarly, when considering the effects of thermal loads on local water quality, CWA § 303(d)(1)(D) calls for a site-specific analysis that takes into account a variety of local factors.

The commenter states that under CWA § 316(a), thermal dischargers have the burden of demonstrating that technology-based (and/or water quality-based) effluent limits on the discharge of heat would be more stringent than necessary to protect the BIP. The commenter further states that the discharger also has the "burden of proving that the alternative [thermal discharge] limits it seeks will assure protection of a balanced indigenous population of shellfish, fish and wildlife considering the 'cumulative impact of its thermal discharge together with all other significant impacts on the species affected … [,' and that i]f the polluter does not carry its burden of proof, no variance to BAT limits can be included in the NPDES permit." In EPA's view, this summary requires a small modification. If the discharger demonstrates that the effluent limits that would be required under CWA § 301 are more stringent than needed to assure the protection and propagation of the BIP, but fails to demonstrate that its proposed alternative limits are adequate to assure the protection and propagation of the BIP, EPA may, in its discretion, decide to impose other alternative thermal discharge limits that it finds will be adequate. *See* Fact Sheet, p. 16; *Dominion*, 12 EAD at 500.

Finally, the commenter also states that "[i]n assessing the impact of a cooling water system on a waterbody, it is always important to compare the current condition of the waterbody with its condition before the cooling water *intakes* caused appreciable harm …" (emphasis added). In this context, EPA believes the commenter meant to refer to thermal discharges as well as, or perhaps instead of, cooling water intakes. Furthermore, the commenter sets up a comparison that *presumes* that appreciable harm has occurred, whereas the comparative analysis may be used to determine *whether or not* appreciable harm has occurred.

That said, EPA agrees that in evaluating an application for renewal of an existing CWA § 316(a) variance, it is desirable to compare current conditions after the thermal discharge began with the conditions that existed prior to commencement of that discharge. Yet, data to support such a direct comparison is not always available. *See* Fact Sheet, p. 62. In such cases, there are other ways to approach the issue using the best available information. For example, one could look to other similarly situated water bodies without thermal discharges present to indicate what the BIP might look like in the absence of the thermal discharge. As another example, the reviewing agency might undertake a *prospective* analysis to determine how the proposed thermal discharge would affect organisms currently or previously residing in the receiving water body by characterizing the range and intensity of the thermal plume and comparing it with the temperature tolerances of these organisms.

Sierra Club Comment III.E Endangered Species Act Consultation

The new Section 316(b) regulations provide a procedure for ensuring that the cooling water intake requirements of a NPDES permit are protective of threatened and endangered species. The new regulations demand that the permitting agencies "transmit all permit applications for facilities…to the appropriate Field Office of the U.S. Fish and Wildlife Service and/or Regional Office of the National Marine Fisheries Service upon receipt for a 60-day review prior to public notice of the draft or proposed permit." [106] In addition, the permitting agency must:

> provide the public notice and an opportunity to comment as required… and must submit a copy of the fact sheet or statement of basis (for EPA-issued permits), the permit application (if any) and the draft permit (if any) to the appropriate Field Office of the. Fish and Wildlife Service and/or Regional Office of the National Marine Fisheries Service. This includes notice of specific cooling water intake structure requirements at § 124.10(d)(1)(ix) of this chapter, notice of the draft permit, and any specific information the Director has about threatened or endangered species and critical habitat that are or may be present in the action area, including any proposed control measures and monitoring and reporting requirements for such species and habitat. [107]

This procedural element of the new Section 316(b) regulations allow NMFS and FWS the opportunity to identify measures to protect federally-listed threatened and endangered species, which measures the director has the authority to include as enforceable permit terms. [108]

[106] 40 C.F.R. § 125.98(h).
[107] *Id.*
[108] 40 C.F.R. 124.94(g).

EPA Response to Sierra Club Comment III.E Endangered Species Act Consultation:

As Sierra Club explains, the Final Rule establishes specific requirements for transmitting permit applications to the Services and providing opportunity for the Services to comment on Draft Permits, including notice of specific cooling water intake structure requirements. *See* 40 C.F.R. § 125.98(h). Sierra Club recognizes that the determination for Schiller Station is an ongoing permit proceeding that began prior to the effective date of the Final Rule. On December 11, 2014, a memorandum was issued from Deborah Nagle (EPA) and Robert Wood (EPA) to the Water Division Directors in EPA Regions 1 through 10 to address implementation of the Final Rule's requirements related to federally-listed threatened and endangered species and/or critical habitat. *See* AR-382. Regarding ongoing permit proceedings, the memo clarifies:

> [i]n the case of permit proceedings begun prior to the effective date of today's rule, the Director may require additional information from the applicant pursuant to 40 C.F.R. 122.21(r). Upon receipt of such additional permit application information requested under 40 C.F.R. 122.21(r), the director must forward a copy of that information to the Services.

Id. at 4. As an ongoing permit proceeding, Schiller Station applied for reissuance of this permit well before the Final Rule and was not required to submit the application materials at 40 C.F.R. §

122.21(r) unless directed to do so by the permitting authority. In Response to PSNH Comment V.B.4, EPA explains that the information provided by the permittee in the permit application and supplemental applications, as well as in response to information requests under Section 308 of the CWA, is sufficient for a determination for the BTA at Schiller Stations CWISs consistent with Section 316(b) and the Final Rule. As such, EPA did not request additional information pursuant to 40 C.F.R. § 122.21(r).

EPA has provided the Services with the necessary documentation and sufficient time to review the materials to ensure that the Final Permit is protective of endangered species. Further, the documentation in the administrative record and the correspondence from NMFS on EPA's findings confirm that both USFWS and NMFS have been properly consulted regarding the potential impacts of the federal action on listed species and critical habitat under their respective jurisdictions. Finally, neither USFWS nor NMFS have communicated that the consultation process completed for the Draft Permit and in preparation of the Final Permit was in any way insufficient or inconsistent with either Section 7 of the ESA or the Final Rule. EPA has responded to Sierra Club's comments related to ESA in Response to Sierra Club Comment IV.D.

Sierra Club Comment IV. Detailed Comments

Sierra Club Comment IV.A EPA Region 1 Should Require Closed-Cycle Cooling or Its Equivalent as a Best Technology Available to Reduce Impingement and Entrainment Mortality Caused by Cooling Water Intake Structures.

Sierra Club supports EPA's preliminary determination, reached in 2010, that closed-cycle cooling is the BTA for Schiller. [109] Sierra Club strongly disagrees with EPA's proposed BTA determination in the draft permit.

[109] *See* 2010 Perkins Letter at 5.

Response to Sierra Club Comment IV.A.

EPA acknowledges Sierra Club's support for closed-cycle cooling as the best technology available (BTA) at Schiller Station and has responded below to Sierra Club's specific comments about EPA's BTA determination proposed with the Draft Permit. EPA notes that the BTA determination under consideration in the following comments and responses is EPA's determination for the 2015 Draft Permit that the BTA for Schiller Station was fine-mesh wedgewire screens. This determination was based primarily on information submitted by PSNH in 2008 and 2014 and was made in light of new EPA regulations promulgated pursuant to CWA § 316(b) that establish permitting requirements for cooling water intake structures at existing facilities (the "Final Rule") and that became effective on October 14, 2014. The Final Rule requires the permitting authority to consider, among other factors, social costs and benefits when establishing site-specific entrainment requirements. *See* 79 Fed. Reg. 48,300.

Sierra Club Comment IV.A.1 Closed-Cycle Cooling is the Best Technology Available for Minimizing Entrainment and Impingement of Aquatic Life

The best technology available to minimize the adverse environmental impact of Schiller's cooling water intake structure is to convert Schiller from the existing 125 MGD once-through cooling system to a closed-cycle cooling system that uses just 2.2 MGD of make-up water, which can be sourced as grey water from the Pierce Island WWTP or salt water from the Piscataqua River. [110] By EPA's own reckoning, as well as PSNH's, such a closed-loop system is technically available at Schiller, and it would reduce impingement and entrainment by 97% - 100% (depending on saltwater or greywater makeup).[111]

The attached analysis from Petrudev states conservatively, with use of saltwater makeup, that "[e]ntrainment reductions of 95% are expected," meaning 7.3 million ichthyoplankton and 65.5 million macrocrustaceans entrained compared to existing technology which results in 145 million ichthyoplankton and 1.3 billion macrocrustaceans entrained, or a net savings of more than 1.3 billion organisms – at least 137.7 million fish eggs and larvae and 1.235 billion macrocrustaceans, plus reduced impingement. [112] Such a conversion also would eliminate Schiller's thermal pollution of the Piscataqua River. [113]

As noted earlier, these estimates are based on PSNH's baseline entrainment figures and must be adjusted upwards to conform to EPA's baseline entrainment estimate – Sierra Club agrees with EPA's upward adjustment to align with Schiller's design intake flow, and believes that Petrudev's estimates, so adjusted, are consistent with the impingement and entrainment estimates that EPA presents for closed-cycle cooling in the Fact Sheet.

EPA has long been aware that closed-cycle cooling is technically feasible at Schiller and would protect the Piscataqua River's aquatic ecosystem to a far greater degree than any other technology. In 2010, EPA reached a preliminary determination "based on Schiller's October 2008 response, that closed-cycle cooling is the Best Technology Available (BTA) for Schiller Station." [114] Sierra Club strongly supports EPA's preliminary determination and urges EPA to carry this determination forward into a final NPDES permit.

EPA and other permitting authorities rendering their best professional judgment with respect to thermal electrical generating units have determined that the best technology available to minimize adverse environmental impacts requires a reduction in water withdrawals and impingement and entrainment commensurate with that achievable by closed-cycle cooling. [115]

Schiller is substantially similar to the facilities for which permitting agencies have required installation of closed-cycle cooling to reduce impingement and entrainment mortality.

For example, at Brayton Point, EPA Region 1 issued (and the EPA's Environmental Appeals Board upheld) a permit provision that "would essentially require closed-cycle cooling for the entire station" as BTA. [116] Like Brayton Point in Fall River, Massachusetts, for which EPA Region 1 required installation of cooling towers pursuant to 316(b), Schiller Station is located in estuarine waters. [117] And absent closed-cycle cooling, both Brayton Point and Schiller entrain more than a billion aquatic organisms every year. [118] EPA determined closed-cycle cooling to be BTA at Brayton Point, and it is likewise BTA here. [119]

More recently, EPA Region 1 has also proposed cooling towers as BTA under Section 316(b) for the Merrimack Station, which like Schiller is located in New Hampshire and owned and operated by PSNH. [120] Merrimack station has two cooling water intake structures allowing for a total intake flow of 287 MGD, [121] which is a little more than double the 124 MGD design flow of Schiller. But despite drawing half as much water, impingement and entrainment levels at Schiller are 420 times higher than at Merrimack (using EPA's baseline figures: 1.59 billion organisms at Schiller, compared to 3.8 million at Merrimack).[122] If cooling towers are warranted to protect aquatic life at Merrimack, they are certainly justified at Schiller.

Likewise, the New York State Department of Environmental Conservation ("DEC") has deemed closed-cycle cooling to be BTA for facilities in New York. E.F. Barrett is a two-unit facility. [123] The receiving water, Barnum's Channel in the Town of Hempstead on the southern shore of Long Island, is also an estuarine waterbody with a diverse finfish community, similar to the Piscataqua. [124] Levels of entrainment are likewise comparable, and indeed are slightly lower at E.F. Barrett: 1.2 billion eggs and larvae, as compared to 1.4 billion organisms at Schiller. [125]

Moreover, in arriving at the conclusion that closed-cycle cooling was BTA, a wide array of alternative control technologies were evaluated, including a number of screening alternatives, an impingement net barrier and variable speed pumps. [126] These are similar and indeed appear to be a more inclusive set of technologies than were evaluated for Schiller. DEC based its determination that BTA was cooling towers on several factors, noting among other things that the technology will reduce entrainment of eggs and larvae "more than any other technology or operational measure available to reduce aquatic impacts." [127] New York DEC also noted the ancillary benefits of abating thermal discharges from the facility, which as described below, are likewise worthy of consideration at Schiller. [128]

New York DEC also required cooling towers as BTA under Section 316(b) for the Indian Point nuclear plant. Indian Point, while a larger facility than Schiller with a higher intake flow rate, nevertheless generates impingement and entrainment impacts comparable to those at Schiller. The aquatic communities around the two plants are similar, with the estuary around the Indian Point facilities serving as a "spawning and nursery ground for important fish and shellfish species, such as striped bass, American shad, Atlantic and shortnose sturgeon, and river herring." [129] Existing controls for Indian Point Units 2 and 3 prior to the 316(b) BTA determination were "modified Ristroph-type traveling screens, fish handling and return systems, and low pressure screenwash systems intended to reduce the number of aquatic organisms injured and killed by being impinged by the facilities' CWISs each year." [130] And, significantly, entrainment levels at Indian Point prior to installation of cooling towers appear to have been directly comparable to those at Schiller, with the Final Environmental Impact Statement indicating that approximately 1.4 to 2.0 billion organisms from the six key species studied were entrained annually. [131]

Elsewhere, the New Jersey Department of Environmental Protection ("NJ DEP") exercised its best professional judgment in requiring cooling towers as BTA in its 2010 draft permit for the Oyster Creek nuclear plant in Forked River, New Jersey. [132] Based on sampling conducted from

2005 to 2007, entrainment at Oyster Creek appears to be comparable to or lower than at Schiller, from approximately 600 million aquatic organisms to 1.35 billion. [133] In reaching its 316(b) determination, NJ DEP evaluated a wide array of alternative control technologies including a number of screening alternatives (including various types of fine mesh screens) as well as optimization of dilution pump operations, and determined that BTA for the facility is closed-cycle cooling. [134] NJ DEP focused on the fact that closed-cycle cooling would reduce water intake usage significantly thereby decreasing impingement and entrainment effects and that it is one of the few technologies available to target entrainment effects, [135] which are likewise a significant concern at Schiller.

In sum, these and other similar decision establish that cooling towers are BTA for plants that kill as many organisms as Schiller.

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[110] Both Powers Engineering and PSNH concur that a sufficient volume of grey water is available at Schiller to serve as make-up water for a closed-cycle cooling system. Use of gray water for cooling has been successfully implemented at a number of facilities nationwide, including the Palo Verde nuclear plant in Arizona and Bergen Station, a natural gas-fired power plant in New Jersey.

[111] *See* Schiller Fact Sheet at 157; 316(b) report at 107.

[112] *See* Petrudev at 6-6. The report also notes that the efficacy of a closed-cycle cooling system "is expected to be slightly lower (<95% reduction) for impingement compared to entrainment since impingement is not likely proportional to flow." Id. (citation omitted).

[113] *See id.*

[114] 2010 Perkins Letter at 5.

[115] *See, e.g.*, Notice of Denial: Joint Application for CWA § 401 Water Quality Certification; NRC License Renewal– Entergy Nuclear Indian Point Units 2 and 3, NYS DEC Nos.: 3-5522-00011/00030 (IP2) & 3-5522-00105/00031 (IP3) (N.Y.S. D.E.C. Apr. 2, 2010) (denying water quality certification on grounds that implementation of closed-cycle cooling was necessary to comply with Section 316(b)) [hereinafter "Indian Point Notice of Denial"]; SPDES Fact Sheet Narrative, National Grid – E.F. Barrett Power Station (Oct. 2009) (setting forth New York Department of Environmental Conservation's determination that closed-cycle cooling is BTA for E.F. Barrett Power Station); New Jersey Department of Environmental Protection, Draft NPDES Permit for Oyster Creek Generating Station (Jan. 7,2010) (concluding as BPJ that closed-cycle cooling was BTA under § 316(b) for Oyster Creek) [Note that this requirement was modified in the December 21, 2011 final NPDES permit following a December 9, 2010 administrative consent order requiring shutdown of the plant by December 31, 2019]; see also EPA, Merrimack Station draft NPDES permit and fact sheet (proposing requirement of closed-cycle cooling as BTA under § 316(b)),available at http://www.epa.gov/region1/npdes/merrimackstation/; Mirant Canal Station, Authorization to Discharge Under the National Pollutant Discharge Elimination System at 16 (issued by EPA Region 1 on Aug. 1, 2008) (requiring reductions in entrainment to levels commensurate with closed-cycle cooling).

[116] *See In re* Dominion Energy Brayton Point, 12 E.A.D. at 504, 597-618.

[117] *See id.* at 502.

[118] According to EPA's 2002 case study, Brayton Point's annual average entrainment is 16,703,221,011 organisms and average annual impingement is 44,752. U.S. EPA, Phase II--Large existing electric generating plants, Proposed Rule -Case Study Analysis for the Proposed Section 316(b) Phase II Existing Facilities Rule, Part F, at F3-21, Table F3-10.

[119] As with Schiller Station, thermal discharges were also a significant concern at Brayton Point.

[120] EPA Region 1, Merrimack Station Authorization to Discharge Under the National Pollutant Discharge Elimination System (Permit No. NH 0001465)-Fact Sheet at 4.

[121] Merrimack Determination at ii-iii.

[122] *See id.* at xiv.

[123] SPDES Fact Sheet Narrative, National Grid – E.F. Barrett Power Station (Permit No. 000-5908).

[124] *Id.*

[125] *Id.* at 1-2.

[126] *Id*. at 2 of 8.

[127] *Id*. at 4 of 8.

[128] *See* id.

[129] Indian Point Notice of Denial at 7-8.

[130] *Id*. at 3.

[131] Final Environmental Impact Statement Concerning the Applications to Renew New York State Pollutant Discharge Elimination System (SPDES) Permits for the Roseton 1 & 2, Bowline 1 & 2, and Indian Point 2 & 3 Steam Electric Generating Stations, Accepted by the New York Department of Environmental Conservation on June 25, 2003, at 2-3 Tables 1 & 2.

[132] Oyster Creek December 2010 Draft Permit, Fact Sheet at 5 (Station withdraws 662.4 MGD for use as non-contact cooling water; station also withdraws water from a separate intake which is mixed with the cooling water to mitigate thermal discharge issues).

[133] *See id*. at 17 (summing entrainment estimates in table).

[134] *See* id. at 10.

[135] *Id*. at 25.

EPA Response to Sierra Club Comment IV.A.1:

Sierra Club comments that the best technology available to minimize the adverse environmental impact of Schiller's cooling water intake structure is to convert Schiller from the existing once-through cooling system to a closed-cycle cooling system that uses either gray water from the Pierce Island WWTP (Sierra Club's preferred option) or salt water from the Piscataqua River as make-up water. According to an analysis by Petrudev on behalf of Sierra Club, closed-cycle cooling using saltwater makeup would result in the entrainment of 7.3 million ichthyoplankton and 65.5 million macrocrustaceans annually, compared to existing technology which results in 145 million ichthyoplankton and 1.3 billion macrocrustaceans annually, which is equivalent to a net savings of more than 1.3 billion organisms. In addition, the commenter notes that closed-cycle cooling would eliminate Schiller's thermal pollution of the Piscataqua River.

The comment discusses the BTA for entrainment and impingement and EPA likewise addresses both in its response. The Final Rule establishes a sequence for aligning the compliance deadlines for impingement mortality and entrainment requirements: the owner or operator of an existing facility must comply with the impingement mortality standard at 40 C.F.R. § 125.94(c) as soon as practicable *after* issuance of a final permit that establishes the entrainment requirements under 40 C.F.R. § 125.94(d). *See* 40 C.F.R. § 125.94(b)(1) and (2). In doing so, EPA recognized that the BTA determination for entrainment may directly impact, and therefore drive, the impingement compliance method. *See* 79 Fed. Reg. at 48,327, 48,358-60. The preamble also states that the permitting authority "is encouraged to consider the extent to which those technologies proposed to be implemented to meet the requirements of § 125.94(d) [the BTA standards for entrainment] will be used, or could otherwise affect a facility's choice of technology, to meet the requirements of § 125.94(c) [the BTA standards for impingement mortality]." 79 Fed. Reg. at 48,369. In this way, the facility can take advantage of the potential impingement benefits provided by the required entrainment controls. *See* Fact Sheet at 156; Response to PSNH Comment V.B.3.

In this case, EPA has made a site-specific determination for the BTA for entrainment based on the relevant factors consistent with the Final Rule. The selected technology (fine-mesh wedgewire screens) also enables the permittee to comply with one of the "pre-approved" technologies under the standards for impingement mortality: a design through-screen velocity ("TSV") of 0.5 fps. *See* 40 C.F.R. § 125.94(c)(2). EPA recognizes that closed-cycle cooling would also satisfy the BTA standard for impingement. *See* 40 C.F.R. § 125.94(c). The comment, however, provides no explanation for its assertion that *only* closed-cycle cooling can be the BTA for impingement at Schiller. Not only are wedgewire screens with a maximum design TSV of 0.5 fps a “pre-approved” technology, but EPA estimated that such screens would reduce impingement by approximately 87.5%. *See* Fact Sheet at 152.

Turning to the BTA for entrainment reduction, Sierra Club, quoting from the Petrudev Biological Report submitted as an exhibit to its comments on the Draft Permit, comments that closed-cycle cooling with saltwater makeup would result in the estimated entrainment of 7.3 million ichthyoplankton (fish eggs and larvae) and 65.5 million macrocrustacean larvae. This would represent a net savings of more than 1.3 billion organisms – at least 137.7 million fish eggs and larvae and 1.235 billion macrocrustaceans – as compared to existing technology which entrains 145 million ichthyoplankton and 1.3 billion macrocrustaceans. EPA notes that Petrudev bases these estimates on a 95% reduction in entrainment with salt-water cooling towers, whereas EPA, based on the 2008 Engineering Response (AR-140), estimated a total reduction in cooling water withdrawals of 96.9% for this technology. *See* AR-140 at 66. *See also* Fact Sheet at 153. This difference in entrainment reductions results in a slight difference in EPA’s and Sierra Club’s estimates of the number of organisms that would be saved from converting to closed-cycle cooling. In addition, as discussed in Response to Sierra Club Comments II.D and IV.B.1, above, the green crab, which accounts for more than half of macrocrustacean entrainment, is an invasive species with negative economic and ecological impacts on the Piscataqua River. EPA has excluded this species from its evaluation of entrainment technologies on the basis that reducing entrainment of this species would not likely have any benefit to the Piscataqua River ecosystem. Therefore, the revised estimates are that closed-cycle cooling, with a 97% entrainment reduction, would result in entrainment of about 4.5 million fish eggs and larvae and about 18 million macrocrustacean larvae annually. Stated differently, converting to closed-cycle cooling would save over 142 million fish eggs and larvae and over 574 million early-life-stage crustaceans, equivalent to a net savings of more than 717 million organisms. EPA agrees that, based solely on the number of organisms saved from entrainment, closed-cycle cooling is the best performing technology for reducing entrainment at Schiller Station, whether the entrainment estimates are based on a flow reduction of 97% or 100%. *See* Response to Sierra Club Comment IV.A.2.c for further discussion of the availability of gray water.

The determination of the BTA for entrainment is not, however, based solely on the number of organisms saved from entrainment. This is true for Schiller Station and it was also true for the other determinations to which Sierra Club refers in its comment. The U.S. Supreme Court held in *Entergy Corp. v. Riverkeeper, Inc.*, that under CWA § 316(b), EPA retains discretion to determine “the extent of reduction that is warranted under the circumstances” and that this determination may “involve a consideration of the benefits derived from reductions and the costs of achieving them.” 556 U.S. 208, 219 (2009). Thus, while the number of organisms entrained is a consideration under § 316(b), EPA is not limited to considering only that one factor. The Court disagreed with the argument that the BTA always “must be the economically feasible technology that achieves the greatest possible reduction in environmental harm.” *Id.* at 219. *See also id*. at 222; 79 Fed. Reg. at 48314. Indeed, over the years, EPA has made BTA determinations for entrainment based on site-specific analyses that consider a variety of factors including, but not limited to, technical feasibility, financial costs, ecological benefits, and non-water quality environmental impacts. Moreover, as befits a case-by-case analytical approach, EPA has found closed-cycle cooling to be the BTA for some facilities, but not for others.

The 2014 CWA § 316(b) Final Rule rejected closed-cycle cooling as a mandated, industry-wide BTA for entrainment reduction and, instead, continued the approach of making entrainment reduction BTA determinations on a site-specific basis after consideration of a diverse suite of factors, only one of which is the number of organisms entrained. *See* 40 C.F.R. § 125.98(f). As the preamble to the Final Rule states, "[t]he entrainment provisions reflect EPA's assessment that there is no single technology basis that is BTA for entrainment at existing facilities, but instead a number of factors that are best accounted for on a site-specific basis." 79 Fed. Reg. at 48,303. The entrainment requirements must reflect the permitting authority's determination of the maximum reduction in entrainment warranted after consideration of all the relevant factors spelled out in the Final Rule, although the permitting authority has considerable discretion in assigning the weight given to each of the factors. *See* 40 C.F.R. § 125.98(f). *See also* Fact Sheet at 156-57. The Final Rule also recognizes that better performing technologies will sometimes be rejected. *See* 40 C.F.R. § 125.98(f)(1) ("The written explanation [of the proposed entrainment determination] must describe why the Director has rejected any entrainment control technologies or measures that perform better than the selected technologies or measures…").

EPA considered the number of organisms being entrained at Schiller Station and the expected entrainment reductions and costs of available technologies, as well as other relevant aspects of the site-specific conditions at Schiller, including the following: (a) the CWISs withdraw a relatively small percentage of the tidal flux of the Piscataqua River; (b) there is no evidence that entrainment losses at Schiller Station are causing or contributing to declines in the overall aquatic health of the Piscataqua River; (c) the existing thermal limits are protective of the balanced, indigenous population; and (d) two of the generating units (Units 4 and 6) have operated well below design capacity in recent years and their status is unlikely to change during this permit cycle. The Fact Sheet concludes that based on the comparison of the costs and benefits of the available technologies, the far greater costs of closed-cycle cooling, as compared to fine-mesh wedgewire screens, are not warranted by the additional margin of entrainment mortality reduction that closed-cycle cooling could achieve. *See* Fact Sheet at 155, 157. In this way, EPA believes it has appropriately considered the factors and established the BTA for entrainment at Schiller Station based on a balance of entrainment reductions, technical feasibility, and costs and benefits. Because each determination is site-specific, the BTA at one facility will not necessarily be the BTA at another, and the determinations at other facilities based on different facts do not mandate a particular determination for Schiller Station.

While Sierra Club's comment points to other power plants for which closed-cycle cooling was determined to be the BTA, these facilities involved materially different facts. To begin with, the determinations that Sierra Club references in its comments were made *prior* to promulgation of the Final Rule. While EPA acknowledges that, as Sierra Club has stated, the Final Rule may not have dramatically altered the determination for BTA for entrainment as compared to the best professional judgement method that Region 1 used prior to the regulations, the Final Rule does lay out a new framework for the information that should be evaluated and newly specifies various factors to be considered, including the social costs and benefits of available technologies. *See* 40 C.F.R. § 125.98(f).

Furthermore, Schiller Station's water withdrawals are significantly lower than the other facilities mentioned by Sierra Club. While Schiller Station's CWISs have a design flow of 125.5 MGD, Merrimack Station operates at a design flow of 287 MGD and E.F. Barrett Station has a design flow of 294 MGD. Prior to its closed-cycle cooling retrofit, Brayton Point Station had a design flow of about 1 billion gallons per day (BGD). Similarly, Oyster Creek and Indian Point stations have design flows of 1.79 and 2.5 BGD, respectively. *See* AR-185, AR-319, AR-327, AR-355, AR-356, AR-357, AR-372. In other words, based on the capacity of the CWISs, Schiller Station's design flow is less than half that of the smallest station that Sierra Club references (Merrimack Station).

In terms of the number of organisms entrained, again, with the exception of Merrimack Station, all of the stations that Sierra Club references entrain well over one billion fish eggs and larvae per year. The biological studies for these facilities did not, however, enumerate macroinvertebrate entrainment. If macroinvertebrate entrainment had been documented, EPA expects the entrainment figures for those facilities would have been much higher. Based on EPA's corrected estimated, Schiller Station entrains about 146 million fish eggs and larvae per year, and entrains an additional 593 million macrocrustacean (mainly crab) larvae.

In addition, it should also be understood that in addition to considering absolute numbers of organisms entrained and impinged, EPA also considers the magnitude of the environmental effect of these losses. For most of the facilities referenced in the comment, the permitting authority was concerned that entrainment was contributing to substantial declines in local fish populations, including commercially important species experiencing regional population declines. For example, Brayton Point was demonstrated to have a negative impact on populations of winter flounder in Mt. Hope Bay and the thermal discharge was not protective of a balanced indigenous population. *See* AR-185. Similarly, the New York State Department of Environmental Conservation (NYSDEC) estimated that E.F. Barrett Station entrains nearly 27 million winter flounder eggs and larvae annually, which accounts for nearly 40 percent of the estimated annual winter flounder entrainment occurring at all the power plants in New York. *See* AR-327. NYSDEC also determined that, based on a comparison of the fish community at the discharge and further from the discharge, the facility fails to meet the state's thermal standards (NYCRR Part 704.1). *See Id*.

At the Indian Point Energy Center, entrainment of over one billion fish eggs and larvae per year indicated that the facility kills an appreciable proportion of Atlantic tomcod, white perch, and bay anchovy populations in the estuary. *See* AR-357. Furthermore, the spatial extent of the thermal plume at Indian Point raised concerns about the passage of fish and impacts to benthic organisms. *Id*. In addition, monitoring of the traveling screens at Indian Point observed impingement of 32 shortnose sturgeon and 601 Atlantic sturgeon over the period from 1974 to 1990 at an average of 4.2 shortnose sturgeon and 78.5 Atlantic sturgeon per year. *See* AR-388 at 63, 80. Both the shortnose sturgeon and the Atlantic sturgeon are listed species under the Endangered Species Act. At Oyster Creek, in addition to the entrainment of billions of fish eggs and larvae, the facility had also entrained several species of endangered turtles. *See* AR-340. For the Draft Permit for Merrimack Station, EPA proposed that closed-cycle cooling was the only technology available to address both impingement and entrainment in light of the fact that CWW screens were not regarded to be feasible at that location at that time. In addition, the Fact Sheet for the Draft Permit also concluded that Merrimack Station's thermal discharge was not protective of a balanced indigenous population of fish in the Hooksett Pool, and that the data demonstrated declines in local fish populations that entrainment was likely contributing to. *See* AR-372.

Compared to Schiller Station, the design intake flows of the referenced facilities are all substantially greater. Moreover, in all the referenced cases, the entrainment losses were substantial and linked to demonstrated declines in overall aquatic health. In addition, all the referenced facilities have negative impacts associated with the thermal discharge. At Schiller Station, there is no indication that entrainment losses are causing or contributing to declines in in the overall aquatic health of the Piscataqua River, nor is the thermal impact negatively impacting the balanced, indigenous population. Notably, except for Merrimack Station and Brayton Point Station, none of these other BTA determinations presented a comparison of relative costs and benefits.

Moreover, only one of the BTA determinations that Sierra Club references in its comment, the one for Brayton Point Station, represented a final permit determination that was implemented. All of the other determinations are draft determinations, and all were made prior to the promulgation of the Final Rule. In at least two cases (Oyster Creek and Indian Point) the BTA determination has changed since the draft to reflect changes in the long-term viability of the power plant. In 2010, New Jersey Department of Environmental Protection (NJDEP) issued a draft permit for Oyster Creek Station in which it determined that closed-cycle cooling constitutes the BTA for impingement and entrainment, which Exelon challenged in its comments on the draft permit by arguing that closed-cycle cooling is not economically feasible due to the cost of the technology, the lengthy period required for permitting and construction, and the limited remaining life of the facility. *See* AR-367. Under an Administrative Order, Exelon and NJDEP agreed that operation of the plant would cease 10 years prior to expiration of its NRC license. NJDEP then determined that, based on Exelon's commitment to terminate operations no later than December 31, 2019, and the length of time that would be required to retrofit the existing cooling system, closed-cycle cooling was not the BTA. *See* AR-367.[54]

Similarly, in 2017, IPEC, NYSDEC, and other parties agreed on a commitment to terminate operations at the plant by 2021. See AR-395. Subsequently, the commitment to retire both units by 2021 was found to represent the BTA for the Station's cooling water intake structures, taking into consideration the expected installation time and significant costs of closed-cycle cooling.[55] *See* AR-392. Furthermore, National Grid, the current owners of E.F. Barrett Station, have also been considering plans to repower the station which has stalled re-issuance of a final permit and

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[54] Also see Exelon News Release from December 8, 2010 announcing plans to retire the plant in 2019. Available at http://www.exeloncorp.com/newsroom/Pages/pr_20101208_Nuclear_OysterCreekRetirement.aspx.

[55] EPA notes that while Entergy has entered into a legal agreement to retire Indian Point, as of the date of this Response to Comments, the company has not formally announced its plans to retire the generating units and a complaint has been filed against the State of New York seeking to annul the agreement and subsequent SPDES permits because the legally-mandated analysis of environmental, economic, and social impacts was not performed. See AR-394.

BTA determination. The most recent feasibility study, completed in April 2017, notes that the five-year average capacity factor (2012-2016) for Barrett's steam units was 38.2%. A final permit for E.F. Barrett mandating closed-cycle cooling has not yet been issued. EPA notes that, for each of these cases described above, the facility has established that its decision to retire generating units or to repower units is driven by changes in market conditions; none of these facilities have specified that the decision is influenced by the determination of closed-cycle cooling as the BTA.

Each BTA determination that Sierra Club references in its comment, including that for Schiller Station, is a case-by-case determination based on the facts of each individual facility. Differing circumstances from facility to facility will naturally affect the determinations, *see In re Dominion Energy Brayton Point*, *LLC*, 12 E.A.D. 490, 607-08 (EAB 2006), and the comment ignores the many site-specific BTA determinations for other facilities that have concluded that a technology other than closed-cycle cooling is the BTA for entrainment. *See, e.g.*, Region 1 BTA determinations for GE Aviation (NPDES Permit No.MA0003905), Gillette (NPDES Permit No. MA0003832), University of Massachusetts Boston (NPDES Permit No. MA0040304), and Wheelabrator Saugus (NPDES Permit No. MA0028193). Under a case-by-case approach, the determination that a particular technology is the BTA at one facility does not mean that it is the BTA at another facility.

EPA disagrees with Sierra Club that Schiller Station is "substantially similar" to the facilities discussed in the comment. As discussed above, EPA concludes that Schiller Station is materially different from those facilities.

Sierra Club Comment IV.A.2 Closed-Cycle Cooling is Economically Justified At Schiller

EPA believes that cooling towers will reduce impingement and entrainment mortality by as much as 97%, while cylindrical wedgewire screens will reduce impingement mortality by 87%, fish entrainment mortality between 37-49% (depending on screen screen-slot size), and macro-crustacean entrainment mortality by 100%. EPA proposed cylindrical wedgewire screens as BTA because EPA believes that wedgewire screens are 40 times less expensive than cooling towers, and that the increased cost of cooling towers is not justified by the increase in benefits.

Sierra Club Comment IV.A.2.a EPA's Approach to Cost-Benefit Analysis is Misguided

EPA has engaged in a comparative cost-benefit analysis of closed-cycle cooling and wedgewire screens that is deeply flawed because EPA engaged in an unsound comparison of the two technologies' cost-effectiveness, rather than actually comparing the costs and benefits offered by each technology

Instead of comparing the net benefits of the two options, EPA compared the benefit-cost ratios of the two competing technologies and found that wedge-wire screens are more cost effective because screens achieve substantial reductions in impingement and entrainment mortality at a cost 40 times less than closed-cycle cooling. EPA concluded "its far greater costs, as compared to the fine-mesh wedgewire screen option, are not warranted by the additional margin of reduction in adverse environmental effects that it could achieve." [136]

This analysis is misguided because it values a technology's cost-effectiveness (i.e., cost per unit of impingement and entrainment reductions), over the maximization of benefits. The Synapse Report explains:

> This is not a logical deduction from the cost ratios and benefit ratios that EPA has presented. Rather, it makes a strong but implicit judgment about the low value of the environmental benefits at stake. Consider two monetary options, with the same cost and benefit profiles identified in this discussion. Plan A requires spending $1 on some protective measure to avoid $100 of damages; Plan B requires spending $40 to avoid $200 of damages. It is true that Plan B costs 40 times as much but saves only twice as much. It is also true that Plan A has a net value of $99 while Plan B has a net value of $160, making the more expensive plan a much better deal. [137]

To be sure, a side-by-side comparison of two technologies' cost-effectiveness is appropriate where the technologies are roughly equivalent in their impingement and entrainment reduction capacity. But where, as here, you have one technology, closed-cycle cooling, that far surpasses the other, wedgewire screens, in its effectiveness, such a comparison does not maximize benefits.

Indeed, EPA itself recognized this concept in the fact sheet associated with the repermitting of the Merrimack power plant. There, EPA explained, an approach that involves "a comparative assessment of the cost per unit of performance by different options" is not helpful "where there are wide disparities in the performance of alternative technologies and those with lower costs-per-unit-of-performance fail to reach some threshold of adequate performance." [138]

Professor Ackerman, the author of the Synapse Report, echoes EPA: "In the absence of [cost and benefits] estimates, nothing can be concluded from EPA's examination of relative costs. A "cost/cost" analysis of this type is normally inconclusive, in the absence of hard information about the relevant costs and benefits." [139] Thus, he explains that the way to a logically sound cost-benefit analysis of "the Schiller CWIS options is to estimate actual dollar values for costs and benefits." [140]

In short, EPA's analysis says nothing of whether the higher cost of closed-cycle cooling is justified by its benefits and whether the benefits exceed the net-benefits of wedgewire screens. Therefore, EPA should redo its cost-benefit analysis to focus on which of the BTA options will produce the greatest net benefit to society.

In the Synapse report, Professor Ackerman follows through on the cost-benefit analysis and provides a rough monetized analysis. Synapse uses the cost figures provided by PSNH. And to imperfectly and conservatively monetize the benefits provide by saving an additional 80 million organisms every year through the use of cooling towers rather than wedgewire screens, Synapse relied on monetary valuations of those fish based on econometric research that EPA commissioned in 2012 in support of its national cooling water intake structure regulations. The

Synapse report concludes that, even with a very conservative benefits valuation, the fish are worth at least as much as the cost of cooling towers:

> the annual entrainment mortality reduction of 80 million individuals achieved by cooling towers rather than the best wedgewire screen option at Schiller would represent about 370,000 adult equivalents. Using my completion of the EPA willingness to pay survey, this mortality reduction would have a value in 2013 dollars of $1.9 million using EPA's assumptions, or $3.8 - $4.8 million using my preferred versions. The present value of 30 years of entrainment mortality reduction at these rates, using EPA's 5.3 percent real discount rate, is $30 million using the EPA assumptions, or $60 -$75 million using my alternatives. (The discount rate and the 30-year horizon are from the fact sheet, 150.)
>
> In other words, the monetized value of reduced entrainment mortality is roughly equal to the cost of cooling towers, at the conservative valuation of fish (and additional non-monetized benefits of reduced fish mortality should tip the balance toward cooling towers). At my recommended valuation of fish, the net monetized benefit of cooling towers far exceeds the net benefit of wedgewire screens. There is no basis for EPA's undocumented certainty that the costs of cooling towers are clearly excessive in comparison to the benefits they achieve. Based on a hard look at the missing numbers, EPA should reconsider its decision and declare cooling towers to be BTA at Schiller. [141]

[136] *Id*. at 157.

[137] Synapse Memorandum at 2 (1/14/16).

[138] *Id*.

[139] *Id*.

[140] *Id*.

[141] *Id*. at 4.

EPA Response to Sierra Club Comment IV.A.2.a:

Sierra Club comments that the analysis in the Fact Sheet is essentially a cost-effectiveness comparison which fails to compare the net benefits of available options and choose the option that maximizes net benefits. According to Sierra Club, this analysis is not sufficient to determine whether the cost of closed-cycle cooling is justified by the benefits and whether these benefits are greater than the net benefits of wedgewire screens. In support of its comment, Sierra Club provided a memorandum from Synapse Energy Economics, Inc. (included as Exhibit 2 to Sierra Club's comments on the Draft Permit) containing a cost-benefit analysis that concludes that the fish saved through the entrainment reductions associated with closed-cycle cooling are worth at least as much as the cost of cooling towers (Synapse Memo). In responding to Sierra Club's comments on cost-benefit analysis above, EPA reviewed the cost and benefit valuations provided in the Synapse Memo.

Sierra Club comments that EPA should redo its cost-benefit analysis to focus on which of the BTA options will produce the greatest net benefit to society. Sierra Club argues at several points in its comment that the appropriate BTA should be the option that maximizes benefits. EPA disagrees with Sierra Club's characterization of how costs and benefits are to be considered under Section 316(b) of the CWA and its implementing regulations. The Final Rule requires that the permitting authority establish site-specific entrainment controls that "reflect the maximum reduction in entrainment warranted after consideration of factors relevant for determining the best technology available for minimizing adverse environmental impact at each facility." 40 C.F.R. § 125.98(f). These factors include, but are not limited to, the "quantified and qualitative social benefits and costs of available entrainment technologies." 40 C.F.R. § 125.98(f)(2). Where the Synapse Memo states that "the way to a logically sound cost-benefit analysis of the Schiller CWIS options is to estimate actual dollar values for costs and benefits," the Final Rule recognizes that it may not be possible to accurately and fully monetize costs and benefits and that assessing costs and benefits on a qualitative and/or quantitative basis is preferable to ignoring those costs and benefits that cannot be accurately monetized. *See, e.g.,* 79 Fed. Reg. at 48,371. Consistent with Executive Order (E.O.) 13563, the Final Rule requires a reasoned determination that the benefits justify the costs, not the option that maximizes benefits. This approach allows for a full assessment in permit decisions of both qualitative and quantitative benefits and costs and strikes an appropriate balance between environmental improvements and costs, allowing the permitting authority to consider all the relevant factors on a site-specific basis and determine BTA on the basis of those factors. *See* 79 Fed. Reg. at 48,352.

Sierra Club comments that EPA's analysis, which compared the benefit-cost ratios of two competing technologies, is misguided because it values a technology's cost-effectiveness (*i.e.*, cost per unit of impingement and entrainment reductions), over the maximization of benefits. As Sierra Club points out, the Fact Sheet reports that closed-cycle cooling costs 40 times more than wedgewire screens (which is a cost-cost comparison) and that wedgewire screens will achieve substantial entrainment mortality reductions at far lower cost. The Fact Sheet concludes that "such costs are not in this case warranted for the additional margin of entrainment mortality reduction that closed-cycle could achieve." Fact Sheet at 157. This determination was not based on a strict comparison of the cost-effectiveness of the two technologies (*i.e.*, a comparison of the cost of the technology and the number of organisms saved):

> EPA reaches this conclusion in light of the moderate size of Schiller Station's withdrawal and its relatively small withdrawal relative to the flow in the Piscataqua River. In addition, EPA's judgment is influenced by the fact that while the Facility's entrainment of eggs and larvae is significant, it has not been associated with higher level impacts, such as major effects on local populations of impacted species or the overall community of organisms in the river, or with impacts to endangered species. In addition, Schiller Station's Units 4 and 6 have been operating at relatively low capacity factors in recent years and this trend is currently expected to continue (although such trends can change over time).

Id. at 157-158. In other words, the determination of BTA for entrainment was based on consideration of the relative costs of the two available and potentially effective technologies in light of the quantitative *and* qualitative benefits of reducing entrainment. The comment fails to acknowledge EPA's consideration of qualitative benefits in its determination.

In the Synapse Memo, the author concludes that EPA failed to justify its BTA decision. The Synapse Memo presents a monetized assessment of the benefits of reducing entrainment at

Schiller Station based on biological data from the Fact Sheet and Normandeau's 2008 Biological Report (AR-136), as well as economic data based on the 2012 Stated Preference Survey conducted by EPA for the Final Rule. According to the Synapse Memo, "A re-examination of EPA's data, combined with analysis of other available documents, demonstrates that closed-cycle cooling is a superior alternative, offering much greater reduction in entrainment of aquatic organisms at an entirely affordable price." Synapse Memo at 1. However, EPA believes that the cost of closed-cycle cooling in the Synapse Memo likely underestimates the true cost of cooling towers at Schiller Station. *See* Response to Sierra Club Comment IV.A.2.b. EPA also has several concerns with the Synapse Memo's valuation of benefits, which are discussed in more detail below. First, however, it is important to reiterate that the Final Rule does not require a permitting authority to perform a monetized benefits analysis in determining the BTA for entrainment. EPA has not offered its own analysis of monetized benefits for this determination but maintains that the comparison of the relative costs and benefits presented in the Fact Sheet, including the quantitative benefits (in terms of the number of organisms saved) and qualitative benefits (in terms of the impacts of reducing entrainment on the waterbody) indicate that the cost of wedgewire screens is justified by the benefits to the Piscataqua River.

The benefits analysis in the Synapse Memo is based on the estimate that closed-cycle cooling will save an additional 80 million organisms per year over the number saved by wedgewire screens, which is calculated from the values presented in Table 10-B of the Fact Sheet (at 153).[56] The Synapse Memo estimates willingness-to-pay (WTP) using values presented in the partial results of EPA's 2012 Stated Preference Survey (SPS) and biological data for Schiller Station from the 2008 Biological Report prepared by Normandeau for PSNH (AR-136) to monetize the benefits of saving an additional 80 million organisms per year.[57] The SPS was developed to estimate total values (use and non-use values) for improvements to fishery resources and ecosystems affected by impingement and entrainment from regulated facilities. The SPS was an attempt to fill the gap in the partial estimate of non-use benefits that EPA generated using benefit transfer from existing data. EPA did not, however, use the results of the survey in estimating benefits for the Final Rule and EPA indicated that the survey was not designed to be used at the facility level. *See* 79 Fed. Reg. at 48,304, 48,325, 48,370, 48,415. EPA is seeking additional, independent review of the survey results prior to using the survey to support benefits analysis for further national rulemaking and/or site-specific 316(b) permitting. *See* AR-338.

The Synapse Memo presents a national estimate of willingness to pay for reduced fish mortality expressed in terms of age-1 equivalents (A1E) ranging from $5.00 per A1E (using EPA's

[56] In response to comments above EPA has clarified the technical errors in Table 10-B and excluded early life stages of green crab from the analysis due to the overwhelming negative ecological and economic impacts of this species. See EPA's Response at Section II.D. Using the corrected values, EPA estimates that closed-cycle cooling, as compared to wedgewire screens, will reduce entrainment of an additional 70 million fish eggs and larvae and about 100 million macrocrustacean larvae.

[57] On June 12, 2012 EPA published new information developed since the proposed standards for cooling water intake structures at existing power generating, manufacturing, and industrial facilities under Section 316(b) were published in April 2011. *See* 77 Fed. Reg. at 34,927. This notice of data availability (NODA) included the results of a stated preference survey that EPA conducted after the proposed rule was published. The results of the survey are discussed in the NODA (77 Fed. Reg. 34,937), the Survey Support Document (AR-406), the Final Rule (79 Fed. Reg. at 48,300), and in the Benefits Analysis for the Final Existing Facilities Rule (AR-338).

assumptions from the SPS) to $10.00-$12.50 per A1E (using the Synapse Memo's recommended adjustments based on comments on the NODA for the SPS). The Synapse Memo does not clearly explain how these willingness-to-pay per A1E values were calculated, but based on review of its comments on the Stated Preference Survey Support Document (included as an attachment to the Synapse Memo) and footnote 4 in the Memo (at 3), it appears WTP per A1E fish was calculated as the ratio of total monetized benefits on a national basis divided by the total number of A1E saved. The value of total monetized benefits and total A1E saved were provided in comments submitted on the NODA for the SPS and attached to the Memo.

First, EPA reiterates that it chose not to rely on the results of the SPS for the Final Rule; it did not calculate monetized benefits of entrainment reductions for the Final Rule nor account for values estimated from the survey in the quantitative comparison of costs and benefits for the Final Rule. *See, e.g.,* 79 Fed. Reg. 48,350, 48,401. To date, EPA has not published the results of the SPS for this use, and EPA does not rely on the monetized benefits presented in the SPS for the site-specific BTA determination for Schiller Station.

EPA disagrees that the WTP values in the SPS can be converted to WTP per A1E as Sierra Club has in the Synapse Memo. The SPS was carefully designed to elicit responses based on the reduction in fish mortality relative to a baseline value of losses of fish. The Benefits Analysis for Final Rule states:

> Although the discussion in this section refers to WTP for a percentage point increase in fish saved, it is important to note that this variable represents a one percentage point reduction relative to the level of baseline mortality (e.g., the Northeast survey booklet indicated a baseline loss of 1.1 billion fish). This relationship between the percentage point reduction and cardinal fish losses was specified clearly in survey questions, and the same relationship was maintained throughout each survey. WTP per percentage point reduction reflects a specific quantity of fish saved, <u>rather than a general relative reduction of one percent from an unspecified level of IM&E</u>. The regional and national surveys have different baseline fish losses. EPA expected survey responses to vary across the regions, because residents might have different values and baseline losses differ.

See Benefits Analysis for Final Rule at 11-28 (emphasis added). As an example, in the Northeast version of the survey, the baseline loss was 1.1 billion fish. Relative to this baseline, a one percent increase in the number of fish saved would be equivalent to 11 million fish. The mean WTP for each one percent increase in fish saved for the Northeast Region was $1.12 – in other words, respondents placed an implicit value of $1.12 per household per year to save 11 million fish. However, the relative baseline mortality is not the same for all regions, which complicates the resulting calculation of national WTP per fish, as the Synapse Memo has done. In its comments on the Proposed Rule, Synapse calculates total WTP for each of four options based on: i) the average annual household WTP per percentage point improvement (*e.g.,* $1.13 per household nationally for each percentage point reduction in baseline mortality), ii) the assumed improvement in attributes per policy option (*e.g.*, a 28% improvement in fish saved for Option 1), and iii) the number of households in the U.S (111.67 million households). However, because of the difference in the baseline mortality for each region, the national prices per percentage point cannot be directly translated to the total percent improvements in the attributes. As the Survey Support Document states:

> Again, using the Northeast survey as an example, EPA is presenting the willingness to pay for a percentage point reduction in mortality which is associated with a specific absolute quantity of fish out of 1.1 billion fish, rather than a general relative reduction of one percent from an unspecified level of I&E mortality. The regional and national survey versions have different baseline fish losses. EPA expected survey responses to vary across the regions, both because residents might have different values, and because baseline losses differ. The implicit process reflects this expected variation.

AR-406 at 35-36. In other words, a WTP per percentage point improvement in baseline mortality for the Northeast is not equivalent to the WTP per percentage point improvement in baseline mortality the Southeast because the number of fish represented by that one percent improvement is not equivalent. Therefore, the WTP per A1E used in the Schiller analysis, which is based on this national estimate, is similarly flawed.

EPA's analysis of the SPS, both in the NODA and in the Final Rule, makes clear that the national estimates were included for illustrative purposes. There are substantial differences in WTP among regions that cannot be properly accounted for in national estimates, in particular, as discussed above, baseline fish losses. *See* Benefits Analysis for the Final 316(b) Existing Facilities Rule at 11-28. EPA cautions against using the SPS values in a site-specific analysis of benefits at the facility scale, as the Synapse Memo has done. In the Response to Comments for the Final Rule (at 391), EPA states:

> …the survey was designed to estimate respondents' willingness to pay for changes in the health of fish populations and aquatic ecosystems and be statistically representative at large (regional and national) scales; the results were not designed to be statistically representative at the facility level for the assessment of benefits for individual site-level permitting decisions. That the survey was not designed for site-specific permitting does not necessarily mean that it cannot be adapted for such use. At this time, EPA has not attempted such an adaptation, although it may do so in the future.

See also 79 Fed. Reg. 48,350.

The Synapse Memo's WTP value of $5.00 per A1E transfers WTP on a national scale (*i.e.*, per household WTP multiplied by 111.67 million households in the United States) to the individual facility scale. WTP for nonuse benefits of environmental improvements on a per household basis are often relatively small (*e.g.*, on the order of cents or low dollar amounts) but can result in significant monetized values because a small per-capita value held by a substantial fraction of the population can result in significant cumulative values. *See* AR-325. The Synapse Memo calculates a monetized value of WTP per A1E based on the total benefits aggregated over all households in the U.S.; however, the benefits of reducing entrainment at Schiller Station will not necessarily accrue on a national scale. Loomis (AR-325) observed that environmental benefits assessed as WTP can sometimes range over far greater spatial scales than the benefits themselves accrue, but WTP at the scale of all households in the U.S. is not necessarily relevant to the benefits for a single facility on the Piscataqua River, particularly where the SPS was not designed to elicit responses at the individual facility scale. The WTP per A1E saved using the Northeast region WTP value ($1.12 per percent change in fish saved attribute per household), number of households (23.3 million), and the total AIE saved (964.9 million) (based on values in the 2012 Survey Support Document), results in an estimated value per A1E of about $2.70 per A1E, compared to the Synapse Memo's estimated (minimum) value of $5.00 per A1E. Adjusting the estimate to reflect the number of households in the Piscataqua River Watershed region (114,959 households) results in a WTP of $0.01 per A1E.[58] These calculations illustrate the range of WTP values that could result depending on the scale over which the nonuse benefits are assumed to accrue and that monetized benefits may be less than the Synapse Memo suggests.

To monetize the incremental benefits of cooling towers at Schiller Station, Synapse multiplies the estimated WTP value per A1E by the total number of A1E saved with cooling towers as compared to wedgewire screens. As discussed above, Synapse uses the estimate of an additional 80 million eggs and larvae saved based on the values in Table 10-B in the Fact Sheet. The Synapse Memo converts the total number of additional eggs and larvae saved to the number of A1E fish using data presented in the 2008 Biological Report prepared by Normandeau for PSNH (AR-136). Normandeau estimated that a total of 143.9 million fish eggs and larvae were entrained at Schiller Station in 2006 and 2007. Using life history data for the most abundant fish taxa, Normandeau estimates that these entrainment losses are equivalent to the loss of 673,725 adults, which is a ratio of 214 eggs and larvae to 1 adult equivalent. Using this ratio, Synapse estimates that the additional 80 million organisms saved by cooling towers as compared to wedgewire screens is equal to about 370,000 adults per year. There are several issues with the assumptions underlying the estimate of adult equivalents used in the benefits analysis.

Synapse's analysis assumes that cooling towers and wedgewire screens act equally to reduce entrainment of the early life stages of all fish and macrocrustaceans, but this is not likely to be the case. Cooling towers, which reduce entrainment by reducing water withdrawals, are equally effective for all life stages and all species – in other words, flow reductions are not biased towards any particular life stage or species. On the other hand, the effectiveness of wedgewire screens depend on the life stage and species entrained. In the Fact Sheet, the effectiveness of screens was assumed to be based first on the ability of the screens to exclude organisms based on mesh size (which favors larger eggs and larvae with greater body depth), and then on the ability of the organisms to survive contact with the screens (which favors eggs and all life stages of macrocrustaceans). More recent research on wedgewire screens suggests that larval avoidance may also play a role in reducing entrainment, which, if accurate, would selectively act on larger, post-yolk sac larvae that have attained some capacity to swim and avoid entrainment. These individuals are also often the most likely to survive to the next life stage and therefore, contribute proportionally more to adult equivalent metrics.

[58] Estimated number of households in the Piscataqua Region Watershed based on the Great Bay Ecosystem Assessment (AR-344), which was in turn based on a state-wide survey for Plymouth State University (AR-408). The Piscataqua Region Watershed includes 42 New Hampshire communities and 10 Maine communities.

Adult equivalent models express entrainment losses as an equivalent number of individuals at some other life stage, referred to as age of equivalency. The adult equivalent metric is a useful means of comparing losses among species, years, and regions. The conversion of early life stages to adult equivalents requires life-stage and species-specific mortality rates from the stage at which entrainment occurs (most commonly egg, yolk-sac larvae, and post-yolk sac larvae) to the life stage of equivalence (*e.g.*, age-one). *See* 79 Fed. Reg. 48,403, Section 316(b) Phase III Rule Regional Benefits Assessment at A1-5 to 6, and Benefits Analysis for Final Rule at 3-2. Synapse's analysis assumes that all life stages contribute equally to A1E, but this is not the case.

The conversion of early life stages (less than one year) is the product of all stage-specific survival rates between the stage at which entrainment occurs and age 1.[59] *See Id*. The likelihood that an egg entrained at a CWIS would have survived to age-one had it not been entrained is the product of the probability that an egg survives to the larval stage, which survives to the young-of-year (YOY) stage, which then survives to age 1. This cumulative survival means that an egg is less likely to contribute to an equivalent adult stage as compared to a post-yolk sac larval fish. In addition, EPA adjusts the survival rate for each stage to account for the full spectrum of development within each life stage. In other words, the survival rate of a recently hatched larvae is lower than the potential survival of a late-stage larvae that is ready to transform into a juvenile. *See Id*. The conversion of an estimated 80 million individuals to adult equivalents depends on the life stages represented. If many of those individuals are eggs as opposed to post-yolk sac larvae, the conversion would result in proportionally fewer adult equivalents. The conversion is not a simple ratio and is further complicated because wedgewire screens likely act selectively on specific life stages, including (potentially) life stages that have higher survival rates and therefore contribute proportionally more in adult equivalent models.

The influence that the stage- and species-specific survival rates has on the estimate of adult equivalents is evident in the adult equivalent abundance results in the 2008 Biological Report (AR-136). Figure 1 illustrates that monthly adult equivalent abundance was highest during the winter months of January through March 2007, but these months accounted for only around 4% to 7% of entrainment. Entrainment (as raw numbers of eggs and larvae) was highest during the summer months of June through August. June, the month with the highest entrainment (32.5%), was among the lowest months for adult equivalent fish (1.4%) because eggs are the dominant life stage entrained in June and eggs, due to the high natural mortality of this life stage, contribute less to the adult equivalent metric than older life stages.

[59] In the analyses for the Phase III and Final Rules, EPA also converted losses of fish older than age-one by modifying the basic calculation to inflate the loss rates in inverse proportion to survival rates. For Schiller Station, the determination is only for the BTA for entrainment, which excludes losses of fish older than age-one (who are highly unlikely to be entrained), thus this conversion is not necessary.

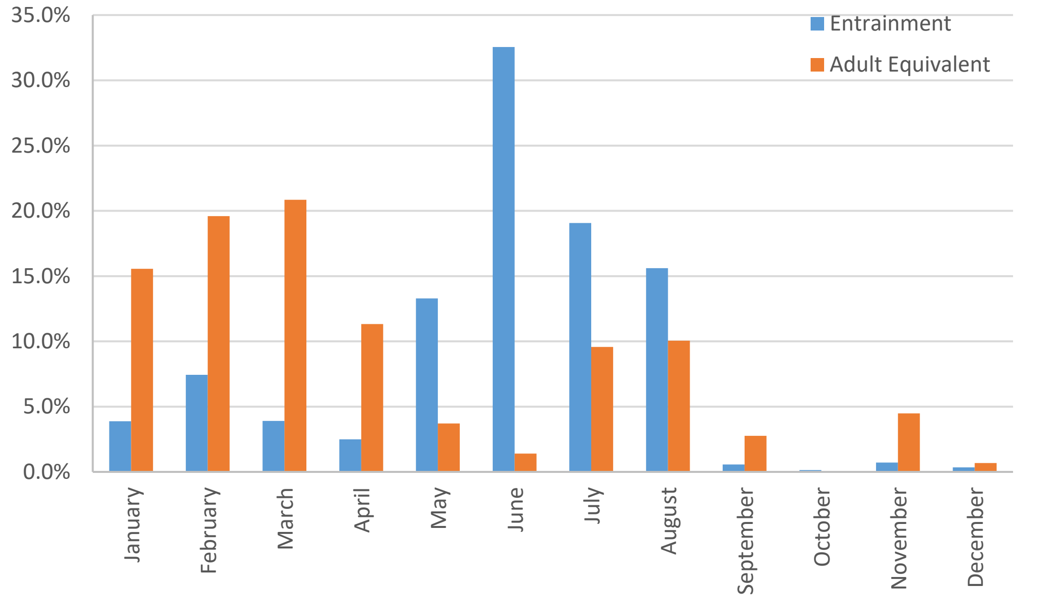

Figure 1: Total entraiment (raw numbers of early life stages) and adult equivalent values as percentage of annual total based on Normandeau 2008.

Rock gunnel was the single species exhibiting the highest number of adult equivalent fish entrained at Schiller Station (377,296 fish) during the study, but only comprised 6% of the total entrainment. Cunner/yellowtail eggs and cunner larvae accounted for nearly 68% of entrainment but only 12.2% of adult equivalent fish. By calculating A1E lost at Schiller Station by a simple ratio, the Synapse Memo overlooks the relative contribution of each life stage and species, which differs based on the life history of each species. While this method may be useful to compare two technologies that act equally in protecting early life stages from entrainment, it is less useful where, as in this case, at least one of the technologies reduces entrainment by selectively protecting some life stages more than others. The assumptions underlying Synapse's calculation of A1E lost at Schiller Station could result in a smaller difference in A1E saved between cooling towers and wedgewire screens because wedgewire screens may save proportionally more A1E compared to the overall total reduction in entrainment by acting selectively on life stages that are more likely to survive to age-one.

Finally, the Synapse Memo equates A1E, the metric used in the SPS, with adult equivalents, the metric used in the 2008 Biological Report. These two metrics are not the same. The analyses for the Final Rule (and supporting documents) standardize impingement and entrainment losses as equivalent numbers of one-year-old fish (A1E). Normandeau evaluated losses at the age of first reaching sexual maturity, which is different for each species and is not usually Age 1. *See* AR-136 at 19-22. As an example, Normandeau modeled the age at sexual maturity for American sand lance as Age 2, for cunner as Age 2, for grubby as Age 1, and for rock gunnel as Age 3. *Id*. The Synapse Memo estimates monetized benefits at Schiller Station as the product of WTP per A1E (based on the SPS results) and the difference in adult equivalents saved (as A1E) between closed-cycle cooling and wedgewire screens, but Normandeau's analysis did not estimate A1E. The difference between the two metrics (A1E in the survey data and age at sexual maturity in the

Biological Report) further complicates the calculation of monetized benefits at Schiller Station in the Synapse Memo. Survival of fish from stage to stage after Age 1 is generally consistent and relatively high, but there are differences in survival from Age 1 to Age 2 that likely cause Synapse to underestimate the number of A1E based on Normandeau's data. In other words, compared to Normandeau's adult equivalent analysis, there will be more A1E fish because additional adult fish are lost between Age 1 and the age at sexual maturity. Assuming Normandeau's adult equivalent values are equal to A1E at Schiller Station could underestimate the total A1E saved at Schiller Station in the Synapse Report because Normandeau's calculation of age at sexual maturity is higher than Age 1 for most species.

To summarize, EPA disagrees with Sierra Club's comment that EPA must redo its cost-benefit analysis to focus on which of the BTA options will produce the greatest net benefit to society. EPA strongly disagrees both that a site-specific entrainment determination requires a monetized benefits analysis and that the BTA must be the option that maximizes net benefit to society based on a monetized cost and benefits estimates. The Responses to Comment for the Final Rule (at 92) states "EPA disagrees that comparing only monetized costs to monetized benefits is an appropriate test that trumps all other Clean Water Act factors for evaluating regulatory options; this casts a shadow of doubt onto any 'benefits that justify the costs,' 'maximize net benefits,' or 'benefits that are commensurate with costs' comparisons that are strictly numeric." That being said, nonuse benefits should not be overlooked or discounted, even if they cannot be monetized, in determining the BTA for entrainment. EPA's determination of the BTA for entrainment at Schiller Station considers the relative costs of available technologies as well as the relative benefits, including the quantitative reduction in entrainment achieved by each technology and the overall potential qualitative benefits that such an entrainment reduction would likely have on the aquatic community in the Piscataqua River. This analysis is entirely consistent with that required by the Final Rule.

Sierra Club Comment IV.A.2.b EPA Has Relied on PSNH's Vastly Overestimated Capital and O&M Costs

PSNH claims that cooling towers are not available at Schiller because the costs of cooling towers are disproportionate to their benefits. This claim is based on PSNH's own cost estimates, which peg the initial capital cost of cooling towers at between $65.7 and $60.9 million, with ongoing annual costs of $21.3 million.[142] As the attached report from Powers Engineering and Synapse Energy Economics show, these cost estimates are not remotely credible and are out of step with both government and industry cost-estimation models.

Cost estimation methods developed by EPA, cooling tower manufacturers, and the Electric Power Research Institute – the power industry's largest research think tank and lobbying arm – all suggest that capital costs are about half of PSNH's claims. [143] And as the attached report from Synapse Energy Economics concludes, net ongoing annual costs of a retrofit, including any energy penalty would be approximately $1 million, not $21.3 million, as PSNH claims. [144]

[142] Sierra Club is unsure why EPA considers PSNH's cost estimates to be confidential business information. Despite PSNH's apparent claim that this data is CBI, PSNH's technical studies are in the public domain – they were released to Sierra Club under the Freedom of Information Act years ago. Thus, Sierra Club's comments discuss the actual economic analysis prepared by PSNH and we expect EPA to do the same in responding to comments.

[143] *See* Powers Report at 4 -6 (establishing estimates under various methodologies ranging from a low of $21 million for a non-plume abated tower using manufacturer figures to, at most, $33.5 million for a plume-abated tower using EPRI methodologies); Synapse Memorandum – Comments on Draft NPDES Permit for Schiller Station at 2 (1/14/16).

[144] *See* Synapse Report at 3 -5 (estimating annual operating costs of $300 -$530 K per year escalating over time, plus energy penalty costs of approximately $500 K).

EPA Response to Sierra Club Comment IV.A.2.b:

Sierra Club comments that both EPA and PSNH acknowledge that converting to closed-cycle cooling would be technologically feasible at Schiller Station. The commenter also states that the capital and annual operation and maintenance costs for closed-cycle cooling that EPA used in its comparison of the costs and benefits of available technologies are "not remotely credible." Sierra Club provided an independent engineering analysis by Powers Engineering ("Powers Report") and additional analysis provided in the Synapse Report to support these comments. EPA notes that although PSNH may not have claimed that closed cycle cooling is not technologically feasible, it did argue that its costs are disproportionate to its benefits. *See* AR-140 at 5.

EPA agrees that the Agency found that closed-cycle cooling "is both technically and financially feasible." Fact Sheet at 157. Indeed, EPA did not rule out any technology based on affordability. Moreover, EPA notes that although PSNH may not have claimed that closed-cycle cooling is technologically infeasible, it did argue that its costs are disproportionate to its benefits. *See* AR-140 at 5.

As explained in response to previous comments, EPA considered the entrainment losses and the expected entrainment reductions and costs of available technologies, as well as other relevant factors for the site-specific conditions at Schiller Station. In addition, EPA also considered that the facility's CWISs withdraw a relatively small percentage of the tidal flux of the Piscataqua River; there is no evidence that entrainment losses at Schiller Station are causing or contributing to declines in the overall aquatic health of the Piscataqua River; the existing discharge of heated effluent is protective of the balanced, indigenous population of fish in the river; and two of the facility's generating units (Units 4 and 6) have operated well below design capacity in recent years and are expected to continue to do so for the foreseeable future. The Fact Sheet concludes that, based on the comparison of the costs and quantitative and qualitative benefits of the available technologies, the far greater costs of closed-cycle cooling, as compared to fine mesh wedgewire screens, are not warranted for the additional margin of entrainment mortality reduction that closed-cycle cooling could achieve. *See* Fact Sheet at 155, 157.

The Powers Report (at 17-18) concludes that a closed-cycle cooling system would be technically feasible and cost-effective for Schiller Station, and is the most effective alternative available to minimize the adverse environmental impact of the intake structures. The Powers Report also comments that no other technology can reduce the aquatic impacts to a level commensurate with closed-cycle cooling. EPA agrees with the commenter in regards to the effectiveness of closed-cycle cooling. This technology is the best performing technology and will achieve entrainment reductions of 97% (using seawater makeup) to 100% (using grey water makeup). EPA also agrees that the total cost estimates for cooling towers provided by PSNH and prepared by Enercon are higher than other cooling tower retrofit cost estimate studies prepared for the Final Rule. At the same time, the lower cost estimates provided in the Powers and Synapse Reports may be no more accurate than the costs provided by PSNH. While PSNH may have overestimated the costs of the technology, there is reason to believe that Powers and Synapse may have underestimated the cost of cooling towers.

To support development of the Draft Permit, EPA relied on the cost estimates prepared by Enercon and submitted by PSNH in response to an EPA request for information under Section 308 of the CWA. In its submission to EPA, PSNH claimed as confidential business information (CBI) certain pages of its Engineering Response, including the cost estimates for the evaluated technologies. As a result, EPA did not include actual cost estimates in the public record supporting its BTA determination for the Draft Permit because EPA cannot publicly release information that PSNH claimed to be CBI under 40 C.F.R. Part 2, Subpart B, unless PSNH later withdraws or waives its CBI claim or EPA determines, after undertaking the formal CBI review and substantiation process (including any appeals and judicial review), that the material is not properly considered CBI. *See* 40 C.F.R. §§ 2.205 and 2.211; Fact Sheet at 150. EPA wanted to try, if possible, to move the Draft Permit forward without the delay of undertaking the formal CBI substantiation process. Therefore, EPA did not pursue a confidentiality determination under 40 C.F.R. Part 2, Subpart B and attempted to move forward to develop a permit record that kept the claimed CBI information confidential.

Meanwhile, EPA also asked PSNH to reconsider its CBI claim. PSNH then subsequently withdrew its CBI claim with respect to certain costs. After the issuance of the Draft Permit, EPA obtained from the website of the New Hampshire Public Utilities Commission (“NHPUC”) a publicly available 2014 memorandum from Steve Wood of ESS Group to Dick Hahn of the NHPUC titled “PSNH Asset Environmental Review” (“NHPUC Memo”). AR-353. Among other things, the NHPUC Memo includes cost estimates for cooling towers at Schiller Station, which, according to the memo, are based on Enercon’s cost estimates in PSNH’s 2008 Engineering Response.[60] On June 16, 2017, EPA contacted PSNH asking whether PSNH would, in light of the public availability of the NHPUC Memo and the information within it, be willing to withdraw its claim of CBI over the 2008 Engineering Response. AR-421. PSNH responded that although it had intended to keep the subject information in the NHPUC Memo confidential, it would withdraw its claim because the information was now publicly available. AR-422.

In addition, PSNH’s comments on the Draft Permit included information that PSNH had previously claimed as CBI, including cost estimates for wedgewire screens and conceptual drawings of wedgewire screens. PSNH did not, however, assert any business confidentiality claim over this or any other information in the comments.[61] On January 9, 2018, EPA contacted PSNH, requesting confirmation that, by including the information in the comments, PSNH

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[60] According to the NHPUC Memo, ESS converted the cooling tower costs presented in the 2008 Engineering Response from 2008 dollars to 2014 dollars. AR-353 at 12. In addition, Sierra Club’s comments also include the same PSNH cost estimates, which Sierra Club indicates were obtained from “PSNH’s technical studies [that] are in the public domain [and] were released to Sierra Club under the Freedom of Information Act years ago.” The comment does not make clear who Sierra Club obtained the studies from.

[61] Pursuant to 40 C.F.R. § 122.7(a), if no claim of confidentiality is made at the time of submittal, EPA may make the information available to the public without further notice.

intended to withdraw its previous claim of CBI and no longer wanted the information treated as confidential. AR-419.

On January 10, 2018, ownership of Schiller Station transferred from PSNH to GSP. On January 19, 2018, a representative of GSP, who had represented PSNH prior to the transfer, confirmed that PSNH did not intend the information in the comments to be treated as CBI and that the information could be disclosed. AR-420. Consequently, in the response to this comment, EPA discusses the costs of these technologies as presented in PSNH's comments, Sierra Club's comments, and the NHPUC Memo.

Capital Cost

Sierra Club comments that PSNH's initial capital cost estimates for cooling towers (between $65.7 and $60.9 million, according to Sierra Club) and annual operation and maintenance costs of $21.3 million (according to Sierra Club) are "not remotely credible and are out of step with both government and industry cost-estimation models." The Powers Report offers its own range of capital cost estimates: a "lower bound" estimate based on a generic cost estimate scaled to Schiller Station and a "higher bound" estimate based on the plume-abated cooling tower cost estimate in the TDD for the Final Rule. *See* AR-182. Table 3 summarizes the various costs estimates as total cost and as dollars per gallon per minute. Although Powers describes costs as dollars per kWh, the Final Rule presents costs as dollars per gpm (as does EPRI, on which the Final Rule's cost estimates were based), and EPA has followed that convention here. The cost of cooling towers at Schiller Station was obtained from the NHPUC Memo and was adjusted to 2016 dollars; EPA also adjusted the cost estimates from the Powers Report and those obtained from the record for the Final Rule to 2016 dollars using the ENR Construction Cost Index.

Table 3. Capital cost estimates presented as total cost and in dollars per gallon per minute ($/gpm) for a closed-cycle cooling retrofit at Schiller Station. Estimates provided by Sierra Club (Powers Report), PSNH, and based on analysis in the Final Rule. Costs have been adjusted to 2016 dollars based on the ENR Construction Cost Index.		
Source	Capital Cost (in millions) (2016 dollars)	$/gpm (2016 dollars)
Powers Plume-abated Towers Lower-Bound (based on generic salt-water tower plus 20% retrofit cost)[62]	$30.1	$344
Powers Plume-abated Upper Bound (based on EPA Final Rule with plume abatement) (AR-182 and AR-330)	$40.4	$462
EPA Final Rule Abatement for Plume *and* Noise (AR-330)	$45.5	$520
PSNH Plume-abated Salt Water Cooling Towers	$63.6	$726

Powers' lower bound estimate for plume-abated towers is based on a cost estimate for generic, salt-water towers by SPX Corporation and scaled for the circulating flow at Schiller Station. The generic SPX tower is designed with a 12°F approach temperature and range of 20°F. The estimate provided by Enercon is based on an 8°F approach temperature, which results in a larger tower that would be required with a higher approach temperature. Enercon estimated that an 8°F approach temperature would result in tower 30% larger than a 12°F approach temperature and would result in a higher cost compared to the generic SPX towers on which Powers based cost estimates. Powers justifies the use of a 12°F approach because Enercon identified this approach as the optimum temperature for the Indian Point Energy Center Conversion. *See* Powers Report at 5. It is not clear, however, either from the 2008 Engineering Response (AR-140) or the Powers Report, that an 8°F tower is overly conservative or that a 12°F tower would be more appropriate. In any case, EPA has evaluated PSNH's proposed costs based on the estimates in the Final Rule, which do not specify an approach temperature or tower size.

In the lower bound estimate, Powers accounts for expenses related to *retrofitting* a facility with cooling towers, as opposed to installing them at a new facility, by adding 20% to the cost of installation based on the 20% retrofit scaling factor in the Phase II Rule. *See* Powers Report at 5 n.17. However, for the Final Rule, EPA determined that this 20% factor was a BPJ estimate that was not based on any supporting analysis or documentation and likely represents retrofit costs for the least difficult facilities.[63] Therefore, the cooling tower capital cost estimates in the TDD

[62] The Synpase Report uses a capital cost estimate of $26 million for cooling towers, which is based on Powers' estimate of $25 million amortized over 20 years at a nominal discount for 7.6 percent. Synapse then assumes a $7 million deduction to account for tax depreciation, resulting in a total capital cost of $19 million for plume-abated towers at Schiller Station. See Synpase Report at 2-3. The Final Rule directs EPA to consider social costs, which are not subject to tax depreciation. For this reason, EPA responds using the pre-tax capital costs presented in the Powers Report.

[63] In responding to comments on the Proposed Rule, EPA compared its cooling tower costs with those estimated by Powers Engineering and submitted with Riverkeeper's comments. EPA explained that the 20% retrofit factor from

for the Final Rule do not use a 20% retrofit scaling factor but instead rely on detailed project estimates and actual costs provided in a 2011 EPRI study (AR-423), which are more likely to represent the actual cost for cooling tower retrofits.[64] *See* AR-342 at 8. Powers' lower bound estimate also included the cost for the tower only. The installation cost was estimated by tripling the cost of a wet cooling tower and adding it to the cost of the plume-abated tower. *See* Powers Report Attachment B. The detailed cost estimates included in EPRI 2011 suggest that installation costs for cooling towers, including the tower basin, piping and valves, pumps, electrical, and site modifications, have a wide range but that a factor of 3 (used in the Powers Report lower bound estimate) is representative of these additional costs. This factor to account for installation costs, however, does not include costs associated with labor, materials, engineering, commissioning, or construction management. These costs can increase the total cost of the towers by an additional 20%, on average, based on the cost estimate evaluated in EPRI 2011. For the reasons described above, the lower bound estimate in the Powers Report ($30 million in 2016 dollars) likely underestimates the actual, site-specific capital cost of a closed-cycle retrofit at Schiller Station. The upper bound estimate (40.4 million in 2016 dollars) is based on the EPA estimate for plume abated towers in the Final Rule and includes more precise estimates for retrofit costs and additional installation and engineering costs. Consequently, it likely offers a more representative estimate for a cooling tower retrofit of "average" difficulty. Any number of site-specific factors can influence the cost of the technology, but the national-level, average compliance costs developed for the Final Rule, equivalent to Powers' upper bound estimate, offer a reasonable comparison to determine if the cost estimates provided by PSNH are, as Sierra Club claims, "out of step" with government and industry estimates.

Powers' cost estimate of $33.5 million (in 2009 dollars), based on the TDD for the Final Rule, assumes a conventional tower retrofit of "average" difficulty is $263/gpm plus an additional $120/gpm to account for plume abatement for a total cost at $383 gpm (in 2009 dollars). *See* Powers Report at 5; TDD at 8-25 (Table 8-8). Adjusting for inflation results in a cost of $462/gpm for a total cost of $40.4 million (in 2016 dollars). For Schiller Station, Enercon also included a cost increase for noise abatement considering that the cooling towers would be located directly across the river from residential areas. *See* Fact Sheet at 146. As explained in the Fact Sheet, "EPA has not conducted an independent analysis to verify the concerns about sound emissions or icing, but does not regard the concerns to be unreasonable given the local geography and weather conditions at Schiller Station." *Id*. at 147. Powers did not include noise abatement in its upper bound estimate. The additional cost increase for noise abatement based on the TDD ($48/gpm dollars for a total cost of $431/gpm in 2009) would bring the capital cost for an average retrofit (adjusted to 2016 dollars) up to $520/gpm, resulting in a total capital cost of $45.5 million for Schiller Station. *See* AR-330 at 6 (Table 2).

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the Phase II Rule did not include the costs for rerouting and installing new and often longer circulating water piping while working around many existing structural interferences and that these additional costs can add significantly to the capital cost of retrofitted cooling towers. These retrofit costs may be one of the drivers in the differences in relative difficulty in EPRI's "easy" and "difficult" cost estimates (and which EPA considered in developing costs for the Final Rule). *See* AR-342.

[64] For the Final Rule, EPA developed cost estimates for cooling towers based on methodology developed in 2011 by the Electric Power Research Institute (EPRI) that produced costs similar to the methodology that EPA used during development of the Phase II Rule but which was simpler, more flexible, and used independent, site-specific cost data obtained from a range of facilities. See TDD at 8-22.

Including these additional costs for both plume and noise abatement, PSNH's estimated capital cost of $63.5 million (in 2016 dollars) is still nearly 30% higher than EPA's capital cost estimates based on the Final Rule ($45.5 million) and more than 50% higher than Powers' lower bound cost estimate. PSNH included a 25% multiplier for contingency costs (to cover additional costs and overruns not anticipated during the preliminary design) as well as a 12% multiplier for additional financing costs (Allowance for Funds Used During Construction or AFDUC). Powers' lower bound estimate (based on a generic cooling tower cost estimate scaled for the size of Schiller Station) does not include either cost. Some of the site-specific costs obtained by EPRI for the 2011 study, which EPA considered in determining costs in the TDD for Final Rule, include contingency costs but not cost increases for escalation or financing. Eliminating the 12% cost for AFDUC from PSNH's estimates results in a capital cost of about $53 million ($606/gpm) which, at a cost difference of about 15%, is not "out of step" with EPA's estimated capital costs of $520/gpm. EPRI 2011 also observed that cooling tower costs tended to be higher both for projects involving marine source water and for projects located in the Northeast, which are additional factors that could result in site-specific costs at Schiller Station higher than the national average cost. In any event, while PSNH's capital costs may not be significantly higher than EPA's estimates, there are additional costs considered under the Final Rule, for example, costs associated with the energy penalty, operation and maintenance, and the construction outage. In response to Sierra Club's comment, EPA also reviewed PSNH's estimates for these costs to determine if they are in line with those estimated for the Final Rule.

Energy Penalty

The performance of a turbine is influenced by the temperature of the cooling water entering the condenser: the cooler the water temperature, the higher the efficiency of the turbine. Because the temperature of the cooling water in a once-through system is typically lower than that of a closed-cycle system (based on an annual average), the efficiency of the turbine is reduced in a closed-cycle system and less energy is generated for the same amount of fuel. This reduction in output is known as an "energy penalty." *See* AR-333 at 6-2 and AR-182 at at 8-31.

Enercon estimated the loss of potential power generation due to operational efficiency losses would be approximately 21.6 MWe (about 14% of capacity). *See* AR-140 at 58. According to Enercon, operation of the condensers beyond the design point of 1.5 inch-Mercury (in-Hg) would result in increased fuel consumption as compared to the existing once-through system. Sierra Club comments that, based on the analysis provided in the Powers Report, the estimated annual average turbine efficiency penalty for a retrofit cooling tower at Schiller Station is approximately 0.2 percent of capacity. This estimate is based on efficiency penalty analyses for two coal-fired plants, Danskammer Unit 4 and Jeffries Generating Station. *See* Powers Report Attachment 3. Substantial work has been done to review the impact of the energy penalty resulting from retrofits of closed-cycle cooling. *See, e.g.,* AR-333, AR-368, AR-XXX. EPRI estimated energy penalty cost on an average annual basis in the range of 1% of output. *See* AR-333 at 6-3. In estimating heat rate penalties in the Final Rule, EPA selected a value of 1.5% of steam generation for fossil fuel-fired plants and 2.5% for nuclear plants. *See* AR-342.

EPA first looked to the analysis Enercon performed to estimate the energy penalty due to conversion of two coal-fired units at Merrimack Station to closed-cycle cooling. While the specific conditions at each site are different (*e.g.*, the inlet temperature from the Merrimack River is likely higher on average than the inlet temperature in the Piscataqua River), Enercon estimated that the energy penalty at Merrimack Station would be 0.6% (2.98 MWe), which is less than the power loss Enercon estimated for auxiliary power to operate the cooling tower pumps and fans. *See* AR-398 at 44. The estimate of 2.98 MWe is significantly less than Enercon's estimate of a 21.26 MWe loss for Schiller Station. Again, though the conditions are different, EPA questions why the estimated energy penalty at Schiller Station would be nearly ten times the estimated penalty at Merrimack Station. No explanation for this large difference is provided in Enercon's analysis.

In the 2008 Engineering Response, Enercon provides only the results of its energy penalty analysis for Schiller Station, without an explanation of the underlying calculations. AR-140 at 51-52. EPA was unable to determine from the limited information provided why the energy penalty at Schiller Station is expected to be substantially greater than either the current literature or the analysis for Merrimack Station suggests. One potential issue is that, as Sierra Club indicates, Enercon's analysis assumes a baseline in which the once-through cooling system is always operating at the ideal design backpressure of 1.5 in-Hg. Enercon's analysis, however, indicates that the existing system already does not operate at this ideal backpressure under all conditions. AR-140, Attachment 3.

The existing once-through system operates most efficiently at inlet temperatures between 55° and 60°F and the condenser backpressure operates over a range from about 1.0 to 2.0 in-Hg. *See* AR-140, Attachment 3 Figures 3-1 to 3-6). Based on the figures provided, only a handful of the observed daily summary values actually occurred at 1.5 in-Hg. These data suggest that calculating the turbine efficiency loss at a baseline of 1.5 in-Hg ignores the existing inefficiencies of the once-through system, which could lead to an overestimate of the impacts on condenser efficiency from a retrofit to closed-cycle cooling. For example, at temperatures less than 45°-50°F the existing system already operates at a backpressure as much as 0.5 in-Hg lower than design. *See* AR-140, Attachment 3 at Figures 3-1 to 3-3. Because Enercon's analysis does not appear to account for the existing efficiency losses, it includes penalties in the range of 2 to 20% from October through April when the inlet temperature is likely to be cool. *See* AR-140, Table 5.1 at 58. Assuming the turbine efficiency losses would be zero during months when the ambient temperature is low (*i.e.*, October through April), the average annual penalty is reduced from 21.6 MWe (or 14% capacity) to 13.6 MWe (or 9% capacity). Similarly, the analysis at a baseline of 1.5 in-Hg also fails to account for the existing penalty when the inlet temperature is greater than 60°F, which would also result in an overestimate of the energy penalty during warmer months (May through September). The existing once-through system appears to operate at a backpressure between 1.5 and 2.0 in-Hg (*i.e.*, as much as 0.5 in-Hg greater than design) at inlet temperatures above 60°F. *See* AR-140, Attachment 3 Figures 3-1 to 3-3. Thus, it seems that Enercon may have calculated loss of generation using an ideal baseline backpressure of 1.5 in-Hg without accounting for efficiency losses in the existing system, which results in an overestimate of the energy penalty.

As Sierra Club suggests, Enercon's estimated energy penalty, which represents 14% of total generating capacity (6.3% at Unit 4, 18.6% at Unit 6, and 18.2% at Unit 6), is substantially greater than the values suggested in literature on energy penalties. However, for the Draft Permit EPA did not consider the energy penalty in its cost comparison for the BTA determination, so the fact that PSNH's estimate is out of step with industry norms had no bearing on EPA's determination of the proposed BTA for Schiller Station. For this Response to Comment, however, EPA has reviewed and revised the cost estimate for the energy penalty and considered this cost in estimating the total social costs for available technologies consistent with the Final Rule. *See* 79 Fed. Reg. at 48,370. In estimating heat rate penalties in the Final Rule, EPA selected a value of 1.5% of steam generation for fossil fuel-fired plants and 2.5% for nuclear plants. *See* AR-342. Based on review of the limited data provided on the basis for the energy penalty at Schiller Station, as compared to energy penalties for the Final Rule and for PSNH Merrimack Station, EPA agrees with Sierra Club that PSNH's estimated energy penalty cost of more than $18 million (based on 21.6 MWe lost generation at a wholesale cost of $98/MWh) is likely overestimated. *See* AR-353. EPA expects that the energy penalty at Schiller Station from a retrofit to closed-cycle cooling is more likely to be consistent with the range identified in the Final Rule (1.5 to 2.5% of capacity), which results in an annual penalty ranging from about $1.1 million (at 1.5% capacity) to $1.8 million (at 2.5% capacity) for Schiller Station based on a wholesale cost of $54/MWh (see discussion on wholesale energy costs below).

Auxiliary Power

Enercon estimates 2.76 MW of auxiliary power (1.9% of capacity) would be needed to run the pumps (2.01 MW) and fans (0.75 MW) associated with mechanical draft cooling towers. Powers estimates a loss of 1.21 MW (1.2% of capacity) for operation of the pumps (0.44 MW) and fans (0.77 MW) associated with a 6-cell tower at a height of 35 feet. See Powers Report at 11. According to Powers, Enercon proposes a tower height of 36 to 40 feet but uses a booster pump head requirement of 85 feet. Enercon estimates three pumps at 900 horsepower (hp) would be needed, while Powers estimates only 370 hp would be necessary. While the booster pumps proposed by Enercon may be slightly overbuilt, the total difference in auxiliary power loss from Enercon (at 1.9% of capacity) to Powers (at 1.2% of capacity) is relatively minor (- 0.7% of capacity or 1.57 MW). For the Final Rule, EPA estimates that auxiliary power requirements for a plume-abated tower would be about 0.0000268 MW/gpm, which produces an estimated loss of 2.35 MW at Schiller Station (at 87,600 gpm). *See* AR-341 and AR-331. Overall the difference in the values for loss of generation for auxiliary power requirements among the Powers Report (1.21 MW), Final Rule (2.35 MW), and PSNH's original estimate (2.76 MW) are relatively minimal.

Construction Outage

Enercon estimated the cost of lost revenue for a 12-week construction outage assuming that the Station is operating at full capacity. According to Powers, the 12-week outage time projected by Enercon for cooling tower conversions at Schiller Station is "not credible in light of actual outage times where such conversions have occurred." Powers provides examples from Canadys and Jefferies Stations, which required 4 weeks or less for construction, and from the Yates Units 1-5 conversion, which required no outage time beyond the scheduled maintenance outage. *See* *also* AR-182 at 8-32 ("EPA found that net downtime may be zero, which is further supported by an estimate of zero net downtime for 'easy' to 'average' retrofits in a report attached to EPRI's comment to the proposed rule."). According to Enercon, the extended outage is due to the complexities of the construction and tie-in, including that the circulating water return flow from a cooling tower must pass under the existing large bore circulating water discharge piping, which requires excavation and undermining of the existing piping and cannot be performed when the station is online. *See* AR-140, Attachment 7.

The outage period required for tying in cooling towers is subject to the specific conditions present at each individual facility. For this reason, EPA disagrees with the comment that the need for any outage period beyond the scheduled maintenance is not credible because no similar outage was required at the other referenced facilities. Additional site-specific data evaluated for the Final Rule suggest that downtime can range from 0 to 6 months and support an average net downtime (*i.e.*, outage remaining after scheduled maintenance outage) of 4 weeks for non-nuclear plants (8 weeks of outage minus 4 weeks of scheduled maintenance), which is slightly less than PSNH's estimate of 7 weeks net downtime at Units 4 and 5 and 12 weeks of net downtime at Unit 6.

Schiller Station's Units 4 and 6 now typically operate as peaking units, which may allow for additional flexibility to schedule the cooling tower tie-in during periods of the year when low capacity is anticipated (most likely during spring and fall), thereby minimizing the likely impact of lost revenue due to construction outages. Enercon assumed that outages at Units 4 and 5 would overlap the 5-week maintenance outage, resulting in a net loss of 7 weeks (at 58,500 MWh), but that Unit 6 would sustain a forced 12-week outage (100,800 MWh). According to PSNH's Long Term Maintenance Overhaul Plan, all three units are never scheduled for a maintenance outage at the same time. The conversion of all three units to closed-cycle cooling, however, is a singular circumstance not likely to be considered in the maintenance plan. While all three units may not typically be offline for routine maintenance, Enercon provides no support as to why maintenance could not also be performed at Unit 6 concurrent with the other Units for one-time only to allow for the tie-in of cooling towers. Shutting down all three units for maintenance at the same time only during the conversion and tie-in of the cooling tower would, at a minimum, decrease lost revenue costs for an additional 5 weeks at Unit 6, equivalent to 42,000 MWh.

Enercon values lost revenue rated at the maximum output of each unit (50 MWe), which would be equivalent to about 110,000 MWh net generation on a monthly basis. Schiller Station has not exceeded 100,000 MWh net generation since at least prior to January 2001 (based on monthly generation data). In fact, Schiller Station has exceeded 75,000 MWh per month only five times since January 2011, and four of those instances have occurred in January and February, which, given weather conditions in New England, are not likely to be months chosen for the tie-in. Enercon assumed that a construction outage would occur from September through November. *See* AR-140, Attachment 7. On average, Unit 5 operated at 75-83% of capacity during September through November from 2010 through 2016. However, Units 4 and 6 (combined) operated at about 8-15% capacity during the same time period. In other words, Enercon estimated lost revenue at Units 4 and 6 based on net generation loss of 58,800 MWh (Unit 4) and 100,800 MWh (Unit 6), when actual revenue at these units (assuming 15% capacity) is more likely to be 8,820 MWh (Unit 4) and 15,120 MWh (Unit 6). Similarly, if the outage is scheduled during April and May to coincide with mud season (consistent with the Unit 5 outage), net generation of the units are similar to the September to November timeframe described above. In both cases, cost estimates for lost revenue due to the construction outage based on maximum output will be overestimates. In estimating possible downtime costs for this analysis, EPA assumed Units 4 and 6 would operate during the outage at 20% capacity (8,820 MWh each) and Unit 5 operates at 85% capacity (49,980 MWh), which is reflective of actual operation at Unit 5 and more than actual operation at Units 4 and 6. The resulting value (67,620 MWh) is less than half of the estimated lost generation that PNSH estimated assuming 100% capacity (218,400 MWh).

PSNH initially estimated the cost of the construction outage as lost revenue to the permittee (at wholesale energy price) less the cost of fuel – in other words, as a private cost. However, under the Final Rule EPA must consider the *social* cost of the technology. *See* 40 C.F.R. § 125.98(f)(2). From society's viewpoint, if another facility is dispatched to replace the generation lost due to the downtime, the social cost is any increase in marginal cost of production at other facilities. *See* 79 Fed. Reg. at 48,367; *see also* 40 C.F.R. § 125.92(x). The Final Rule also states that

> Unless a facility can demonstrate that its costs of compliance will result in lower overall supply in the markets in which its products are sold, and that the effect of the lowered supply is an increase in market price and lower quantity of product sold, the facility should not make a social cost adjustment to reflect these larger market impacts.

79 Fed. Reg. at 48,367. In other words, society pays for the electricity whether it is generated at Schiller Station or at another facility and a social cost would be imposed when the loss of generation due to downtime affects the reliability of the local energy market and where this decrease in reliability would increase the price of energy. New England generally experiences relatively low demand in spring and fall (when downtime will occur) and electricity supplies are generally more than sufficient to meet demand.[65] Moreover, the outage will occur only during installation (*i.e.*, once during the life of the technology) and the permittee and the system operator will have sufficient time to plan for the outage to ensure that impacts to the market and system reliability are minimal. For these reasons it is probable that there will be no social cost of downtime associated with the installation of cooling towers.

Again, if they are considered in the social costs analysis, downtime costs would be adjusted to reflect generation made up by other facilities. The cost of downtime to society is the cost incurred for other facilities to make up the electricity that would have otherwise been generated by Schiller minus the cost that would have been incurred by Schiller to generate the electricity. This difference in cost reflects the additional cost, if any, that society must pay to generate the replacement electricity. *See* 79 Fed. Reg. 48,370. There was insufficient information to determine what additional cost, if any, society would pay to replace the generation that would

[65] ISO New England Seasonal System Outlook. Available at https://www.iso-ne.com/markets-operations/system-forecast-status/seasonal-system-outlook.

otherwise have been produced by Schiller Station during any downtime. EPA has estimated the maximum potential revenue lost by the permittee due to the outage at about $5.4 million dollars, which includes lost revenue at the wholesale cost of electricity, plus the potential lost revenue from the sale of renewable energy credits (RECs) resulting from the generation at biomass-fueled Unit 5 at a market value of $35/MWh.[66] As explained above, this estimate does not represent a cost to society. Further, it overestimates private cost to the facility because it does not subtract the cost of production at each of the Units (which EPA was unable to estimate with certainty). EPA maintains that the social cost of the outage is likely to be negligible because an outage at Schiller Station's units in spring or fall is not likely to disrupt the supply or market price of electricity. In any event, even including the above overestimate of the private cost of the downtime would have only a small impact on the overall cost estimate for cooling towers. Between zero and the upper bound (private cost) estimate of $5.4 million, the resulting total cost of cooling towers changes ±5%. EPA uses a moderate, stand-in cost for downtime at $3.7 million, calculated as the lost generation (based on the reduced capacity assumptions described above) times the wholesale energy cost, but not including the potential REC value.

In summary, PSNH's estimated 12-week construction outage is slightly longer than EPA's estimated outage on a national average basis (8 weeks), but is not out of step with the range of construction outages reported to EPRI or EPA for the Final Rule. *See* AR-423, AR-182. Sierra Club expects that the estimated construction outage will not extend the 5-week scheduled maintenance outage period because other plants have not, but offers no specific critique of the outage or conditions at Schiller Station to cause EPA to reconsider PSNH's site-specific estimate. However, in response to Sierra Club's comments, EPA has reconsidered the evidence PSNH has provided to support its claim that shutdown of one of the units cannot overlap the scheduled maintenance period, which results in a net reduction in lost generation compared to PSNH's estimate. EPA also re-evaluated the loss of net generation (MWh) based on the actual operating capacity of the units over the past several years, rather than the maximum generation capacity used by PSNH. In both cases, EPA's evaluation results in a lower estimated impact from the construction outage. Overall EPA estimates that the cost of downtime due to the one-time construction outage may range from $0 (assuming there is no increase in the price of electricity due to the outage and thus, no social cost) to as much as $3.7 million (assuming a social cost equal to the wholesale cost of electricity).

Wholesale Electricity Price

Revenue losses due to the construction outage, annual turbine efficiency loss (energy penalty), and annual auxiliary power are calculated using the wholesale electricity price (in $/MWh). In 2008, PSNH used a baseline wholesale electricity price of $98/MWh to calculate the loss in revenue due to generation losses from the energy penalty and construction outage. Any explanation for the basis of this value was claimed as Confidential Business Information by

[66] The REC value is based on REC prices for compliance purposes (excluding solar), which are typically higher than RECs used for voluntary purposes because restrictions on compliance RECs limit the supply. Prices for compliance RECs peaked in 2013 and remained high in 2014 and 2015, but began declining in 2016. EPA's estimated REC price is based on the average New Hampshire REC price in 2015 and 2016. *See* National Renewable Energy Laboratory, Status and Trends in the U.S. Voluntary Green Power Market (2016 Data), AR-435.

PSNH. However, in 2007 PSNH used a wholesale price of $72/MWh in the cost analysis for closed-cycle cooling at Merrimack Station. *See* AR-426. The wholesale pricing data from 2013 through 2016 indicates that over 48 months, the Real Time On-Peak Average Locational Market Price (LMP) for the New Hampshire pool was $98/MWh or higher during just 6 months.[67] In their comments on the Draft Permit (Powers Report), Sierra Club uses a value of $36/MWh which, according to Powers, is the average 2012 wholesale price of electricity in New England. Powers notes that this value was included in a 2012 Press Release from ISO New England documenting the lowest wholesale electricity prices in New England since 2003. *See* Powers Report n.73. The wholesale value is used to calculate initial costs (as lost revenue during the outage) and annual costs (as energy penalty) and, as such, the value can have a significant impact on the total cost estimate for closed-cycle cooling. The difference in the wholesale price between PSNH's estimate and Sierra Club's estimate is $62/MWh, which, as an example, results in an annual cost difference of nearly $1.5 million for just the auxiliary power (assuming PSNH's estimated requirements of 2.76 MW). Based on real-time market prices from ISO New England, it appears that neither $98/MWh nor $36/MWh accurately reflects the actual average wholesale electricity price for New England.

EPA reviewed wholesale market price data for the New Hampshire pool as reported by ISO New England for the years 2013 through 2016, which likely reflect the most updated market conditions (*e.g.*, recent changes in the cost of natural gas). This period also includes the extreme cold during the winter of 2014, which reflects peak pricing, as well as the relatively mild winter and lower market prices throughout 2016. EPA used the values for real-time on-peak LMP data, which reflect the actual peak value of electricity. The average monthly price ranged from about $34/MWh in June to a peak of $111/MWh in February, which reflects the peak value of $177/MWh in February 2014. On average, the wholesale electricity price for the New Hampshire pool from 2013 to 2016 was $54/MWh, which EPA uses in updating the cost estimates for closed-cycle cooling in response to Sierra Club's comments.

Conclusion

In response to comments and exhibits submitted by Sierra Club, EPA reviewed the capital and annual cost estimates provided by PSNH for the retrofit of Schiller Station with closed-cycle cooling. EPA revised cost estimates for closed-cycle cooling at Schiller Station, based on the national average cost estimates derived in the TDD and supporting documentation for the Final Rule. See Table 4.

[67] Data obtained from the ISO New England Day-Ahead and Real-Time Monthly LMP Index Reports from 2013 through 2016.

Table 4. Estimated capital, outage, and annual energy costs estimated in the Powers Report, by PSNH in the 2008 Engineering Response, and by EPA in the TDD for the Final Rule. Costs updated to 2016 dollars based on CCI index.			
	Powers	PSNH	EPA
Capital (1)	$ 30,137,500	$ 48,086,808	$ 45,514,958
Capital (2)	$ 40,444,887	$ 53,097,616	---
Outage	$ 0	$ 15,377,629	$ 3,651,480
Energy Penalty	$ 54,744	$ 19,322,726	$ 1,064,340
Auxiliary Power	$ 328,464	$ 2,470,159	$ 1,110,698

Lower bound capital cost (1) for Powers based on generic cooling tower plus installation and retrofit towers. Lower bound capital cost (1) for PSNH for gray water tower. Upper bound capital cost (2) for Powers based on TDD for plume-abated tower. Upper bound capital cost (2) for PSNH based on seawater tower. Capital estimates from PSNH do not include AFDUC. EPA capital cost based on TDD for plume- and noise-abated tower.

Based on the Powers Report, the total, one-time capital costs for cooling towers ranges (including the construction outage) from about $30-$40 million, as compared to PSNH's estimated one-time costs of $63-68 million. The lowest estimate ($30 million) does not include the more recent cost estimates for cooling tower retrofits; Powers also assumes that cooling towers will require no outage beyond the scheduled maintenance period, which underestimates total costs. PSNH may have overestimated outage costs by calculating losses using design capacity generation as the baseline and a relatively high wholesale electricity price. EPA's estimate of about $50 million (for capital and outage) is about 25% higher than Powers' estimate and about 37% less than PSNH's. Powers estimated annual energy-related costs of $383,000 as compared to PSNH's annual costs of more than $21 million; most of this difference is due to PSNH's overestimate of the costs related to the energy penalty (generation lost due to the reduction in efficiency in the condenser), which, as described earlier, EPA did not in any event consider in its cost comparison for the BTA determination in the Draft Permit. Using the industry standards for energy penalty and auxiliary power, EPA estimates about $2.2 million in energy-related annual costs, which are far less than PSNH but are based on cost estimated from a wider range of plants under more varied operating conditions than the two facilities used in the Powers Report. Neither PSNH nor Enercon present a substantive basis for proposing an energy penalty more than 18 times the national average.

Sierra Club begins Comment IV.A.2 by stating that EPA's decision to select cylindrical wedgewire screens as the BTA is based on its determination that the increased cost of cooling towers as compared to the cost of wedgewire screens is not justified by the increase in benefits. In Comment IV.A.2.b, Sierra Club argues that the cost of closed-cycle cooling was based on PSNH's "vastly overestimated capital and O&M costs." EPA reviewed PSNH's cost estimates for closed-cycle cooling and agrees that the energy penalty estimated by PSNH at Schiller Station is substantially greater than estimates of energy penalties available in the literature, the Final Rule, or even that PSNH itself anticipates for converting Merrimack Station to closed-cycle cooling. In addition, PSNH may have overestimated lost revenue during any required construction outage because it assumed losses relative to 100% output at Units 4 and 6, which is not representative of actual operations in many years. EPA also believes that the wholesale electricity price used to estimate lost revenue is not representative of today's market. In these cases, EPA's adjustments decrease the cost of closed-cycle cooling relative to PSNH's estimate. On the other hand, PSNH's estimates of the capital costs for cooling towers are not necessarily out of step with the analysis provided in the Final Rule, and the lower bound estimate in the Powers Report would be considered at the low end of the range for capital costs for even an "easy" retrofit.

As EPA explained above and in other responses to comments on the Draft Permit, the Final Rule directs the permitting authority to consider the social costs and benefits of available technologies. *See* 40 C.F.R. 125.98(f)(2). EPA calculated the total social costs over the compliance technology life (typically 30 years for closed-cycle cooling) as the full value of the resources used without accounting for any tax effects. The social cost of closed-cycle cooling is considerably more than wedgewire screens. For the Draft Permit, EPA determined that the cost of closed-cycle cooling is not warranted by the benefits, but fine-mesh wedgewire screens will make improvements at a relatively low cost that is warranted by the benefits.[68] *See* Fact Sheet at 155-58. EPA revised its cost estimates for both technologies in response to comments on the Draft Permit and converted the present value estimates from a private to a social cost basis. EPA estimates a present value social cost for closed-cycle cooling (in 2016 dollars) is about $97.8 million (at 7% discount rate) to $111.9 million (at 3% discount rate). The social cost of wedgewire screens, on the other hand, is estimated to be about $6.9 million.[69] EPA considered these costs in addition to other aspects of the site-specific conditions at Schiller. Thus, EPA considered not only the numbers of organisms entrained at the Facility, but also the relatively small percentage of the tidal flux of the Piscataqua River withdrawn by Schiller's CWISs, the absence of evidence that entrainment losses at Schiller Station are causing or contributing to declines in in the overall aquatic health of the Piscataqua River, the finding that the Facility's existing thermal discharge is not harming the balanced, indigenous population of organisms in the river, and the recognition that two of the Facility's generating units (Units 4 and 6) have operated well below design capacity in recent years and are expected to continue to do so during this permit cycle. EPA maintains that the considerable cost of closed-cycle cooling (at a total social cost of around $100 million) is not warranted by the benefits to the waterbody, and that wedgewire screens (at a total social cost of about $7 million) will achieve the maximum reduction in entrainment warranted in light of all of these considerations.

[68] PSNH included a claim of confidential business information (CBI) for all cost estimates in both the 2008 and 2014 engineering reports. *See* AR-140 and 227. Because of the claim of CBI, EPA did not release cost information for any technology. *See* Fact Sheet at 150. As explained earlier in this response, the claim was later withdrawn, and EPA uses the actual cost values in this response rather than a relative index as it did in the Fact Sheet.

[69] The capital cost of wedgewire screens is based on the total cost value estimated by Enercon for wedgewire screens in 2014, updated to 2016 dollars. An additional multiplier was used to account for the potential increase associated with fine-mesh screens based on cost estimates for coarse and fine mesh screens at Indian Point Energy Center. *See* PSNH Comments Appendix 4 to Exhibit 1 and AR-393. For the Draft Permit, EPA assumed the useful life of wedgewire screens would be 15 years and that the screens would be replaced once for comparison with the 30-year period for closed-cycle cooling. The Final Rule assumes that the useful life of a submerged near-shore passive screen installation is 30 years; EPA recalculated capital costs for the Final Permit based on a 30-year life for screens. *See* TDD at 8-48. The annual operations and maintenance costs are not expected to increase as compared to the existing system based on analysis by Enercon. AR-140 at 90.

Sierra Club Comment IV.A.2.c EPA Has Undervalued the Benefits of Closed-Cycle Cooling by Basing Its Calculations on Salt Water Make-up Rather than Grey Water, and by Relying on PSNH's Low Estimate of Schiller's Impingement and Entrainment

EPA has undervalued the benefits of closed-cycle cooling in two important ways: 1) EPA improperly compared wedgewire screens to closed-cycle cooling using sea water, rather than grey water, as make-up; and 2) EPA relies on PSNH's unrealistically low impingement estimates and on entrainment sampling that was not properly designed to be representative of natural variation.

First, EPA's should have compared cylindrical wedgewire screens to cooling towers that rely on gray water as make-up, which would reduce impingement and entrainment by 100%. Instead, EPA compared wedgewire screens to cooling towers that rely on saltwater as makeup, which achieve would reduce impingement and entrainment by 97%. The Fact Sheet makes clear that the Pierce Island Wastewater Treatment Plant would be able to provide sufficient grey water as make-up water if Schiller was retrofitted to closed-cycle cooling and that. [145] EPA concluded that "using grey water for make-up water [is] a potential BTA for minimizing impingement and entrainment if cooling towers are installed." [146] By comparing wedgewire screens to cooling towers with sea water make-up, EPA tipped the analysis in favor of its propose BTA.

Second, PSNH's impingement and entrainment estimates require further adjustment. Sierra Club agrees with EPA's decision to estimate entrainment losses based on the plant's design flow of 124.4 mgd, rather than the plant's 5-year average operating flow Schiller used in its estimates. [147] Further, Sierra Club agrees with EPA decision to estimate entrainment mortality by assuming 100% mortality for entrained larvae, rather than Schiller's unscientific survival rates. However, in determining the best technology available to minimize the significant adverse environmental impacts of Schiller's once-through cooling system, EPA should take into consideration the fact that those environmental impacts are still understated by PSNH, and that PSNH's numeric estimates should be scrutinized. Nevertheless, it bears repeating that, by any reasonable standard, even with PSNH's undercounts, EPA's estimates show that Schiller impinges and entrains a significant number of fish and crustaceans – more than 1.7 billion every year.

PSNH attempts to downplay the extremely high impingement and entrainment rates by claiming that only a small fraction of the 1.7 billion impinged and entrained organisms actually die. While EPA properly rejected PSNH's entrainment mortality rates, EPA has wrongly accepted the impingement mortality estimates put forward by PSNH's consultant, Normandeau Associates.

Normandeau's impingement mortality rates are unrealistic and inconsistent with experience elsewhere. Normandeau's estimated impingement mortality rates are calculated based on a 12 hour hold to observe latent mortality, rather than the industry norm of either 24 or 48 hold. Petrudev concluded that Normandeau's decision to report on such a short hold time leads to "survival estimates for both fish and macrocrustacea [that] are not long enough in duration, and therefore may be subject to error." [148]

Further, PSNH's impingement and entrainment numbers do not respond directly to all of the requirements set by EPA, and may not be representative, therefore EPA should act conservatively by treating PSNH's figures as lower-bound estimates. There are at least two problems with the representativeness of PSNH's figures.

First, PSNH did not accurately compare entrainment densities with egg and larval densities in the Piscataqua River, as requested by EPA. [149] Second, EPA requested that PSNH establish an entrainment and impingement sampling method that would generate results representative of year to year variations. Normandeau concentrated its sampling in a single 13-month period, creating a narrow five-week overlap period in which samples can be compared year-on-year. But as the attached report from Petrudev shows, Normandeau selected a period of low variability and very low entrainment and impingement as the overlap period in which to conduct the year-on-year comparison. This period is not representative of higher periods of impingement, and PSNH's year-on-year comparison does not have a seasonal component. Thus, the five-week window cannot be extrapolated out to other times of year and EPA cannot be sure that the sampling results are representative of long run impingement and entrainment rates. [150] In light of the uncertainties that PSNH's sampling methodology creates, EPA should consider PSNH's impingement and entrainment results to be lower-bound estimates.

[145] Schiller Fact Sheet at 145-46.

[146] *Id.*

[147] Schiller Fact Sheet at 93

[148] Petrudev at 3-10.

[149] *See id.* at 3-6.

[150] *See id.* at 3-7; 3-10.

EPA Response to Sierra Club Comment IV.A.2.c:

Sierra Club makes two points to support its comment that the potential benefits of closed-cycle cooling have been undervalued: 1) that the availability of gray water to supplement the make-up volumes in a closed-cycle system will make the volume reduction from the existing once-through system 100% versus EPA's estimate of 97%; and 2) that the impingement and entrainment estimates provided by Normandeau likely underestimate long-term rates of impingement and entrainment. Sierra Club includes a supplemental engineering evaluation ("Powers Report") and biological evaluation ("Petrudev Report") as Exhibits to its comments on the Draft Permit. EPA addresses both Sierra Club's comments and the supporting analysis by Petrudev and Powers here.

Availability of Gray Water

The Fact Sheet identifies that the Pierce Island Wastewater Treatment Plant ("WWTP"), which discharges 4.8 MGD and is about 3 miles from the Facility, could possibly provide sufficient gray water for the make-up volume in a closed-cycle system at Schiller Station. *See* Fact Sheet at 145. Enercon also identified the potential use of gray water as make-up water for the towers. Enercon noted that although the WWTP could supply an adequate volume of water and gray water offers certain advantages over seawater, "additional investigation would be required to confirm availability of these grey water sources, finalize pipeline routing, and confirm that necessary easements and permits can be obtained." AR-140 at 97. Enercon concluded that "the potential use of grey water for Schiller Station make-up when operating in a closed-cycle cooling configuration offers significant advantages…and should be further evaluated and pursued." *Id.* EPA considered using gray water to eliminate all water withdrawals from the Piscataqua River to be a potential BTA, although there is considerable uncertainty about this option because neither PSNH, Sierra Club nor EPA fully evaluated the feasibility or cost of piping gray water over 3 miles from the WWTP to Schiller Station. *See* Fact Sheet at 145; AR-140 at 97. The Powers Report confirms that the WWTP produces sufficient water to supply the make-up volume for cooling towers at Schiller Station through a 12-inch pipeline but does not provide any evaluation of the site-specific feasibility of connecting the WWTP to Schiller Station.[70] If closed cycle cooling was installed as the BTA for Schiller Station, PSNH could pursue using gray water as make-up volume in its final design.

EPA's analysis of closed-cycle cooling based on entrainment reductions of 97% is consistent with the Final Rule, which identifies closed-cycle cooling as the best performing technology even at expected flow reductions of 95-97%. EPA agrees that using gray water as make-up water would eliminate the need for seawater withdrawal and, if pursued by PSNH, would ultimately achieve even greater reductions in impingement and entrainment than seawater as make-up water (100% as compared to 97%). In either case, EPA concludes that saving 142 to 147 million fish eggs and larvae and 574 to 593 million macrocrustacean larvae from entrainment by operating either seawater (97%) or gray water (100%) closed cycle cooling towers would be consistent with the Section 316(b) requirement to reduce entrainment. *See* 40 C.F.R. § 125.94(c)(1), (d). In any case, using gray water as make-up in a closed-cycle system does not ultimately change EPA's conclusion based on the comparison of the relative costs and benefits of available technology.

EPA concludes that wedgewire screens can significantly reduce entrainment and largely eliminate impingement. *See* Fact Sheet at 108-18, 150-55, 162. The comment essentially is that EPA should have explicitly considered a closed-cycle system using gray water that achieves a 100%, rather than a 97%, reduction in entrainment. As noted earlier, and as described in the Fact Sheet, EPA considered not only the expected entrainment reductions and costs of available technologies, but also other relevant aspects for the site-specific conditions at Schiller Station, including that its CWISs withdraw only a relatively small percentage of the tidal flux of the Piscataqua River, that there is no evidence that the Station's cooling water withdrawal is causing or contributing to declines in the overall aquatic health of the Piscataqua River, that the existing discharge of heated effluent is likely protective of the balanced, indigenous population, and that two of the generating units (Units 4 and 6) have operated well below design capacity in recent years. *See* Response to Sierra Club Comment IV.A.1; Fact Sheet at 156. In EPA's determination and as EPA has described herein, these factors weigh in favor of the Agency's determination that the BTA for entrainment at Schiller Station is wedgewire screens. The costs of closed-cycle cooling may be higher if gray water is used due to the need to identify and implement a method

[70] The Powers Report estimates that the capital cost of laying two miles of pipeline in soil/rock in an urban environment would be about $ 1 million (in 2010 dollars) based on estimate provided for the South Central Texas Regional Water Plan. *See* Powers Report at 17. However, this cost does not include the cost of operating the associated pumps and equipment to convey the water to Schiller Station, nor does it provide sufficient evidence that the costs of a pipeline in South Central Texas are a reasonable approximation of the site-specific costs for this specific location in New Hampshire.

of conveying the water from the WWTP to the power plant. EPA has concluded that the costs of closed-cycle cooling are not warranted by the benefits that it would provide using either gray water or seawater as makeup.

Again, in this analysis, EPA compares the social costs and benefits of the BTA options. EPA is charged with establishing site-specific requirements for entrainment control that reflect its determination of the maximum reduction in entrainment warranted after consideration of the relevant factors, and EPA is given the discretion to weigh those factors based on the circumstances at each facility. See 40 CFR §§ 125.94(d), 125.98(f). In EPA's view, the three percent additional entrainment reduction that using gray water with closed-cycle cooling would provide is not enough to "tip the balance" and alter EPA's BTA conclusions (that adding wedgewire screens, rather than converting to closed-cycle cooling, is the BTA for entrainment reduction at Schiller Station).

Impingement and Entrainment Estimates

Sierra Club comments that the environmental impacts from impingement and entrainment are understated, and that PSNH's numeric estimates should be scrutinized. Sierra Club also comments that estimates may not be representative and should be treated as lower-bound estimates.

Regarding impingement, Sierra Club comments that Normandeau's impingement mortality rates are unrealistic and inconsistent with experience elsewhere. Petrudev (at 3-10) critiques the impingement survival studies, suggesting that a 12-hr latent survival period is not long enough and, consequently, that the survival estimates are subject to error.

The Fact Sheet presented the number of fish and macrocrustaceans impinged (Tables 8C and 8D) and the comparison of technologies for reducing impingement mortality (Table 10-A) based on the number impinged adjusted for screen collection efficiency, but not adjusted for survival. *See* Fact Sheet at 95-6, 151. In other words, EPA did not consider impingement survival in its assessment of adverse environmental impact or in determining the BTA in the Draft Permit, because, in this case, the latent mortality associated with the traveling screens does not affect the BTA for impingement mortality at Schiller Station. The Final Rule requires all existing facilities with a DIF of 2 MGD or greater, which includes Schiller Station, to comply with one of seven alternatives to meet the BTA standards for impingement mortality. In this case, wedgewire screens, with a through-slot velocity of 0.5 fps or less, will comply with one of the "pre-approved" compliance alternatives for impingement in the Final Rule. *See* 40 C.F.R. § 125.94(c)(2). This technology relies on the ability of fish to *avoid being impinged* without being removed from the waterbody. As such, latent survival – which is an issue for approaches that rely on the use of traveling screens and fish return systems to reduce impingement mortality – is not a factor for this determination.

Turning to entrainment, Sierra Club and Petrudev conclude that the site-specific entrainment study at Schiller Station was not representative of potential survival of larvae through the full CWIS and concur with EPA's assumption of 100% entrainment mortality. *See* Fact Sheet at 92. Sierra Club also comments, however, that Normandeau has systematically underestimated the extent of impacts from operation of Schiller Station's CWISs. Petrudev offers a number of critiques of Normandeau's methodology and analysis to support Sierra Club's comments that PSNH underestimates entrainment.

According to Petrudev (at 3-1 to 3-2), entrainment sampling was not robust enough during the months of May and September to characterize variability during significant periods of entrainment of ichthyoplankton and macrocrustaceans. Petrudev argues that, because variability in entrainment rates increases when entrainment is high, sampling frequency should be increased during these periods. Normandeau sampled weekly during peak entrainment periods from June through August, but Petrudev asserts that sampling should have also been weekly during the months of May and September, which Petrudev characterizes as months with significant entrainment.

Entrainment sampling results are highly variable over time and space partly due to the naturally patchy distribution of early life stages in the water column. While greater monitoring frequency may provide more precision in the estimates of entrainment, Sierra Club offers no analysis of the existing data to support its statement that greater precision would necessarily result in higher entrainment estimates. Newington Energy, located less than 1 mile from Schiller Station, conducted ichthyoplankton sampling in the Piscataqua River from 2001 through 2003 to support issuance of NPDES permit NH0023361. In light of the comment, EPA examined this ichthyoplankton data relative to the entrainment counts at Schiller Station in 2006 and 2007 to see if Normandeau's entrainment values and seasonal variability are consistent with the earlier data. EPA acknowledges that these studies employ different methodology to a different purpose; at Schiller Station, Normandeau pumped entrainment samples from the screenhouses, while Newington Energy performed ichthyoplankton tows at three river stations (intake on south side of river, mid-river, and north side of river). Nevertheless, the review is useful in the context of the comment to better understand whether Normandeau's samples are consistent with the seasonal and year-to-year variation in ichthyoplankton abundance in the Piscataqua River. EPA compared the raw entrainment data from Normandeau (number collected per 100 m^3) to the geometric mean density (per 100 m^3) from three in-river stations.[71] See Figures 2 and 3.

[71] EPA presents ichthyoplankton data on a logarithmic scale because the total number of eggs and larvae collected varies by several orders of magnitude on an annual basis.

Figure 2. Log number of eggs entrained per 100 m^3 during ichthyoplankton sampling in the Piscataqua River (2001, 2002, and 2003) and at the Schiller Station CWIS (2007).

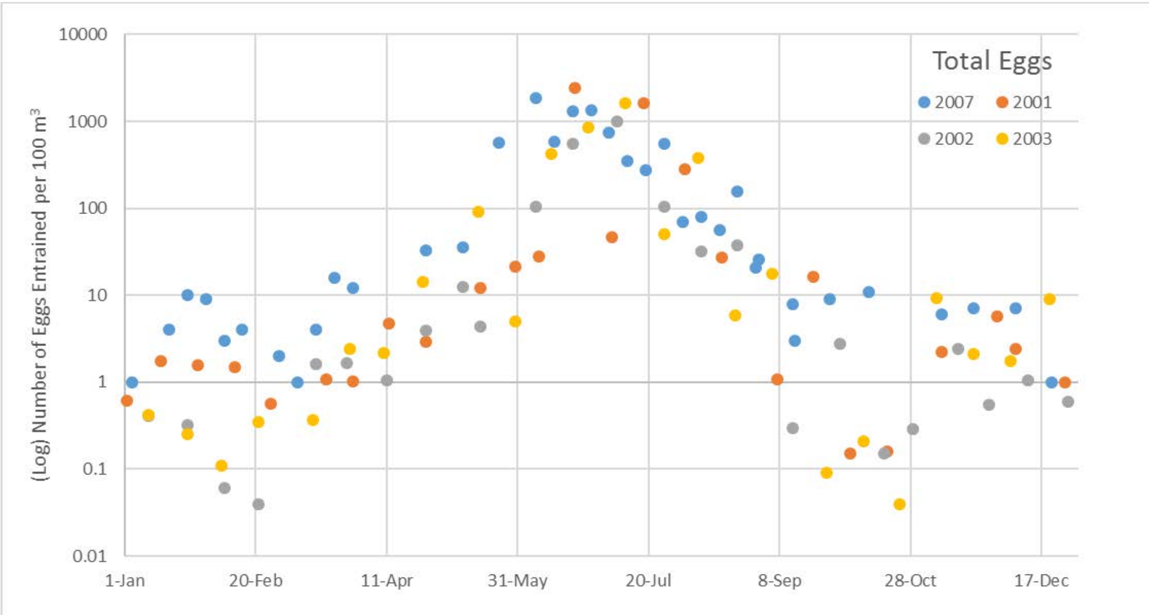
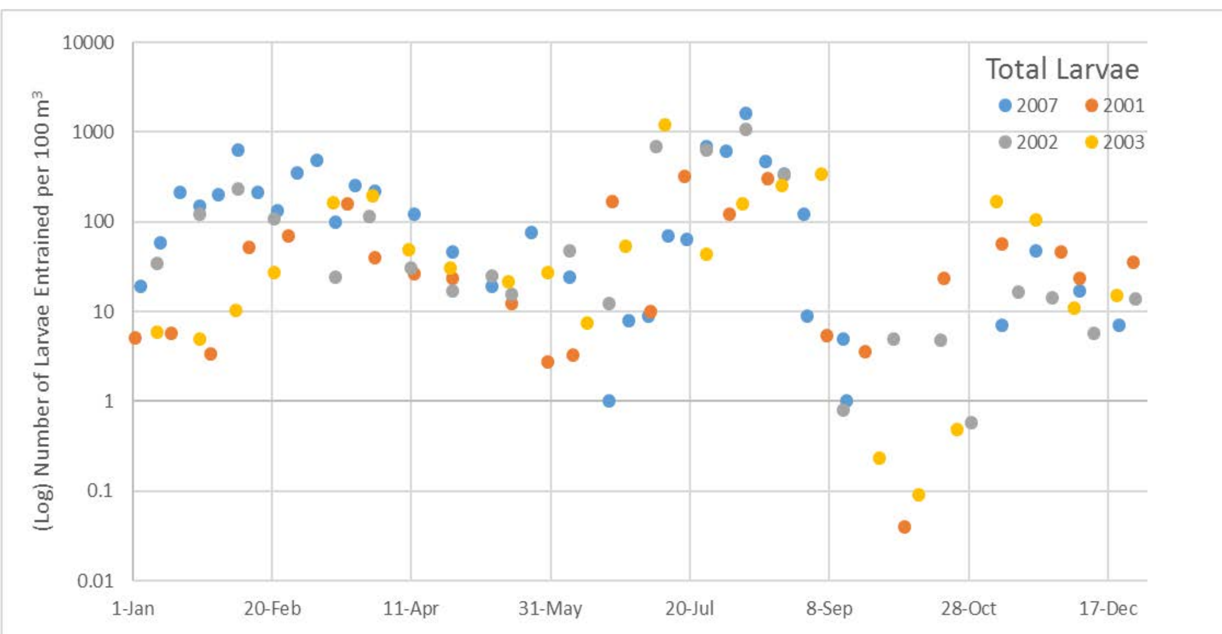


Figure 3. Log number of larvae entrained per 100 m^3 during ichthyoplankton sampling in the Piscataqua River (2001, 2002, and 2003) and at the Schiller Station CWIS (2007).



The figures illustrate that the number of eggs and larvae collected during Normandeau's 2006-2007 study is generally consistent with the mean values for eggs and larvae in the Piscataqua River during 2001 through 2003 on both a seasonal and annual basis. Entrainment densities also appear consistent with mean in-river densities during the months of May and September, even though the 2006-2007 biological study sampled once every two weeks during May and September, rather than weekly. Based on this comparison to three years of in-river ichthyoplankton data, there is no evidence that Normandeau consistently underestimates entrainment or that the 2007 data should be considered a "lower bound" estimate for entrainment of eggs and larvae at Schiller Station.

Petrudev (at 3-6 to 3-7) also lists a number of criticisms of PSNH's estimate of the percentage of eggs and larvae withdrawn by the CWISs based on the assumption that entrainment is directly proportional to flow. Normandeau calculated monthly and annual losses of eggs and larvae at Schiller Station's CWISs by volumetric extrapolation based on daily operating flows during the study and historical operating flows. *See* AR-136 at 12-15. EPA understands that this method assumes that eggs and larvae are uniformly distributed in the water column, but this assumption may not always be met. Nonetheless, when data on actual distributions are unavailable, simple models based on this assumption are commonly used to estimate entrainment at a facility (EPRI 1999). *See* AR-384. Petrudev (at 3-6 to 3-7) criticizes Normandeau's method but offers no preferred alternative for extrapolating sampling data. While EPA agrees that eggs and larvae are not likely to be uniformly distributed in the water column, Normandeau's analysis is consistent with EPA's assumptions in the rulemaking under CWA § 316(b) and with similar evaluations for BTA determinations at other facilities. *See, e.g.*, NPDES Fact Sheets for Pilgrim Nuclear Power Station (MA003557), GE Aviation (MA0003905), and Merrimack Station (NH0001465). Finally, Petrudev offers no evidence to indicate that Normandeau's method systematically underestimates entrainment based on the extrapolation methodology.

Finally, Petrudev (at 3-1) comments that the entrainment sampling was not designed to detect species of low abundance such as the shortnose sturgeon, which are found in the Piscataqua River, and that the sampling frequency should have been increased to twice per week. According to the 2010 Biological Assessment of Shortnose Sturgeon (AR-405), adult and juvenile sturgeon *may* be present in the Piscataqua River, although there are very few records of any sturgeon being captured in the river, including during a sampling program by New Hampshire Fish and Game in 1988 and 1989 which sampled 11 locations in the Piscataqua River and Great Bay Estuary over 146 net days and did not encounter a single sturgeon. *See also* AR-378. Given the rarity of sturgeon in the vicinity of the facility, twice weekly sampling would likely not have been sufficient to detect this species. Regardless, in the unlikely event that an adult or juvenile shortnose sturgeon does encounter Schiller Station's CWIS, its strong swim speed (1.9 fps) will overcome the through-screen velocity at the CWISs (0.7-1.4 fps). *See* AR-378. NMFS concurred with EPA's assessment that shortnose sturgeon are unlikely to be affected by the CWIS. *See* AR-379.

Moreover, there is currently no evidence of spawning by shortnose sturgeon near the facility and, consequently, early life stages are not expected to be present in the estuarine environment of the Piscataqua River. *See* Fact Sheet Attachment E, AR-378. Therefore, it is extremely unlikely that a life stage that would be subject to entrainment would be in the vicinity of the CWIS and, therefore, this species is not likely to be entrained during a sampling program. Juvenile and adult shortnose sturgeon may use habitat like that of the Piscataqua River for foraging, but because sturgeon are benthic feeders, they are unlikely to be exposed to the shoreline location of the CWIS for Units 5 and 6. In sum, based on their distribution, EPA does not expect early life stages of shortnose sturgeon to be present in the action area. Even if a juvenile or adult shortnose sturgeon was present, it would not likely be susceptible to impingement. For these reasons, EPA does not believe that the monitoring study was inadequate to sample shortnose sturgeon. *See* AR-378. Rather, shortnose sturgeon are unlikely to be susceptible to impingement and entrainment at Schiller Station. *See also* Response to Sierra Club Comment V.D.

Sierra Club Comment IV.A.3 EPA Is Not Required to Conduct a Monetized Cost-Benefit Analysis

As the Synapse Report indicates, even a monetized cost-benefit analysis using conservative benefits valuations (i.e. underestimates of benefits) suggests that cooling towers not only provide net benefits, but that they deliver greater net benefits than wedgewire screens. Nonetheless, it is vital to note that monetization of benefits and costs is not required by state or federal law.

At similar power plants, EPA has considered costs and benefits rigorously and quantitatively, but without using questionable monetization techniques. Applied at Schiller, the approaches used by EPA show that the existing once-through cooling system has significant adverse environmental impacts and that the benefits of replacing it with a closed cycle cooling system at Schiller amply justify the costs.

In particular, EPA Region 1 should look to the economic evaluation it conducted at the Merrimack power station as a relevant point of comparison for Schiller. EPA's analytical process, applied to Schiller, shows that closed cycle cooling is both technically feasible and economically sensible.

As noted above, Schiller bears strong similarities to Merrimack, which EPA Region 1 recently determined must install a closed cycle cooling system. Both are PSNH owned and operated. But while Schiller withdraws only half as much water as Merrimack, and therefore is less costly to convert to a closed-cycle system, the plant entrains 300 times more organisms than Merrimack (145 million fish eggs and larvae and 1.3 billion macrocrustaceans at Schiller, compared to 3.8 million fish and eggs at Merrimack). Since EPA concluded that cooling towers are economical at Merrimack, a fortiori they are economically justified at Schiller.

At Merrimack, EPA concluded that the cost of retrofitting hybrid wet-dry mechanical draft cooling towers and operating in a closed-cycle mode year-round "would be significant but economically achievable for PSNH" at an "after-tax cash flow cost…of $111.8 million, with an annual equivalent cost of $9.0 million (at 5.3 percent over 21 years) on an after-tax, nominal dollar basis (i.e., including the effects of inflation)."[151] EPA found this cost not only affordable, but reasonable in relation to the major reduction in environmental harm that would be achieved by reducing intake and thermal discharge by 95%.[152] Even using PSNH's grossly exaggerated cost estimates, the capital cost of a closed-cycle cooling retrofit at Schiller would be only half that at Merrimack. And as the above referenced reports show, in reality the considerably smaller cooling system needed for Schiller should cost less than a third as much as the Merrimack cooling system, but will deliver significantly greater environmental benefits.

Next, while EPA decided to monetize social costs at Merrimack, the agency chose to compare these costs to benefits "assessed in terms of the number of organisms saved and a qualitative assessment of the public value of the organisms saved and the aquatic habitat improved." [153] EPA considered trying to monetize benefits and conduct an analysis similar to the one that PSNH had submitted at Schiller years ago, but decided it was not possible:

> [T]ranslating the fish eggs, fish larvae, juvenile fish, and adult fish saved by each BTA option, along with the ecological improvements that may accompany these savings, into a dollar value that fully represents the benefit of each BTA option – i.e., developing a monetized benefits estimate – presents a nearly insurmountable task…Estimating the monetary value of all these benefits, however, requires specialized data and expertise and is difficult, time-consuming, controversial and expensive. This is especially so with regard to estimating recreational use values and, even more so, for estimating non-use values arising from ecological improvements. All the benefits or values of ecological improvements, such as protecting fish, cannot necessarily be reduced to a money value, or at least reduced to a money value that can be generated with a reasonable effort and that will be generally accepted. Thus, EPA and state permitting authorities have rarely even attempted to develop estimates of the full monetized benefit of saving aquatic organisms by using the BTA under § 316(b). Benefits have, instead, been assessed qualitatively, which is a reasonable, legally acceptable approach. [154]

Instead, in comparison to the $110 million net present value of costs (or less than $10 million annualized cost) for seasonal closed-cycle cooling at Merrimack, EPA found that:

- Entrainment would be reduced by 95%, saving some 3.6 million eggs and larvae annually. [155]
- Impingement mortality would be reduced by 47%, saving some 4,000 fish annually [156]
- These benefits were considerably greater than the benefits offered by any other technology that would entail the continued use of once-through cooling.
- Continued entrainment at existing levels likely would impede recovery of the aquatic communities. [157]
- Closed-cycle cooling "would provide an opportunity to restore biological integrity . . . by reducing both thermal discharges and the loss of fish and forage to entrainment and impingement." [158]
- Because some of the species harmed at Merrimack were popular for recreational fishing, "entrainment and impingement losses…undermine the value of the water body as a resource for recreational fishing" and interfered with government attempts to restore fish populations in the river. [159]
- Segments of the waterbody affected by Merrimack, both up and downstream of the plant, though not adjacent to it, had been designated for special protection by the state of New Hampshire and reducing fish kills and thermal pollution would contribute to the state's goals. [160]

- There are no significant adverse secondary environmental effects of converting to closed-cycle cooling. [161]

On the basis of this assessment, EPA required a closed-cycle cooling retrofit at Merrimack. Because of the strong similarities between the two plants and the fact that, the Schiller retrofit is cheaper than the Merrimack retrofit and saves hundreds of millions more animals, the BTA determination made by EPA Region 1 for the Merrimack plant provides an excellent point of comparison to Schiller.

[151] Merrimack Determination at ix.

[152] *See id*. at x.

[153] *Id*. at xv.

[154] *Id*. at 325-326.

[155] *Id*. at 333, Table 12-3.

[156] *Id*.

[157] *Id*. at 335.

[158] *Id*.

[159] *Id*.

[160] *Id*. at 335-36.

[161] *Id*. at 341.

EPA Response to Sierra Club Comment IV.A.3:

Sierra Club comments that a monetized benefits analysis is not required by state or federal law, though its analysis, prepared by Synapse and attached to its comment, urges that the cost of closed-cycle cooling is justified by monetized benefits. Sierra Club also comments that EPA has considered benefits quantitatively and qualitatively in other permitting decisions and points to EPA's draft determination that closed-cycle cooling is the BTA at Merrimack Station, another PSNH-owned generating station, as an important point of reference for Schiller Station.

EPA agrees that a monetized cost-benefit analysis is not required for a BTA determination under Section 316(b) of the CWA. The Fact Sheet explains that while the CWA does not *require* EPA to compare the costs and benefits of the options being considered as the possible BTA, the statute does provide EPA with the discretion to consider such comparisons in its CWA § 316(b) determinations and EPA has done so for many years. Fact Sheet at 159 (citing *Entergy*, 556 U.S. at 222-226). The 2014 CWA § 316(b) Final Rule directs permitting authorities to consider both the social costs and social benefits of available technologies when establishing entrainment controls on a site-specific basis if the available information is of "sufficient rigor" to help support decision-making. *See* 40 C.F.R. § 125.98(f)(2)(v). *See also* §§ 125.92(x) and (y) (defining "social benefits" and "social costs"). The Fact Sheet at 159 states "[n]either statute, nor regulations, nor guidance document dictate precisely how such cost/benefit evaluations should be conducted." Neither law nor EPA policy mandates that EPA conduct a monetized cost-benefit analysis.

As Sierra Club points out, for BTA determinations for other facilities, EPA has rigorously considered costs and benefits from both a quantitative perspective and a qualitative perspective, but without monetizing benefits. *See*, *e.g.*, permitting decisions for GE Aviation, Wheelabrator Saugus (NPDES Permit No. MA0028193), and Merrimack Station. The non-monetized, quantitative assessment of the benefits of particular CWIS technologies has focused on the number of organisms that the technology would save from entrainment and/or impingement. *See* 40 C.F.R. § 125.98(f)(2)(i). Although Sierra Club suggests that a similar quantitative analysis applied at Schiller Station would show that the benefits of replacing the existing once-through system with a closed-cycle cooling system amply justifies the costs, EPA notes that it *did* apply the same approach to comparing costs and benefits as was used in these other permits, but it reached a different conclusion than is favored by Sierra Club.

The Fact Sheet explains EPA's approach to considering the costs and benefits for Schiller Station as follows:

> EPA did not attempt to develop a monetized estimate of the full benefits that would accrue to society from the above-discussed impingement mortality and entrainment reductions from the preferred BTA – such as by undertaking a stated preference study or a benefits transfer analysis to estimate non-use benefits for this case – because EPA decided that doing so would be prohibitively difficult, time-consuming and expensive for this permit.
>
> * * *
>
> As a result, EPA has considered the benefits of reducing entrainment (and impingement) mortality *quantitatively* simply in terms of the number of organisms saved by the various options, and then has assessed the overall benefit of saving these organisms on a qualitative basis.

Fact Sheet at 160-61. As explained above in prior responses to comments, EPA has considered the benefits of saving the organisms by evaluating whether entrainment or impingement losses may have been causing or materially contributing to declines in overall aquatic health, and has also considered whether or not shifting to closed-cycle cooling was also needed to limit damaging thermal discharges. In this case, EPA determined that closed-cycle cooling was not needed to address these types of harms. *See* Response to Sierra Club Comment No. IV.A.2.b, above.

Thus, in response to Sierra Club's comment, EPA maintains that its consideration of the quantitative and qualitative benefits of available entrainment technologies for Schiller Station was appropriate and consistent with the Final Rule and past permitting decisions. EPA considered estimates of the raw number of organisms that would be saved by using various technologies, but, consistent with 40 C.F.R. § 125.98(f)(2) and (3), that was not the only factor considered. Furthermore, EPA responded to the results of the economic analysis presented in the Synapse Report, and to Sierra Club's comments on whether the benefits of closed-cycle cooling justify its cost, in Response to Comment IV.A.2, above.

Turning then to Sierra Club's comments that EPA's draft determination that closed-cycle cooling (used seasonally) is the BTA for Merrimack Station is an "excellent point of comparison" to Schiller Station, EPA replies that each BTA determination is site-specific and made based on the singular conditions and circumstances at each individual facility. It is not sufficient to simply transfer a BTA determination made for one facility to a second facility, even if the facilities are located in the same state or owned by the same company. For example, EPA determined that fine-mesh wedgewire screens were the BTA for GE Aviation (NPDES Permit No. MA0003905) on the Saugus River in Lynn, MA, but determined that the BTA for Wheelabrator Saugus (NPDES Permit No. MA0028193), which is located across the river from GE, was not fine-mesh wedgewire screens because the bathymetry of the river on the Wheelabrator side could not accommodate CWW screens. In other words, site-specific considerations resulted in different BTA determinations for two facilities along the same segment of a single river. For the 2014 CWA § 316(b) Final Rule, EPA decided not to identify a single technology as the BTA for entrainment for the entire industrial category precisely because site-specific conditions for different facilities could vary so widely. *See* 79 Fed. Reg. 48338 and 48342. *See also* TDD for the Final Rule at 7-3. EPA decided for the Final Rule that each BTA determination for entrainment should be made on a site-specific basis and "must reflect the maximum reduction in entrainment warranted after consideration of factors relevant for determining the best technology available for minimizing adverse environmental impact at each facility." 40 C.F.R. § 125.98(f). What is "warranted" may vary from facility to facility based on site-specific considerations.

The comparison of draft determinations at Merrimack and Schiller Stations is not as straightforward as Sierra Club suggests.[72] As EPA discussed above, each BTA determination is made independently based on the specific circumstances of the facility at issue. As the Schiller Fact Sheet states, "[t]his is a site-specific decision and closed-cycle cooling might be the BTA at another site under different facts." Fact Sheet at 157. EPA recognizes that, as Sierra Club notes, cooling towers at Merrimack Station are likely to cost more than cooling towers at Schiller Station.[73] EPA has addressed Sierra Club's comments on the cost of the towers in response to Sierra Club's comment IV.A.2.b, above. However, the determination of the BTA at any facility is not simply a matter of the cost of the technology. There are a number of other factors that EPA must weigh when establishing site-specific entrainment requirements, including an assessment of the potential benefits (quantitative, qualitative, and, when available, monetized). *See* 40 C.F.R. § 125.98(f)(2) and (3).

Merrimack Station and Schiller Station are located on different types of waterbodies, each with its own unique physical and biological characteristics. Merrimack Station is located in a relatively slow moving, shallow pool along a segment of the Merrimack River bounded by two dams. In contrast, Schiller Station is located on a relatively deep section of the Piscataqua River, a tidal river with a particularly fast ambient velocity (except during a minimal period around

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[72] EPA also notes that the BTA determinations for Schiller Station and Merrimack Station that Sierra Club refers to are both *draft* determinations. This Response to Comments provides the basis, in part, for the final BTA determination for Schiller Station. EPA is still in the process of reviewing and responding to many hundreds of pages of comments on the Merrimack Station Draft Permit, which include comments on the determination of closed-cycle cooling as the BTA from PSNH, UWAG, and other industry stakeholders, as well as Sierra Club and Conservation Law Foundation. At this time, there is no final BTA determination for Merrimack Station.

[73] EPA notes that the cost estimates Sierra Club references in its comments are not directly comparable. For one, some estimates are given in $2009 and some in $2010. Also, the estimates for Merrimack and in the Synapse report are after-tax, private basis costs for initial and annual costs over the 20-year life of the technology while PSNH's Schiller estimate of about $60 million is only for the construction of the towers.

slack tide). While EPA found that closed-cycle cooling was a viable technology for both facilities, it found that CWW screens was an available option at Schiller Station but not at Merrimack Station due to various site-specific constraints. EPA is, of course, currently considering comments questioning the latter conclusion.

Merrimack Station primarily entrains freshwater fish larvae from April to August and at times, can withdraw a sizeable percentage of the flow in the Hooksett Pool. EPA estimates that Schiller Station, on the other hand, withdraws only about 0.5% of the tidal prism of the estuary. In addition, several species commonly entrained at Merrimack Station have experienced declines in Hooksett Pool, including yellow perch and white sucker. Moreover, for the Draft Permit, EPA also concluded that the Hooksett Pool fish community exhibits overall poor health and an apparently limited ability to recover due in part to continued entrainment (including, at times, the intake of a substantial percentage of the total volume of the Hooksett Pool) and impacts from thermal stress resulting from discharges of heated effluent. The type of adverse species-specific and community-wide biological conditions identified at Merrimack Station were not identified at Schiller Station. Of course, EPA is still considering public comments received that question the Agency's analysis for Merrimack Station. For Schiller Station, EPA concluded that the added benefit of reducing thermal discharges with closed-cycle cooling is not a significant factor, because the facility's existing thermal discharge is not currently considered problematic. EPA found that "… Schiller Station's thermal discharge has not harmed the BIP in the relevant area of the Piscataqua River and would not be expected to do so in the future." *See* Fact Sheet at 69. Having considered the public comments submitted in response to the Draft Permit Schiller Station, EPA continues to find that the record supports its judgment that renewal of Schiller Station's CWA § 316(a) variance with the existing thermal discharge limits will assure the protection and propagation of the BIP in the Piscataqua River.[74]

These differences in physical and biological characteristics between the Schiller and Merrimack Stations also influence the availability of technologies to control entrainment. Based on the information available at the time of draft permit issuance, EPA determined that physical factors (*e.g.*, limited depth, limited space given the large number of screens believed to be required, and relatively slow ambient velocity in late summer and early fall) excluded CWW screens as an option for Merrimack Station and left closed-cycle cooling as the only available technology that could effectively reduce the facility's entrainment. In other words, EPA did not propose CWW as the BTA for the Merrimack Station Draft Permit, because, at the time, it appeared that the conditions necessary for an effective wedgewire screen installation would not exist in the Hooksett Pool on a consistent and reliable basis. As a result, EPA proposed that the only effective technology to minimize entrainment was closed-cycle cooling.

In contrast, wedgewire screens are available at Schiller Station and will effectively reduce entrainment, albeit not to the same level and with the same certainty as closed-cycle cooling. As a result, EPA's proposed determination for the Merrimack Station Draft Permit that closed-cycle cooling should be the BTA to minimize entrainment relied in part on a conclusion that

[74] EPA recognizes that Sierra Club's comments on the Draft Permit dispute EPA's decision to grant Schiller Station a variance from technology and water quality-based standards under Section 316(a) of the CWA. EPA has responded to these comments herein. *See* Responses to Sierra Club Comment IV.C.

wedgewire screens were not an available control technology at that facility. Moreover, as mentioned above, EPA currently considering public comments on its BTA determination for Merrimack Station. EPA has yet to make a final BTA determination for that facility.

The crux of the argument in the comment is that because Schiller Station entrains many times more organisms than Merrimack Station, and because converting to a closed-cycle system is likely to be less costly at Schiller than at Merrimack, cooling towers must be the BTA for entrainment at Schiller. Sierra Club states that "since EPA concluded that cooling towers are economical at Merrimack, a fortiori they are economically justified at Schiller." EPA disagrees. Not only does this conclusion ignore that EPA determined for the Draft Permit that wedgewire screens were not available at Merrimack Station, it would have EPA make its BTA determination purely on the basis of the cost of cooling towers and the quantified entrainment reduction (in terms of absolute numbers of organisms saved). Sierra Club argues that closed-cycle cooling would provide significantly greater benefits at Schiller Station than at Merrimack Station because the absolute number of organisms saved would be larger at Schiller. Yet, EPA does not agree with this conclusion because, as discussed herein, EPA's analyses for the Draft Permits indicates that the ecological significance of converting to closed-cycle cooling would be greater at Merrimack Station. Under previous EPA Section 316(b) determinations based on either best professional judgement (prior to promulgation of new regulations) or the 2014 Final Rule, EPA has considered many more factors than just the cost and number of organisms saved. *See*, for example, Final Region 1 § 316(b) Determinations for Brayton Point Station Permit No. MA0003654 and GE Aviation Permit No. MA0003905; Draft Determination for Pilgrim Nuclear Power Station Permit No. MA0003557.

In the RTC for the 2014 CWA § 316(b) Final Rule, EPA explains as follows:

> EPA also disagrees that under section 316(b), the EPA may only consider one factor - the performance of different entrainment reduction technologies - in determining BTA requirements under section 316(b). *Riverkeeper I* and *II* and the U.S. Supreme Court's decision in *Entergy* establish that, while EPA may consider the factors specified in sections 304 and 306 as relevant factors in its decision-making, it is not limited to those factors. Section 316(b) is a separate and distinct statutory provision from section 301, 304 and 306. (See, for example, page 1506 of 129 S. Ct., which concluded that EPA is not bound to apply only those factors. The court noted that the BTA standards of section 316(b) must "minimize" adverse environmental impacts and contrasted that with the Congressional goal to "eliminate" the discharge of pollutants. Also, the Supreme Court noted that 316(b) contains broader language with additional discretion, describing the statute's silence on certain issues as an indication to "convey nothing more than a refusal to tie the agency's hands.") As a consequence, while EPA may consider factors like those considered in developing its effluent limitations guidelines, EPA has discretion to consider other factors in its decision-making under 316(b).

Final Rule RTC at 83. *See also Entergy*, 556 U.S. at 222, 79 Fed. Reg. at 48,313-14, and Final Rule RTC at 15 ("[T]he language of section 316(b) is silent regarding specifically how stringently cooling water intake structures must be controlled, only that their adverse environmental impacts be 'minimized' and the Supreme Court has held that this gives EPA discretion to consider many factors."). As discussed above and elsewhere in this RTC, the Final Rule establishes a suite of factors that EPA *must* consider (at 40 C.F.R. § 125.98(f)(2)), and a suite of additional factors that EPA *may* consider (at 40 C.F.R. § 125.98(f)(3)), when setting site-specific entrainment controls. The cost of available technologies, and the number of organisms saved, are just two of the eleven factors that EPA must or may consider; notably, the weight given to each factor is at the discretion of the permitting authority based upon the circumstances of each facility. *See* 40 C.F.R. § 125.98(f)(2).

EPA considered all of the factors at § 125.98(f)(2) and the relevant factors at § 125.98(f)(3) in determining the BTA for Schiller Station. After consideration of the information at hand, EPA, independent of the determination for any other facility, determined that, at Schiller Station, the cost of wedgewire screens was warranted by the qualitative and quantitative benefits and that the cost of closed-cycle cooling was not warranted by the benefits it would produce. For this reason and those discussed above, EPA rejects Sierra Club's assertion that the BTA at Schiller Station is closed-cycle cooling because the proposed BTA at Merrimack Station is closed-cycle cooling.

Sierra Club Comment IV.B. EPA's Proposed Determination that Cylindrical Wedgewire Screens are the BTA for Schiller is Arbitrary, Capricious, and an Abuse of EPA's Discretion

Contrary to EPA's finding, cylindrical wedgewire screens are not the best technology available at Schiller. Sierra Club strongly supports EPA's preliminary determination that closed-cycle cooling is the BTA at Schiller and urges EPA to carry it forward into a final NPDES permit.

Sierra Club Comment IV.B.1 EPA's BTA Determination is Arbitrary and Capricious Because It Disregards the Considerable Uncertainty Surrounding the Effectiveness of Wedgewire Screens

Macro-crustacean larvae and eggs make up about 1.3 billion of the roughly 1.59 billion entrained organisms at Schiller (using EPA's adjusted baseline figures). EPA asserts that 100% of formerly entrained macro-crustacean eggs and larvae will avoid the new screens entirely or survive making contact with them. This 100% survival claim drives EPAs conclusions about the relative benefits of wedgewire screens compared to closed-cycle cooling. By assuming that all 1.3 billion formerly-entrained macro-crustacean larvae and eggs survive contact with the new wedgewire system, EPA is able to conclude that 1.47 billion organisms would be saved by wedgewire screens, which is a 92% total reducing in I&E mortality. [162]

Because so much turns on macro-crustacean entrainment survival, EPA's entire BTA analysis is highly sensitive to uncertainty in this survival rate. If EPA has missed the true value of entrainment survival by even 10% (i.e. the true value is a 90% macro-crustacean survival rate), this would equate to a loss of 130 million organisms a year, an 84% total I&E mortality reduction, and a more than doubling of the gap in entrainment survival between cooling towers and wedgewire screens. Thus, even a small degree of uncertainty about macro-crustacean survival dramatically alters EPA's conclusions about the costs and benefits of wedgewire screens relative to cooling towers.

It is therefore disturbing that EPA admits that its estimate of entrainment survival is highly uncertain, but then ignores that uncertainty in its BTA analysis.

EPA's views on the fate of organisms that were formerly entrained but would now come into contact with wedgewire screens differs radically depending on whether the organisms in question are fish or macro-crustaceans. For fish, "[b]ased on EPA's review of various EPRI reports (2003, 2005, 2007), EPA's TDD for the 316(b) rule and our site specific knowledge of the Piscataqua River, EPA estimated egg survival to be 80% and larval survival to be 12%."[163] From this, EPA projects overall fish entrainment mortality reductions of between 37% and 49%, depending on wedgewire screen size.

Sierra Club notes that EPA's TDD, based on the EPRI studies that EPA Region 1 cites as well as other data, note that these are mean survival rates, and that some of the species affected by Schiller may have lower survival rates. And while Sierra Club has not critically reviewed the EPRI studies in question and cannot comment on their quality, in order to derive the 80% egg and 12% larval survival rates, EPA's TDD reviewed multiple lab and field studies. The larger point is that in citing to the TDD and to the studies it is based on, EPA Region 1 is basing its views on survival of formerly-entrained fish larvae and eggs on *something*.

In contrast, EPA's views on macro-crustacean survival rates are based on absolutely nothing. EPA states its belief in 100% entrainment survival of formerly-entrained macro-crustaceans that contact wedgewire screens with a 0.5 fps velocity thus: "EPA estimates a 100% reduction in macrocrustacean entrainment mortality on the grounds that these organisms are hearty enough to survive contact with the wedgewire screens." [164] EPA cites no authority or evidence in support of its belief. As far as Sierra Club can tell, none of the studies that EPA cited for fish egg and larvae survival rates say anything about macro-crustacean fish and larvae. The EPA TDD itself, on which EPA Region 1 also relies, makes no specific statements about macro-crustacean eggs and larvae being hardy enough to survive contact with screens. As Region 1 notes, the TDD concludes generally that among all species studied (overwhelmingly if not exclusively fish species) survival of eggs and larvae is poor. The EPRI 2003 and 2005 studies cited by Region 1 are lab and field studies, respectively, that looked only at fish species. [165]

Sierra Club agrees with EPA that crustaceans are tough critters. But that's not a basis for rulemaking. If anything, the logical implication of the literature is that macro-crustacean survival rates are somewhere between a 100% survival rate and the survival rates for fish egg and larvae.

EPA repeatedly admits that there is "considerable uncertainty" in its estimate of entrainment mortality reduction. [166] EPA starts by noting that it lacks any site-specific evidence of survival rates:

> If egg and larval mortality by entrainment is simply replaced with mortality by impingement, the CWIS's adverse environmental impact will not have been reduced. PSNH's consultants did not, however, evaluate such survival. They only assessed the ability of different screen slot sizes to exclude organisms from being entrained. [167]

EPA then notes that the scientific literature provides little to no help either:

> At present, EPA has insufficient information that directly assesses egg and larval survival after contacting a fine-mesh wedgewire screen. 79 Fed. Reg. 48335-48336, 48435. See id. at 48331…That said, EPA has collected and reviewed some information from the scientific literature…This data suggests that under some circumstances (e.g., low intake velocity) the eggs of some fish species, as well as crustacean larvae, may be capable of surviving contact with a fine-mesh wedgewire screen. [168]

There is an enormous and untenable leap between the idea that "under some circumstances…crustacean larvae, *may be capable* of surviving contact with a fine mesh wedgewire screen" (*Id*., emphasis added), and EPA Region 1's conclusion that all of the macro-crustacean eggs and larvae will absolutely survive contact with Schiller's wedgewire screen. The gap is too wide. To treat EPA's assumption as correct would be arbitrary, capricious, and a clear abuse of discretion.

EPA admits as much. EPA acknowledges that "[t] here is no way, however, for EPA to estimate with any precision whether, or how many, more eggs and larvae would avoid contact with the proposed wedgewire screens than currently avoid contact with the existing CWISs." [169] And EPA provides no estimate of how many of the formerly excluded eggs and larvae would be impinged, and thus certainly would not survive contact with the screens and associated predation. Overall, EPA acknowledges that "[t]here is unavoidably significant uncertainty regarding these estimated survival rates because there is a dearth of such information for fine-mesh wedgewire screens generally, and no information specifically for the proposed installation of such screens at Schiller Station." [170]

In the face of "unavoidably significant uncertainty," [171] the only thing that is certain is that EPA's estimate of 100% entrainment survival is wrong – there is some error rate separating EPA's estimate and the true value of entrainment survival. And since the true rate cannot be more than 100%, the error in EPA's assumption is a bias that overestimates the effectiveness of wedgewire screens.

But in its BTA analysis, EPA treats its assumption of 100% survival as if it is certain. On the basis of that assumption, EPA concludes that cylindrical wedgewire screens will save just 80 million organisms less than cooling towers (using river water) and thus deliver what EPA considers an acceptable performance at the price, compared to cooling towers. [172] In sum, EPA acknowledges "unavoidable, significant uncertainty," but proceeds to make its calculations and BTA determination as if there were no uncertainty. That is arbitrary, capricious, unreasonable, and an abuse of discretion.

Sierra Club agrees with EPA that macro-crustacean eggs and larvae are sufficiently robust that their survival rate will be at least equivalent to that of fish. Thus, the true survival rate of macro-crustacean eggs and larvae is less than EPA's 100% estimate, and equal to or greater than the 37% to 49% rate of fish egg and larvae survival. But for purposes of the BTA analysis at Schiller, that is an enormous range. Every 1% error in the survival rate equates to a loss of 13 million organisms annually. If EPA were accounting for uncertainty properly, it would provide an estimated value and associated uncertainty (margin of error). And in this case, even a small error destroys the reasoning behind EPA's conclusion that "[the] costs are not in this case warranted for the additional margin of entrainment mortality reduction that closed-cycle cooling could achieve." [173]

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[162] Schiller Fact Sheet at 153, Table 10-B.

[163] Schiller Fact Sheet at 154.

[164] Schiller Fact Sheet at 154. Sierra Club assumes that EPA means to describe crustacean larvae as hardy (strong, tough), and not hearty (warm, providing abundant nourishment). Sierra Club is concerned, however, that macro-crustacean larvae drawn to or slowed by contact with a screen may end up providing a hearty meal to predators. Thus, Sierra Club disagrees with EPA's assessment of 100% entrainment survival.

[165] Sierra Club was unable to identify the source cited by EPA as EPRI 2007 – there is no EPRI document dated 2007 in either the Fact Sheet Bibliography or the bibliography to Chapter 6 of the TDD.

[166] Schiller Fact Sheet at 116-117 & 154.

[167] *Id*. at 116.

[168] *Id*. at 116-117-17.

[169] *Id*. at 154.

[170] *Id*.

[171] *Id*.

[172] *Id*. at 154 & 165.

[173] *Id*. at 157.

EPA Response to Sierra Club Comment IV.B.1:

Sierra Club's comment makes two key points: 1) that EPA's estimate of 100% survival of macrocrustacean larvae that come into contact with the wedgewire screens is not supported and has a high degree of uncertainty, and 2) that this macrocrustacean survival assumption "drives" EPA's conclusions about the relative benefits of wedgewire screens and factoring in uncertainty would cause EPA to reach a different conclusion regarding whether the additional cost of closed-cycle cooling is warranted by the incremental benefits in entrainment mortality reduction as compared to the screens.

Turning first to the survival of macrocrustaceans that encounter wedgewire screens, there is substantial support for the assumption that macrocrustacean larvae entrained at Schiller Station would experience significant survival. Sierra Club rightly points out that EPA focused its analysis of survival with wedgewire screens on fish eggs and larvae and should have provided more support for its views about macrocrustacean survival. *See* Fact Sheet at 117, 154. Over 99% of the macrocrustaceans entrained at Schiller Station were crab zoeae (the first, free-swimming larval stage of certain crustaceans, including crabs), and 99% of the crab zoeae entrained were either green crab (*Carcinus maenas*) or Cancer *spp*. (typically Atlantic rock crab (*Cancer irroatus*) or Jonah crab (*Cancer borealis*)). The remaining entrained organisms were at the megalops stage (second larval stage of many macrocrustaceans); no macrocrustacean eggs were observed during entrainment monitoring.

The limited research on the survival of crab larvae that encounter screens indicates that survival is relatively high as compared to fish larvae. In one study, initial survival of 8 species of macrocrustacean zoeae impinged on fine-mesh traveling screens at Big Bend Power Station was greater than 90%, including three crab families (Grapsidae, Pinnotheridae, and Xanthidae) with survival rates above 99% (Taft et al. 1981). *See* AR-381. Latent survival rates at 48 and 96 hours were similar between test and control samples, suggesting that the long-term impacts of encountering the traveling screens were relatively small. This study also compared initial survival of three families of invertebrates (Caridea, Xanthidae, and Pinnotheridae) that had experienced the screenwash or fish return trough and again found no difference between test organisms and control organisms. EPRI (2003) summarized survival estimates of early life stages of crustaceans, demonstrating that these organisms generally have a high tolerance to impingement. Extended survival rates for zoeae and megalops of several taxa of crab and shrimp were in the range of 80 to 100 percent. *See* AR-386 and references therein.

Relatively high impingement survival of macrocrustacean zoeae is not surprising based on the morphology of this life stage. In contrast to fish larvae, which have little musculature, decapod zoeae have a carapace (hard upper shell) and (for the species at Schiller Station) a large dorsal spine, which assist in protecting the zoeae from predation (Morgan 1987). *See* AR-348. It is likely that the carapace and associated appendages may also offer the zoea some protection when contacting a screen. Based on the literature and the morphology of this life stage, EPA concludes that macrocrustacean zoeae are likely to experience relatively high survival if these organisms encounter wedgewire screens at Schiller Station. Although there is some uncertainty in this assessment, available evidence suggests that macrocrustacean zoeae are likely to experience substantially less impingement mortality than fish larvae might experience if encountering wedgewire screens because fish larvae lack the outer protection that the carapace and spines provide to crustacean larvae. Nevertheless, the estimate for the Draft Permit of 100% entrainment reduction may have slightly overstated the potential for macrocrustacean early life stages based on the ability of the screens to physically exclude these early life stages. In response to Sierra Club's comment and based on the information summarized above, EPA has re-evaluated the numbers of macrocrustacean larvae with wedgewire screens assuming that 80% of the larvae survive, based on the lower end of survival estimates in EPRI 2003. *See* AR-386.

EPA has reviewed its analysis of the likely survival of crustacean larvae that encounter wedgewire screens and has determined that, while the Fact Sheet may have somewhat overestimated survival, macrocrustacean zoeae, which make up 99% of the entrained macrocrustacean early life stages at Schiller Station, are likely to experience high survival (at least 80%) if they contact the screens. However, even if the assumption of larval macrocrustacean survival for the Draft Permit was high, EPA disagrees with the comment that the reduction in the entrainment of macrocrustacean larvae "drives" EPA's determination of the BTA for entrainment at Schiller Station. The reasons, discussed in more detail below, are two-fold: first, nearly 56% of the macrocrustaceans entrained (over 748 million larvae) are green crab, which is an invasive species and has little to no ecological value; and second, EPA's review of the costs and benefits focused on fish eggs and larvae, not, as the comment would indicate, macrocrustaceans.

As Sierra Club notes, macrocrustacean larvae make up about 1.34 billion of the roughly 1.49 billion entrained organisms at Schiller, or about 90% of the entrained organisms. Normandeau observed entrainment of zoeae, megalops, and juvenile stages of macrocrustaceans, and, in fact, as explained above, more than 99% of the entrained crustaceans were zoeae. Nearly 56% of total crustacean entrainment was green crab (*Carcinus maenas*), which is an invasive species from Europe. The green crab is a voracious predator with a high tolerance to fluctuations in environmental factors, high fecundity, and a long planktonic larval stage, all of which factor in to its ability to colonize and thrive in new environments. *See* AR-347 (Leignel et al. 2014). The green crab is an omnivorous species and has been shown to negatively impact local populations of aquatic organisms by preying on annelids, gastropods, bivalves, fish, algae, shrimp, and other crabs. In New Hampshire, the invasive green crab is a dominant predator on clams, oysters, crabs, and mollusks and is partly blamed for the collapse of the soft-shell clam industry and the reduction of other commercially important bivalves including scallop and northern quahog.[75] One investigation of the economic impacts of green crabs estimated the economic damage to commercial shellfishing on the East Coast of the U.S. at $22.6 million per year. *See* AR-345 (Lovell et al. 2007). Green crab burrowing has also been linked to salt marsh erosion and loss, and the presence of green crabs is associated with reductions in eelgrass biomass and changes in fish community structure. *See* AR-363 (Aman and Grimes 2016) and AR-346 (Matheson et al. 2016).

Given myriad negative ecological and economic impacts of green crabs in the Piscataqua River, EPA has excluded this species from its quantitative analysis of the benefits of entrainment technologies for the final determination. The decision to exclude green crab is consistent with the Final Rule, which authorizes the Director to determine that "all life stages of fish and shellfish" does not include other specified nuisance species and to exclude nuisance species from the totals for both impingement and entrainment. *See* 40 C.F.R. § 125.92(b); 79 Fed. Reg. at 48,376. The elimination of green crab from the estimate of entrainment reduces total entrainment from about 1.49 billion eggs and larvae (90% macrocrustaceans) in the draft determination to about 740 million eggs and larvae (80% macrocrustaceans).

For the reasons discussed above, EPA disagrees with Sierra Club that there is a high level of uncertainty regarding the ability of macrocrustacean larvae to survive contact with the wedgewire screens and that the assumption that all larvae will survive drives EPA's determination of the BTA based on relative costs and benefits of wedgewire screens and closed-cycle cooling. Having said that, EPA allows that the actual survival rate of crustacean larvae encountering wedgewire screens may be less than 100% (as assumed in the Fact Sheet). In addition, the Fact Sheet failed to explain that the benefits of reducing entrainment of Jonah and Atlantic rock crab (both commercially and ecologically important species) should not be regarded to be equivalent to the benefits of entrainment reductions for green crab (an invasive and ecologically damaging nuisance species).

After considering the comment, EPA has revised its analysis to include a more conservative survival rate for macrocrustacean larvae encountering wedgewire screens and to exclude enumeration of the numbers of green crab individuals saved from comparison of the technologies. The revised analysis is presented in Table 5 and considered in response to comments on the relative costs and benefits and determination of BTA below. Note that this table is the same as the corrected values presented in Table 2 in Response to Sierra Club's

[75] New Hampshire Fish and Game Invasive Species Profiles: Green Crab, available at http://www.wildlife.state.nh.us/fishing/invasive-species.html (last accessed June 6, 2017).

Comment II.D. This analysis demonstrates that, in comparison to wedgewire screens, closed-cycle cooling could reduce entrainment by about 70 million more fish eggs and larvae and about 100 million more macrocrustacean larvae annually.

Table 5. Comparison of entrainment mortality reduction for Schiller Station's existing cooling water intake structure and available BTA options.

	Annual Fish and Macrocrustacean Entrainment Mortality	Estimated % Reduction in Fish Entrainment Mortality	Estimated % Reduction in Macrocrustacean Entrainment Mortality	Estimated Annual Number of Fish Eggs and Larvae Saved	Estimated Annual Number of Macrocrustacean Larvae Saved
No Action	740,076,249	0	0	0	0
Fresh Water Cooling Towers	0	100	100	146,841,244	593,235,005
Salt Water Cooling Towers	22,942,364	96.9	96.9	142,289,165	574,844,720
Wedgewire Screen 1.0 mm	256,677,770	6	80	8,810,475	474,588,004
Wedgewire Screen 0.8 mm	211,156,985	37	80	54,331,260	474,588,004
Wedgewire Screen 0.69 mm	200,878,098	44	80	64,610,147	474,588,004
Wedgewire Screen 0.6 mm	193,536,035	49	80	71,952,210	474,588,004
Ristroph Screens	740,076,249	0	0	0	0

Sierra Club suggests that the reduction in entrainment of macrocrustaceans was the primary factor in EPA's determination of wedgewire screens as the BTA. EPA disagrees with this suggestion. In fact, the comparison of the entrainment reductions and costs between closed-cycle cooling and wedgewire screens focused on entrainment reductions for fish eggs and larvae because it is these entrainment reductions that drive the difference between the two technologies. *See* Fact Sheet at 155 ("[t]here are significant differences, however, between the two technologies' ability to reduce entrainment and entrainment mortality for fish eggs and larvae."). Region 1 estimated that the wedgewire screen option with the smallest slot size is estimated to reduce entrainment mortality for fish eggs and larvae by 49%, whereas closed-cycle cooling would likely reduce entrainment mortality for fish eggs and larvae by 97-100%. However, given the magnitude of the ecological impacts in this case, the cost of closed-cycle cooling in not warranted by the suite of quantitative and qualitative social benefits. EPA concluded that closed-cycle cooling is the best performing technology for reducing entrainment mortality for fish eggs and larvae, but the wedgewire screen options can achieve substantial entrainment mortality reductions at far lower cost. *Id*.

EPA also factored other considerations into its determination, including the size of the cooling water withdrawal relative to the flow of the Piscataqua River, the lack of evidence that the CWISs are causing or contributing to declines in the overall aquatic health of the river, the fact that the CWISs are unlikely to adversely affect endangered species, and the limited additional benefit of reducing thermal discharges, given EPA's conclusion that the current thermal discharge is protective of a balanced, indigenous population. Finally, EPA considered that Schiller Station's Units 4 and 6 have been operating at relatively low capacity factors in recent years and are currently expected to continue to do so (although such trends can change over time). *See* Fact Sheet at 157-158. EPA weighed each of the qualitative and quantitative factors, including the costs and quantified benefits to both fish eggs and larvae as well as macrocrustaceans, to ultimately conclude that the costs of fine-mesh wedgewire screens are justified by the benefits and that, in this case, the substantial cost of closed-cycle cooling is not warranted by the benefits that it would provide. *See* Fact Sheet at 157. EPA has determined that the selected BTA will achieve the maximum warranted reduction in entrainment after consideration of the relevant factors under 40 C.F.R. § 125.98(f)(2) and (3), including comparative social costs and benefits.

Sierra Club Comment IV.B.2 EPA's Proposed Determination is Facially Arbitrary and Capricious Because It Departs Drastically from the Merrimack BTA

Set aside, for a moment, every issue that Sierra Club has raised in these comments about inflated cost estimates, underestimated impingement and entrainment, and EPA's disregard for uncertainty. Even assuming that the data presented in the Fact Sheet is entirely correct and completely certain, EPA Region 1's analysis would still be facially arbitrary when compared to EPA's past BTA determinations: EPA is not treating like power plants alike.

As noted previously, this is not EPA Region 1's first BTA determination. EPA Region 1 has determined that closed cycle cooling is the BTA at two other plants: Brayton Point, and Merrimack. A comparison of the situation of the Merrimack plant with the Schiller plant illustrates just how irrational it is for EPA to propose selection of wedgewire screens as BTA.

The Merrimack power plant draws more than twice as much water as Schiller (285 MGD) and thus cooling towers at Merrimack are proportionately more expensive than at Schiller. But as noted above, Schiller kills about 1.596 billion organisms annually while Merrimack kills 3.8 million. Schiller kills 420 times more fish than Merrimack. [174] And cooling towers for Schiller would cost less than half as much as they would for Merrimack. Since EPA determined that cooling towers were the BTA to protect aquatic life at Merrimack, they are certainly the BTA at Schiller, where they will save 420 times more fish at half the price.

Powers Engineering's analysis and the EPRI model both suggest that cooling towers at Schiller should cost about 25% -30% of what they cost at Merrimack (about $25-$30 million at Schiller, vs. $100 to $110 million at Merrimack). Even on PSNH's inflated cost estimate of $60 million, cooling towers at Schiller cost about half what they did at Merrimack. And EPA found spending $100 million on cooling towers to be cost-justified and thus "available" at Merrimack to save about 4 million organisms annually.

Taking all of EPA's figures at face value (i.e. ignoring uncertainty), opting for cooling towers over wedgewire screens at Schiller would save at least 80 million organisms annually. That is, EPA estimates that 1.55 billion organisms would be saved by cooling towers (assuming 96% macro-crustacean egg and larvae survival), while 1.47 billion organisms would be saved by wedgewire screens (assuming – unrealistically -100% macro-crustacean egg and larvae survival).[175] The difference is 80 million more organisms saved by cooling towers.

So at minimum, making all possible assumptions in favor of wedgewire screens, the question facing EPA is this: since it is worth spending $100 million at Merrimack to save 4 million organisms per year, why isn't it worth spending $25-$60 million to save 80 million organisms per year at Schiller? The only rational answer is yes. EPA's determination that cooling towers are not cost-justified at Schiller is an abuse of discretion.

Note further that if EPA were to use the correct BTA comparison technology -wet cooling towers with grey water makeup -the differential between towers and screens rises further: 1.596 billion organisms would be saved by cooling towers vs. 1.47 billion organisms saved by wedgewire screens, [176] and thus opting for cooling towers over wedgewire screens would save an additional 126 million organisms annually.

For legal purposes, however, the question of whether cooling towers would save 126 million more organisms or "just" 80 million more organisms annually is academic. EPA Region 1 determined – *correctly* –that for the Merrimack power plant, wet cooling towers costing $100 million were the best technology available to save 4 million fish a year. Taking everything EPA writes in the Fact Sheet as correct, taking PSNH's inflated costs estimates at face value, and deciding every uncertainty in favor of wedgewire screens, it is still patently absurd for EPA to turn around after the Merrimack BTA determination and decide – *on the basis of relative costs* – that wet cooling towers costing $60 million or less (on PSNH's inflated estimates) are *too expensive* to be the best technology available to save 80 million organisms per year at Schiller (much less the hundreds of millions that Sierra Club believes will actually be saved).

[174] Merrimack NPDES Permit-Attachment D, at xiv.

[175] See Schiller Fact Sheet at 153, Table 10-B.

[176] Again, this uses EPA's considerably uncertain and totally unsupported assumption that wedgewire screens will lead to 100% survival by previously entrained macro-crustacean eggs and larvae.

EPA Response to Sierra Club Comment IV.B.2:

Sierra Club comments that, since EPA determined that cooling towers were the BTA to protect aquatic life at Merrimack, they are certainly the BTA at Schiller, where they will save 420 times more fish at half the price. The value of 420 times the fish at half the price is based on estimates in the Fact Sheet that Schiller kills about 1.596 billion organisms annually while Merrimack kills 3.8 million (or "420 times more fish"). As discussed in Response to Sierra Club Comment II.D, the estimate of 1.596 billion organisms has been revised to 740 million organisms per year, which is still about 195 times the number of organisms killed from entrainment at Merrimack Station. Sierra Club also characterizes this difference as "420 times more fish," which is not representative of the actual impact. The CWISs entrain 740 million eggs, larvae, and juvenile life stages of fish and macrocrustaceans, which is not the same as "fish" as described in the comment. That being said, EPA recognizes and responds to the intent of the comment, which is to say that, based on the proposed determination that closed-cycle cooling is the BTA at Merrimack Station where about 3.8 million eggs and larvae are entrained annually, it follows (according to Sierra Club) that closed-cycle cooling must be the BTA at Schiller Station, where about 740 million eggs and larvae, including about 146 million fish eggs and larvae, are entrained annually and where the cost of closed-cycle cooling at Schiller Station is less than the cost at Merrimack Station.

Sierra Club comments that it is "patently absurd" for EPA to determine – on the basis of relative costs – that closed-cycle cooling is not the BTA for entrainment at Schiller Station where the technology is less expensive and saves many more organisms than at Merrimack Station, where EPA determined that closed-cycle cooling is the BTA. EPA responds that the determination at Schiller Station was not, as Sierra Club's comment argues, based only on the relative cost of cooling towers and wedgewire screens. Second, EPA responds here and elsewhere that the site-specific draft BTA determination for Merrimack Station was based on the individual circumstances and distinctive conditions for that facility and that waterbody and is not directly applicable to the site-specific conditions and circumstances for Schiller Station and the Piscataqua River. Finally, EPA observes that Sierra Club appears to argue that closed-cycle cooling is clearly the BTA for Schiller Station, based on the BTA at Merrimack Station, because the technology will save more organisms for less money at Schiller. Yet, each BTA determination is a site-specific decision based on the facts and issues at that site and the assessment in one case is not determinative of what the decision should be a different facility.

The determination at Schiller Station was not, as Sierra Club's comment suggests, based only on the relative cost of cooling towers and wedgewire screens. The section of the Fact Sheet that includes the comparative analysis of technologies (Section 10) considers "their respective costs, cost-effectiveness and relative costs and benefits as part of its determination of the proposed BTA for Schiller Station's CWISs." Fact Sheet at 148. EPA did conclude that "under the facts of this case," the far greater costs of closed-cycle cooling, as compared to the fine-mesh wedgewire screen option, are not warranted by the additional margin of reduction in adverse environmental effects that it could achieve. EPA also concluded that the additional benefit of reducing thermal discharges is not significant here because the impacts of the thermal discharges at Schiller Station are not considered particularly problematic. *See* Fact Sheet at 157 ("[T]he added benefit of reducing thermal discharges by approximately 95% with closed-cycle cooling is not a significant factor because the facility's thermal discharge is not considered particularly problematic. This is a site-specific decision and closed-cycle cooling might be the BTA at another site under different facts.").

Sierra Club appears to interpret this conclusion to imply that EPA limited its analysis to the costs and reduction in entrainment for each technology, but this was not the case. As the Agency explained:

> EPA reaches this conclusion in light of the moderate size of Schiller Station's water withdrawal and its relatively small withdrawal relative to the flow in the Piscataqua River. In addition, EPA's judgment is influenced by the fact that while the Facility's entrainment of eggs and larvae is significant, it has not been associated with higher level impacts, such as major effects on local populations of impacted species or the overall community of organisms in the river, or with impacts to endangered species. In addition, Schiller Station's Units 4 and 6 have been operating at relatively low

> capacity factors in recent years and this trend is currently expected to continue (although such trends can change over time).[76]

Fact Sheet at 157-58. EPA concluded that the cost of the closed-cycle cooling option is not warranted by the benefits it would achieve. These benefits considered here include not only quantitative benefits (*i.e.*, the number of eggs and larvae that would be saved) but also qualitative benefits, including the benefit of reduced thermal discharges, the overall effect of the CWIS on the aquatic health of the waterbody, and the value of the entrainment reductions to the Great Bay Estuary. As the Fact Sheet states:

> All things being equal, the greater reduction in mortality from entrainment and impingement, the greater benefits that will be achieved. At the same time, it should also be understood that, as mentioned above, EPA has no evidence that entrainment and/or impingement losses at Schiller Station are causing or significantly contributing to declines in local populations of the affected species of aquatic organisms or to disruptions in the local community or assemblage of organisms in the Piscataqua River. This is not surprising given that Schiller Station's withdrawal of 125 MGD is only 0.5% of the tidal prism of the Piscataqua River Estuary (approximately 25,000 MGD).

Id. at 158. Sierra Club posits that because Schiller Station entrains more organisms than Merrimack Station, the impacts of entrainment must be greater and, as such, the BTA for entrainment should be the same.

Yet, the comment's simple quantitative comparison ignores the context of the potential impacts from entrainment both due to the volume of water entrained relative to the source water and the potential impacts of the loss based on the life history of the organisms themselves. Schiller Station entrains an estimated 0.5% of the tidal prism – in other words, 0.5% of the volume of the Piscataqua River that flows past the facility is estimated to be drawn into the CWISs at design flow. In comparison, on average, Merrimack Station entrains about 9% of the mean annual flow of the Merrimack River and can entrain 42% or more of the river volume under minimum flow conditions. In addition, compared to freshwater fish larvae, marine fish larvae tend to be smaller at hatching, experience higher mortality rates, and have longer stage durations. In part due to the relatively high mortality of marine larvae, marine fish species tend to have high fecundities and produce abundant progeny.

Furthermore, as has been stated earlier, each BTA determination under the Final Rule is a site-specific, case-by-case determination. *See* 40 C.F.R. § 125.98(f). The entrainment provisions of the Final Rule "reflect EPA's assessment that there is no single technology basis that is BTA for entrainment at existing facilities, but instead a number of factors that are best accounted for on a site-specific basis." 79 Fed. Reg. at 48,303. Differing circumstances from facility to facility will

[76] Sierra Club concedes elsewhere that the influence of this last point—that Unit's 4 and 6 have in recent years been operating at relatively low capacity factors—on EPA's BTA determination is "understandable." *See* Sierra Club Comment IV.B.3.

naturally affect the determinations, such that the BTA at one facility will not necessarily be the BTA at another. A proposed determination for Merrimack Station[77] does not mandate a particular result for Schiller Station, in part because of the differences between the facilities, the entrainment control technologies available to each, the waterbodies from which they withdraw, and their impacts on those waterbodies, as EPA has explained above. *See* Response to Sierra Club Comment IV.A.3. EPA's proposed determination that closed-cycle cooling is the BTA to minimize entrainment at Merrimack Station relied at least in part on a conclusion that wedgewire screens were not an available control technology at that facility, which, again, is not the case for Schiller Station. In any event, nothing in the Clean Water Act guarantees that every facility will be required to meet the exact same standard. *See Nat. Res. Def. Council, Inc. v. U.S. EPA*, 859 F.2d 156, 201 (D.C. Cir. 1988) (noting that the "statute simply does not *require* uniformity in all circumstances").

Lastly, EPA agrees with Sierra Club that "this is not EPA Region 1's first BTA determination" and notes the many site-specific BTA determinations for other facilities in which Region 1 has concluded that a technology other than closed-cycle cooling is the BTA for entrainment. *See, e.g.*, BTA determinations for GE Aviation (NPDES Permit No.MA0003905), Gillette (NPDES Permit No. MA0003832), University of Massachusetts Boston (NPDES Permit No. MA0040304), and Wheelabrator Saugus (NPDES Permit No. MA0028193). *See also* Responses to Sierra Club Comments IV.A.1, IV.A.3. As befits an objective, case-by-case permitting regime, EPA has found converting to closed-cycle cooling to be the BTA for some facilities but not for others.

Sierra Club Comment IV.B.3 If Cylindrical Wedgewire Screens Are Selected as BTA, the Permit Must Contain a Water Withdrawal Limit

Despite all of the above, Sierra Club understands EPA's interest in exploring the use of cylindrical wedgewire screens in light of the fact that two of Schiller's units have had low capacity factors for several years. EPA notes in [177] the Fact Sheet that these low capacity factors influence its judgment. See Fact Sheet at 158. That influence is understandable.

Sierra Club agrees that if the permit contained both seasonal outages as EPA proposes, and certainty about the current low water-withdrawal rates – which could be achieved through an enforceable permit term controlling the volume of water withdrawals – that the selection of cylindrical wedgewire screens at Schiller would not be an abuse of EPA's discretion. With 0.5 mm wedgewire screens, a 0.2 fps through-screen velocity, seasonal outage for maintenance as

[77] EPA reiterates that the BTA determination for Merrimack Station referred to in the comment is not a final determination. Since issuance of the Merrimack Station Draft Permit, the promulgation of new regulations, in combination with new information about the design, effectiveness, and availability of wedgewire screens at Merrimack Station, prompted EPA to prepare a Statement of New Information and request public comment on, among other things, the potential for wedgewire screens to be the BTA for entrainment at Merrimack Station. EPA is now reevaluating whether wedgewire screens should be EPA's preferred technology for controlling entrainment at Merrimack Station in light of public comments and new information suggesting potentially better-than-previously-estimated performance of wedgewire screens and the possible resolution of logistical and engineering issues. *See* Response to Sierra Club Comment IV.A.3. EPA is not prejudging the result of that reevaluation, and, thus, we find unpersuasive the argument that a ***draft*** determination for another facility mandates the same result for a different facility.

proposed by EPA, and a water withdrawal limit that achieves current or lower capacity factors, Sierra Club believes that impingement and entrainment mortality are likely to decrease to a level nearly comparable to a closed-cycle cooling system drawing from the Piscataqua for makeup water.

EPA reached its proposed BTA determination in light of the fact that Schiller's coal burning units "have been operating at relatively low capacity factors," a trend that is expected to continue. [178] But EPA acknowledges that trends such as these may change over time. In order to ensure the level of environmental protection achievable today, the selection of wedgewire screens as BTA should be backstopped by an enforceable water withdrawal limit that would preserve the current low-capacity factor conditions (around 10 percent for Schiller's coal burning units). Without such a limit, the environmental improvements achieved by wedgewire screens would be impermanent, and subject to unpredictable events in the energy markets, the weather, and elsewhere.

[177] Schiller Permit Fact Sheet at 158.

[178] *Id*.

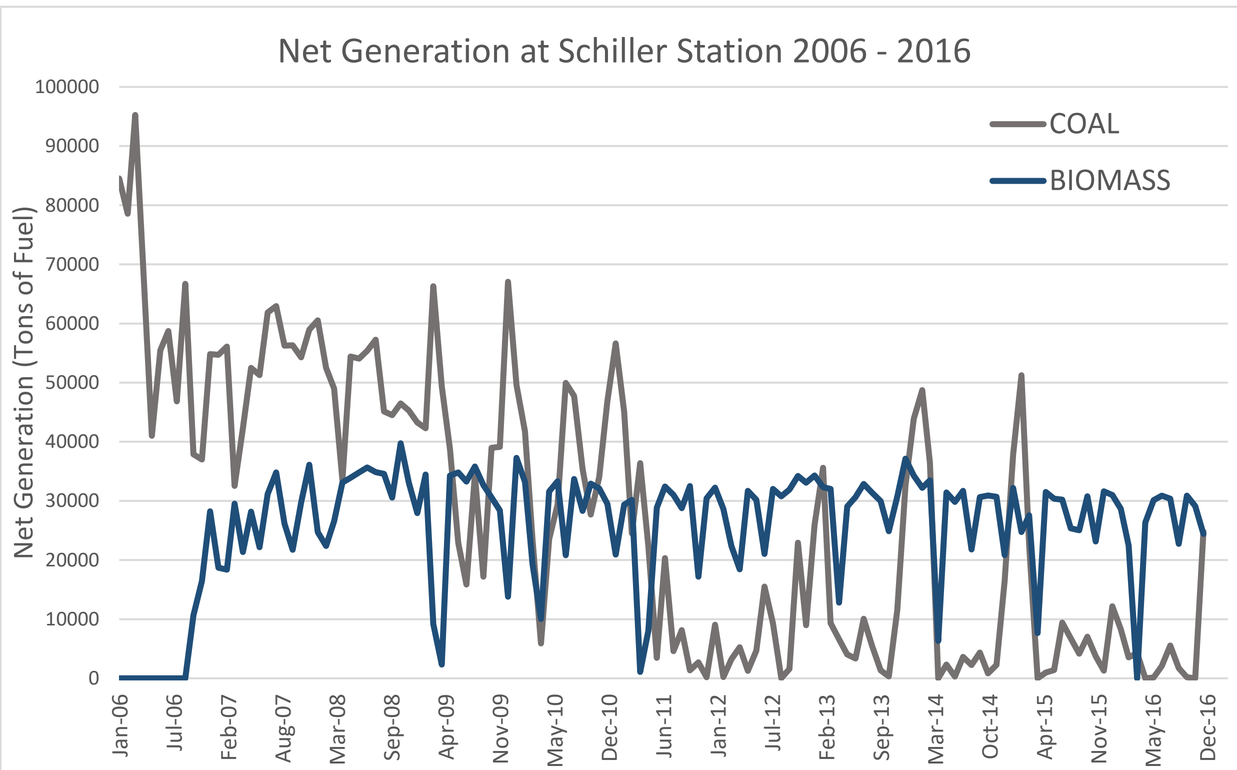
EPA Response to Sierra Club Comment IV.B.3:

According to Sierra Club, if the permit mandates seasonal outages, a water withdrawal limit that requires PSNH to maintain the current capacity factor or lower, a slot size of 0.5 mm, and a through-slot velocity ("TSV") of 0.2 fps, the impingement and entrainment mortality reductions achieved would be "nearly comparable" to closed-cycle cooling using seawater. The comment appears to reprise a recurring theme of Sierra Club's comments: that closed-cycle cooling is the only justifiable BTA for entrainment and impingement at Schiller Station because it reduces entrainment by the most of the technology options. EPA has already responded to this theme. *See* Responses to Sierra Club Comment IV.A.1, IV.B.2. Sierra Club also comments that without the water withdrawal limit "the environmental improvements achieved by wedgewire screens would be impermanent."

First, with respect to the comment that slot size and TSV must be 0.5 mm and 0.2 fps, respectively, EPA responds in detail to comments on the recommended design parameters of wedgewire screens as the BTA for entrainment at Schiller Station elsewhere in these Responses to Comments and incorporates those responses by reference here. *See* Responses to Sierra Club's Comments IV.B.1, IV.B.4. EPA has also responded to comments about the maintenance outage in the Response to PSNH's Comment V.B.6. With respect to the suggestion that only impingement mortality reductions associated with closed-cycle cooling are the BTA for impingement, EPA reiterates that either closed-cycle cooling or wedgewire screens with a maximum design TSV of 0.5 fps would satisfy the permittee's obligation under Part 125 to comply with the BTA standard for impingement. *See* Fact Sheet at 152 (citing 40 C.F.R. § 125.94(c)(1), (2)). The comment also fails to offer any explanation for its implicit assertion that the 87.5% estimated impingement mortality reduction associated with wedgewire screens operated at facility design flow cannot satisfy the BTA standard for impingement. *See* Response to Sierra Club Comment IV.A.1. Below, EPA responds further to Sierra Club's comment about the need for a water withdrawal limit to comply with BTA requirements for entrainment.

As Sierra Club states, the operation of Schiller Station has changed dramatically since 2008, when the engineering response and biological report were completed. At that time, the facility was still operating as a baseload facility and the average daily withdrawals between 2002 and 2007 were about 7.3% less than design flow. *See* Fact Sheet at 93. At the time that the Draft Permit was issued, Schiller Station Units 4 and 6 were no longer operating as baseload, but rather to meet electricity needs during peak load times, generally during the winter and, less commonly, in the summer months. *See* Fact Sheet at 149. Figure 4, below, illustrates the shift from coal to biomass as the primary fuel source for Unit 5 beginning in mid-2011 and the declining net generation at coal-burning Units 4 and 6 in the last 5 years or so. *See* AR-402. Based on discharge monitoring data from 2012 through 2016, Schiller Station is operating at average intake flows equal to 67.8 MGD, which is about 46% less than design flow (in comparison to the 7.3% difference based on flows from 2002 to 2007). This decline is largely due to decreases in the intake flows at Units 4 and 6, which are operating at an average of about 35% and 30% of DIF, respectively.

Figure 4. Net generation (tons of fuel) from 2006 through 2016 based on plant-level data from the U.S. Energy Information Administration.



EPA did not factor this change in operation into its assessment of the adverse environmental impacts from entrainment. The estimated numbers of eggs and larvae entrained, and of adults and juvenile fish impinged, were based on the capacity at design intake flow (at maximum pumping capacity at each unit is 125.8 MGD), not actual intake flows.[78] *See* Fact Sheet at 93. EPA chose to evaluate impacts based on design flow because PSNH requested to operate at this flow in its in its 1995 permit application (AR-044) and in the updated application submitted in 2010 (AR-139), and, as such, it represents the worst case for entrainment.

EPA also assessed the efficacy of technologies based on operation of all three generating units at design flow because these are the conditions that PSNH requested in its permit applications. *See* AR-139 and AR-044. PSNH has not indicated that it plans to operate at lower capacity in the future and, as EPA recognized, "there is no way to predict with certainty the seasonal or annual capacity factor for each unit." Fact Sheet at 149. However, Part I.A.13.a.3 of the Draft Permit does require the permittee to shut down intake pumps when a unit is not operating and water is not needed for fire prevention or other emergency conditions. Given that Units 4 and 6 are running infrequently based on the past few years of operations, this reduction in cooling water could substantially reduce entrainment at the facility as compared to the potential for entrainment at DIF. As an example, based on the actual average monthly intake flows for Units 4 and 6 from 2012-2016 as compared to the DIF, the reductions in cooling water flows would result in an entrainment reduction of 49%, which is equivalent to nearly 72 million fewer fish eggs and larvae entrained per year over this period. EPA did consider that Units 4 and 6 have been operating at a relatively low capacity factor in recent years in its evaluation of the relative costs and qualitative benefits of available entrainment technologies. While the Final Permit stops short of establishing a limit requiring Schiller Station to reduce its intake flow, the recent declines in generating capacity at Units 4 and 6, which are likely largely influenced by the shift towards natural gas-fired generation in New England,[79] are expected to continue. *See* Fact Sheet at 158, 161, and 166.

At the same time, EPA endeavored to establish a more permanent and enforceable solution to minimize entrainment at Schiller Station. As Sierra Club notes, the Draft Permit authorizes the permittee to withdraw the maximum daily design flow at the CWISs, requiring only that Units 4 and 6 shut down when not in operation. Because this permit condition is required "to the extent practicable" and, because it is dependent on market conditions, it is not a permanent technology for reducing entrainment. EPA believes that wedgewire screens, the BTA for entrainment, operated consistent with other permit conditions, will ensure that the requirements of § 316(b) are met. Wedgewire screens are a permanent installation that will be run year-round with minimal exceptions for use of an emergency intake. *See* PSNH Comment and EPA Response V.B.7. The technology will provide continuous protection from entrainment and impingement whether the Units operate at design flow or not.

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[78]In the attachment to PSNH's Comment VII.A.1, Enercon points out that the design intake flow (DIF) at Schiller Station is 125.8 MGD based on the design capacity of the intake pumps of 42.2 MGD at Unit 4 and 41.8 MGD at Units 5 and 6. *See* AR-140 at 9-10; AR-227 at 21 (Table 1). This DIF is slightly higher than the DIF of 124.4 MGD used to estimate total entrainment in the Fact Sheet at 93.
[79] See, for example, ISO New England 2015 Regional System Plan available at https://www.iso-ne.com/system-planning/system-plans-studies/rsp.

EPA agrees that the entrainment reductions and accompanying environmental improvements that may have been realized over the past few years as a result of the limited generating capacity at Units 4 and 6 cannot be guaranteed. However, EPA has assessed the BTA for entrainment based on the year-round use of a permanent technology under design operating conditions consistent with the permit application (*i.e.*, design flow). EPA disagrees with Sierra Club's comment that without a flow limit preserving the low AIF at Units 4 and 6, "the environmental improvements achieved by wedgewire screens would be impermanent, and subject to unpredictable events in the energy markets, the weather, and elsewhere."[80] The entrainment reductions achieved with wedgewire screens as assessed in the Fact Sheet and elsewhere in this response to comments are based on operating at the design flow. Any reductions that result from a reduction in generating capacity, and thus cooling water flow, at Units 4 and 6 will be additional benefits that EPA does not rely on in calculating entrainment reductions, although the likely continued limited capacity at these units is one of many qualitative factors that EPA considered in evaluating the relative costs and benefits of wedgewire screens versus closed-cycle cooling. In addition, the screens will be designed at a through-slot velocity of 0.5 fps or less, which will provide year-round compliance with one of the alternative impingement mortality standards under the Final Rule. For these reasons, and those provided in EPA's Responses to Sierra Club's Comments IV.A.1 and IV.B.2, EPA does not conclude that closed-cycle cooling is the BTA for entrainment at Schiller Station, or, as this comment rephrases it, that wedgewire screens with a water withdrawal limitation are necessary to comply with the requirements of § 316(b).

Sierra Club Comment IV.B.4 If EPA Selects Cylindrical Wedge-Wire Screens It Should Require a Screen-Slot Size of 0.5 mm and a Through-Slot Velocity of 0.2 fps.

The attached Petrudev Report finds that the most effective use of wedge wire screens at Schiller would operate with 0.5 mm slot-size screens, at a velocity of 0.2 fps. [179] If EPA selects wedgewire screens as BTA in the final permit, Sierra Club urges this configuration be required. Petrudev's proposed slot-size of .5 mm is .1 mm narrow than the smallest slot-size under consideration in EPA's proposed BTA determination and will produce commensurate reductions in entrainment.

The lower through-slot velocity will provide greater reductions in larval impingement and entrainment. Studies detailed in the Petrudev report support the conclusion that a 0.2 fps velocity will eliminate juvenile and adult impingement, and substantially reduce entrainment by up to 85-90% -although this does not equate to a similar reduction in entrainment mortality.

Petrudev notes that there is significant uncertainty about the survival of formerly entrained organisms that contact or are impinged on the screens. [180]

The uncertainty about survival rates is a further argument in favor of lower velocity. All else being equal, decreasing the through-slot velocity to 0.2 fps will help limit the significant uncertainty inherent in EPA's unsupported assertion that wedgewire screens will lead to a 100%

[80] EPA notes that any technology, including closed-cycle cooling, can face potential issues due to unusual, unpredictable events. This is not an issue solely for wedgewire screens. Moreover, methods for responding to particular potential concerns such as frazil ice and other types of screen clogging have been identified.

decrease in entrainment mortality of macro-crustacean eggs and larvae. As a general matter, the slower through-screen velocity increases the likelihood that cross-flow and avoidance behaviors will reduce egg and larval screen contact. In Section 6 of their attached report, Petrudev suggests that if wedgewire screens are used, a through-screen velocity reduction from 0.5 fps to 0.2 fps could reduce entrainment (not entrainment mortality) by around 10%, which equates to about 160 million fish and crustacean eggs and larvae annually. [181] Since a significant fraction of that reduction in entrainment due to reduced velocity is due to increased success of avoidance behavior, it is reasonable to assume that a 0.2 fps velocity would actually reduce contact with screens and thus would reduce the uncertainty in EPA's estimate of entrainment mortality.

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[179] Petrudev Report at 6-6 – 6-7.

[180] *Id*. at 6.8.

[181] *Id*. at 6-6 to 6-7 (suggesting that CWWS entrainment reductions of up to 75% may be possible at 0.5 fps, while 85%-90% is attainable at 0.2 fps).

EPA Response to Sierra Club Comment IV.B.4:

Sierra Club comments that, if EPA selects wedgewire screens as BTA in the Final Permit, it should require the screens to have a 0.5 mm slot-size and operate at a through-screen velocity of 0.2 fps because, according to Sierra Club, screens with these characteristics would be "the most effective use of wedge wire screens at Schiller." Sierra Club provides additional analysis in support of this comment in Exhibit 3 of its comments ("Petrudev Report"). EPA responds to the comment and supporting material below.

In its initial assessment in 2008, Enercon estimated reductions in entrainment of fish eggs and larvae ranging from 11.5% at 1.0 mm to 94.4% at 0.6 mm as the percentage of individuals that would be excluded based on the slot size and egg diameter or larval body depth. *See* AR-140 Attachment 6 and Fact Sheet at 110. EPA considered that not all of the eggs and larvae exposed to, but not entrained by, the screens would survive that encounter, resulting in more conservative effective entrainment reductions of 6% at 1.0 mm to 49% at 0.6 mm. *See* Fact Sheet at 117-118. It is these entrainment estimates that EPA relied on in its evaluation of the effectiveness and relative costs and benefits of available technologies and ultimate determination that wedgewire screens are the BTA for entrainment at Schiller Station.

The Petrudev Report selects a slot size of 0.5 mm based on field studies (EPRI 2005, 2006) which, according to the report, are "more realistic than theoretical predictions" of physical exclusion based on literature values of egg diameter and larval body depth provided in the 2008 Engineering Response. Petrudev Report at 6-7 (citing AR-140 Attachment 6). While EPA agrees that the entrainment reduction estimates based solely on physical exclusion have certain limitations, it does not necessarily follow that the field studies cited by Petrudev are without limitations of their own.

With respect to estimates based solely on physical exclusion, the analysis predicts that an organism with a diameter or body depth greater than the wedgewire screen slot size will not be entrained, which assumes that eggs and larvae could not be extruded through a slot size smaller than the measurement of greatest width of the organism. Research has observed, however, that eggs, for instance, may be entrained at screens with slot sizes of 0.5 mm even though the egg diameter is greater than 0.5 mm, albeit at significantly lower rates than at screens with slot sizes larger than the egg diameter. *See, e.g.*, AR-334. On the other hand, estimates based solely on physical exclusion ignore reductions in entrainment due to larval avoidance and hydrologic bypass, both of which Sierra Club and Petrudev acknowledge are factors in reducing entrainment at wedgewire screens.

EPA's estimates of entrainment reductions with wedgewire screens are likely conservative for at least two reasons. First, they do not account for avoidance, which is likely to occur, even while recognizing that not every organism with a depth measurement or diameter greater than the slot size will be excluded. Second, Normandeau's analysis based on physical exclusion assumes that larval body depth is equal to the transition size for each stage, whereas actual larval depth is likely to be greater because not every larva is likely to be the age at transition (*i.e.*, some larvae will be between transition stages and therefore larger than the size at transition, which Normandeau conservatively assumed). Petrudev suggests that Normandeau's values for egg diameter and larval greatest body depth are not site-specific, but offers neither evidence that these values are inappropriate for the organisms at issue nor support for the argument that body depth and egg diameter are likely to change drastically with location. Petrudev Report at 3-4 to 3-5. EPA has no reason to believe that the values in Attachment 6 to the 2008 Response are not reasonable approximations for these species.

The field studies which Petrudev used to estimate entrainment reductions at Schiller Station have certain limitations as well.[81] Unlike laboratory studies, which control the conditions of the study and can more precisely quantify entrainment reductions, field studies are subject to considerable variability in the number of larvae exposed to the screens in any given run. In the field studies cited by Petrudev, the 0.5 mm and 1.0 mm screens were not run concurrently and were not exposed to the same densities of organisms, and the high variability between runs and between screens may complicate analysis of the results. This is not to say that these field studies are not valid for examining the potential effectiveness of CWW screens, but that these field studies should be considered in concert with results from laboratory and modeling efforts to assess the overall effectiveness of screens.

In addition, the field studies only observed 0.5 mm and 1.0 mm screens; they did not investigate screens of intermediate slot sizes such as 0.8 mm, which is the largest slot size required by the Draft Permit. To EPA's knowledge, none of the laboratory or field studies have studied slot sizes between 0.5 and 1.0 mm in order to determine if a 0.5 mm slot size would be substantially more effective than either 0.6 mm or 0.8 mm. Thus, there is considerable uncertainty as to whether Petrudev's field studies provide sufficient support for Sierra Club's assertion that screens with Sierra Club's preferred characteristics (*i.e*., 0.5 mm slot size and 0.2 fps TSV) would be "the most effective use of wedge wire screens at Schiller." In any case, the Draft Permit requires a pilot study to identify the most appropriate slot size for the site-specific conditions in the Piscataqua at Schiller Station, including analysis of site-specific egg diameter and larval greatest

[81] EPA notes that Petrudev offers an estimated entrainment reduction of 75% for fish eggs and larvae and 85-90% for macrocrustacean larvae based on three field studies but does not provide any additional information on how these values were calculated.

body depth. EPA has concluded that recommending a conservatively small slot size in the Draft Permit and requiring a pilot study to examine effectiveness and determine the optimal slot size for the site-specific conditions at Schiller Station is the best approach.

Petrudev also indicates that a through-slot velocity of 0.2 fps, as compared to a 0.5 fps required in the Draft Permit, will provide greater reductions in larval impingement and entrainment by eliminating juvenile and adult impingement and reducing entrainment (though not necessarily entrainment mortality) by up to 85-90%. Petrudev notes that the uncertainty regarding survival of organisms that contact the screens favors a lower through-screen velocity, which Petrudev argues will allow more individuals to avoid contact. In support of its 0.2 fps requirement, the Petrudev Report references prolonged swim speeds for alewife (Klumb et al. 2003) and golden and silver perch larvae from Australia (Kopf et al. 2014), although alewife larvae are not entrained in significant numbers and perch larvae are not present at Schiller Station. In addition, burst swimming speed (the mechanism that allows larvae to escape predators) would be a more appropriate metric to assess if larvae can avoid screens since they would need only to be able to escape the relatively small zone of influence of the screen. Petrudev references a literature review that investigated burst swim speeds for a multitude of species and environments (Miller et al. 1988) and concludes "larval fish as small as 3.8 mm can attain burst speeds of 6 cm/s (0.2 fps) and likely would not be able to overcome an *approach* velocity of 0.5 fps."[82] Petrudev Report at 6-7 (emphasis added). *See also* AR-326. Miller's regression can be used to calculate that a 3.8 mm larva could achieve burst speeds of 0.2 fps and that a 12 mm larvae could achieve burst speeds of 0.5 fps. The r^2 value of the regression, however is 0.46, suggesting there is substantial variability in the regression not explained by larval size alone, meaning that larval size alone cannot predict burst speed. Miller, et al., note that differences in swimming ability of species with substantially different morphologies at the same body size accounts for some of the variability, as well as differences in the methods used to estimate swimming speed in different studies of the same species. There is also substantial variability in swim speeds for larvae of the same size. For example, at a larval size of 4 mm, observed burst speeds ranged from about 0.07 fps (2 cm/s) to more than 0.5 fps (15 cm/s). The variability in burst swimming speed appeared to be greater than for sustained speeds. Generally, EPA agrees that a lower velocity would likely allow smaller larvae to potentially escape, but EPA is not convinced that 0.2 fps, or for that matter, 3.8 mm larvae, is a necessary threshold that would warrant a change in the permit conditions.

EPA agrees with Petrudev that larval fish swimming ability generally increases with size. Normandeau's comments on the Draft Permit include a model predicting that larval avoidance of wedgewire screens increases as a function of body length. As larvae develop musculature and swimming ability, they are more likely to be able to avoid entrainment by actively swimming away from the screens. In some studies, larvae that were small enough to be entrained were found downstream of CWW screens in substantial numbers, suggesting that at least some larvae can avoid entrainment, either by actively swimming away or because the hydraulics of the system allow some larvae to bypass the screens without encountering them. See, for example, literature reviews in Normandeau's 2016 comments on the Draft Permit and AR-334. However,

[82] EPA notes that Petrudev describes an "approach velocity" here, but the draft permit requires a maximum design through-screen velocity of 0.5 fps, which would result in an approach velocity at the screens that is less than 0.5 fps.

the proportion of avoidance as a result of active swimming versus hydraulic bypass is difficult to distinguish.

It is possible that in a system like the Piscataqua River, where the average ambient current is 4.4 fps (ebb) to 4.9 fps (flood) (compared to a through-screen velocity of 0.5 fps or less), that hydraulic bypass may play a greater role in overall avoidance than active swimming, with the exception of very short periods of time around slack tide when the ambient current drops below 0.8 fps. *See* Fact Sheet at 112. In this case, the ratio of the ambient velocity to the through-screen velocity, rather than a minimum intake velocity, would likely be the more influential value. *See* AR-334 at 5-21, 5-25. At a maximum through-screen velocity of 0.5 fps, the ratio of ambient (at about 4.4 fps) to through-screen velocity would be nearly 9:1, while at 0.2 fps, this ratio would be 22:1. Given that the ambient flow is substantially higher than the through-screen velocity, even at 0.5 fps, it is not clear from Sierra Club's comment or from the Petrudev Report that lowering the through-screen velocity to 0.2 fps would necessarily result in a measurable reduction in entrainment.

As described above, EPA has considered Sierra Club's recommendation to require a 0.5 mm slot size and 0.2 fps through-screen velocity. EPA also considered additional implications of the recommendation. For instance, changing from a screen array with a smaller slot size and lower through-screen velocity would require additional screens. At Indian Point Energy Center, designing the proposed CWW screens with a 0.25 fps through-screen velocity rather than 0.5 fps doubled the number of required screens. Although there may be some incremental additional reduction in entrainment at the smaller slot and lower velocity (a point EPA is unable to confirm, let alone quantify, based on available information), it is not certain that the trade-off of any incremental improvement would overcome the potential negative impacts of doubling the number of required screens. For instance, in addition to increasing the cost of the technology, the screen array would be twice the size and would likely increase the probability that an egg or larvae would be exposed to a wedgewire screen in the river and would increase the acreage of river unavailable for recreation or other uses. A smaller slot size could also potentially cause more fouling and clogging issues, which would then interfere with achieving a low through-screen velocity and may impede operation of the screens, which would require more frequent use of the emergency intake. Finally, Enercon's 2014 evaluation of 9.5 mm slot CWW screens as the BTA for impingement mortality (though not intended to reduce entrainment) proposed a through-screen velocity of 0.33-0.37 fps. According to Enercon, the reduced design velocity provides operating margin and allowance for some blockage on the screens. *See* AR-227 at 29.

Sierra Club Comment IV.B.5 The Permit Should Require Through-Screen Velocity Monitoring

Sierra Club agrees with EPA's proposed BTA requirement that "[t]he permittee shall verify" [182] the through-screen velocity at the wedgewire screen surface. But verification must be done by measurement, not by calculation as EPA proposes to allow.

In light of the significant operational risks associated with the clogging and fouling of wedgewire screens, verification that the screens are operating as designed, with the required through-screen velocity, is a necessity. So that this requirement is more than just an aspiration, Sierra Club proposes that the Permit require continuous through-screen velocity monitoring on each screen as an enforceable term of the permit. Sierra Club recommends that EPA set a reasonable but brief averaging period to allow Schiller to respond to catastrophic blockages of any screen – such as a daily average velocity limit enforceable at each screen.

[182] Draft Permit at 16.

EPA Response to Sierra Club Comment IV.B.5:

Sierra Club comments that the permit must establish a requirement to continuously monitor the through-screen velocity at the screens to ensure that velocity, as a component of the BTA, is an enforceable term. Sierra Club notes that, due to the potential for clogging and/or fouling of the screens, at times the through-screen velocity may be higher than the design velocity. EPA agrees that if fouling or clogging results in a higher through-screen velocity, then the biological effectiveness of the screens to minimize impingement and entrainment may decrease. For this reason, the Draft Permit requires the permittee to install and operate a pressurized system to regularly clear debris from the screens and minimize fouling. In addition, Part II.B.1 of the permit requires the permittee to 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, including the required through-screen velocity. The Draft Permit proposed that the required through-screen velocity could be verified through measurement or calculation consistent with requirements for the through-screen velocity established in 40 C.F.R. § 125.94(c)(3) ("[Y]ou must monitor the velocity at the screen at a minimum frequency of daily. In lieu of velocity monitoring at the screen face, you may calculate the through-screen velocity using water flow, water depth, and the screen open areas.").

Pursuant to the Final Rule, a permittee must conduct weekly visual inspections or employ remote monitoring devices to ensure that any technologies established as the BTA under § 125.94 are maintained and operated to function as designed. 40 C.F.R. § 125.96(e). In addition to the required visual inspections or remote monitoring, the Final Rule authorizes the permitting authority to establish site-specific monitoring requirements for entrainment and impingement in addition to any specified in the BTA standards for impingement mortality at § 125.94(c), including, for example, intake velocity. *See* 40 C.F.R. §§ 125.96(a), (b).

Sierra Club comments that there are significant operational risks associated with clogging or fouling of the screens. PSNH and Enercon also commented on the potential for fouling and debris to interfere with operation of the screens, including an attendant increase in through-screen velocity and a decrease in "fish protection," in their comments on the Draft Permit. *See* Comments V.B.5 and .7. EPA agrees with both Sierra Club and PSNH that the extent to which fouling and/or debris may impact proper operation of the CWW screens is unknown, but that some impact is possible.

Because the through-screen velocity is integral to minimizing both entrainment and impingement mortality, and because it is potentially affected by fouling, EPA agrees that monitoring the through-screen velocity at Schiller Station will ensure that the technology is operated and maintained in compliance with the permit. A remote monitoring device, such as a differential pressure monitor, will ensure that a protective flow is maintained during normal operations of the screens. As explained in Response to PSNH Comment V.B.7, the Final Permit allows limited use of an emergency intake when, due to factors beyond the reasonable control of the permittee (*e.g.*, an unanticipated blockage), continuing to withdraw cooling water through the wedgewire screens would result in loss of human life, personal injury, or severe property damage. Monitoring the wedgewire screen flow, as with a differential pressure monitor, would also facilitate the permittee's ability to anticipate and respond quickly when fouling may cause the screens to become inoperable. In other words, the permittee will likely want and need to monitor the through-screen velocity for the additional reason of assessing when use of the emergency intake is appropriate. Moreover, in the Piscataqua River, using a monitoring device, such as a pressure monitor, to ensure that the appropriate through-screen velocity is maintained would provide a more quantitative and reliable method of monitoring than visual inspection (an alternative monitoring option mentioned in 40 C.F.R. § 125.96(e)) and would be less prone to feasibility challenges and personnel safety concerns caused by weather, visibility, or other conditions than visual inspections.

In response to Sierra Club's comment and consistent with the Final Rule, Part I.A.11.a.2 of the Final Permit requires the permittee to monitor the through-screen velocity daily and report the average monthly and daily maximum through-screen velocity in the discharge monitoring reports.

Sierra Club Comment IV.B.6 EPA Is Not Even Certain That Cylindrical Wedge-Wire Screens that achieve a consistent through-screen velocity of 0.5 fps are "available" at Schiller, so they cannot be the Best Technology Available

Both EPA and PSNH have noted that there are serious implementation risks for wedgewire screens, regarding what PSNH describes as "aggressive marine life fouling" environments. [183] These risks are especially significant for the most effective, narrow width slot screen designs that PSNH knows are "highly susceptible to catastrophic blockage from marine life." [184] According to PSNH's report, the smaller slot sizes that are necessary to achieve greater entrainment reductions are acutely vulnerable to clogging: "the surface may foul with finer debris (i.e., algae) at a faster than normal rate, even under low velocity (i.e., less than 0.5fps)…" [185] Because the Piscataqua River is an impaired waterbody that is experiencing significant eutrophication, Sierra Club is concerned that PSNH will not be able to "avoid heavy algal blooms and similar types of debris," as recommended by the cylindrical wedgewire screen manufacturers that PSNH quoted in its report. [186]

For this reason, a component of EPA's BTA determination is the requirement that PSNH conduct a pilot test and demonstration report on the use of wedgewire screens. PSNH must evaluate multiple screen size options and consider "each option's ability to reduce entrainment mortality, avoid screen clogging, fouling or other maintenance issues." [187]

The study requirements prove that EPA is putting the cart before the horse: EPA is proposing a system of cylindrical wedgewire screens that achieve a through-screen velocity of 0.5 fps as the best technology available before first determining whether cylindrical wedgewire screens can actually maintain a consistent through-screen velocity of 0.5 fps. EPA has determined that its chosen technology is the "best available" before ensuring that it is available at all. This is clearly arbitrary, unreasonable, and unlawful. In Sierra Club's view, the solution is to select closed-cycle cooling as BTA.

But if EPA were to rationalize this BTA determination by coupling cylindrical wedgewire screens with a monitored, 0.2 fps velocity limit, enforceable water withdrawal limits, and seasonal outages, as discussed above, Sierra Club believes that the "availability" issue could be overcome: EPA can alter the permit conditions to define the BTA to include closed-cycle cooling as the default practice unless the pilot testing shows that 0.5 mm wedgewire screens will maintain consistently the desired velocity (which in Sierra Club's view should be 0.2 fps). Sierra Club requests that if EPA persists with the use of wedgewire screens based on studies, that EPA also include closed-cycle cooling as the default alternative and set a procedure for EPA to review the pilot study results and approve or deny the use of screens in place of cooling towers during the permit term.

[183] 316b report at 83.

[184] *Id*.

[185] *Id*.

[186] *Id*. at 84. Sierra Club also notes that for a cylindrical wedgewire screen design to function, six 15-foot long cylinders, with appropriate spacing between them, must be installed in an area where New Hampshire hopes to reestablish eelgrass habitat. Is installation of the screens compatible with returning this area to eelgrass habitat?

[187] Schiller Fact Sheet at 167.

EPA Response to Sierra Club Comment IV.B.6:

Sierra Club comments that it is arbitrary and capricious to conclude that narrow-slot cylindrical wedgewire screens are available at Schiller Station because of uncertainty regarding the extent to which fouling and debris loading may affect the ability to maintain low through-screen velocities at any wedgewire screen array at Schiller Station. Sierra Club further comments that the pilot testing required prior to installation of the screening system "prove[s]" that EPA has determined the technology to be "the 'best available' before ensuring that it is available."

EPA disagrees. The information in the record indicates that the potential for fouling does not make wedgewire screens unavailable. Wedgewire screens have been successfully deployed at CWISs around the world in various types of waterbodies. *See, e.g.*, AR-334. The volume of cooling water, the depth of the waterbody, and the strong and consistent ambient sweeping flow in the Piscataqua River make Schiller Station particularly well-suited to this technology. EPA concludes that there is no question that wedgewire screens are available and can be deployed to reduce impingement and entrainment at Schiller Station. Although EPA recognizes there is some level of uncertainty regarding the extent to which fouling may be an issue to be managed, that uncertainty does not, in EPA's view, render wedgewire screen technology *unavailable* at Schiller Station. "As in many science-based policymaking contexts, under the CWA the EPA is required to exercise its judgment even in the face of some scientific uncertainty." *Upper Blackstone Water Pollution Abatement Dist. v. United States EPA*, 690 F.3d 9, 23 (1st Cir. 2012). And as EPA noted in the preamble to the Final Rule, the Act "vests EPA with broad discretion in determining what is the 'best' technology that is 'available' for minimizing adverse environmental impact." 79 Fed Reg. at 48,328. In exercising its discretion here, EPA has reasonably relied on information in the record, including that wedgewire screens have been successfully installed and operated at other facilities and that certain measures are available to control the extent and impacts of fouling at Schiller Station. Although EPA recognizes that "smaller slot sizes may be more likely to have screen fouling problems from debris and/or biological growth," and that "as screen fouling increases, screen intake velocity increases, too," Fact Sheet at 115, the uncertainty is not "so profound that it precludes EPA from making a reasoned judgment." *Massachusetts v. EPA*, 549 U.S. 497, 534 (2007).

The information in the record indicates that certain design elements and operational practices are available to the permittee to control potential fouling of the wedgewire screens, including an airburst system, regular inspections and cleaning, and appropriate screen materials selection. Fact Sheet at 109, 115. Proper operation and maintenance of the screens will be necessary to achieve consistent and sufficiently low through-screen velocities. The relatively fast-moving flows of the Piscataqua (compared to the intake velocity) may also provide sufficient current to sweep debris past the wedgewire screens. *See id.* at 109. Overdesign is a further means to overcome, or at least lessen, the fouling concern. An intake velocity limit lower than 0.5 fps would allow for a margin of error allowing for some blockage of the screens while still achieving a through-screen velocity of 0.5 fps. In the 2008 Engineering Response, Enercon estimates a through-screen velocity of 0.478 to 0.493 fps for the maximum (1.0 mm) and minimum (0.6 mm) slot size, respectively. *See* AR-140 at 81. The Draft Permit at Part I.A.13.a.2 requires the permittee to "reduce the wedgewire screen through-screen velocity to a level no greater than 0.5 fps." This permit condition requires the effective through-screen velocity to be no greater than 0.5 fps, not that the screens are designed with a velocity at this level that may then be exceeded whenever the screens become fouled.[83] Enercon, in its 2014 evaluation of coarse-mesh screens, accounts for this difference in its proposal. The screens proposed have a maximum velocity of 0.33-0.37 fps, which would allow for an operating margin and allowance for some blockage on the screens. *See* AR-227 at 29-30. The Final Permit requires that the effective through-screen velocity meet a level no greater than 0.5 fps. The optimal design velocity to ensure that this requirement is met will be determined during the preliminary engineering phase. In addition, the permittee is required to operate a pressurized air system to clear the screens on a regular basis. *See* Fact Sheet at 109, 115; AR-140 at 81-2; AR-227 at 28. The frequency of cleaning cycles would also be optimized during the on-site pilot study with the goal of minimizing growth of fouling organisms on the screens.

Finally, Enercon's evaluation of coarse-mesh wedgewire screens included a proposal to use copper-nickel alloy for the screening material, which reduces growth of fouling organisms. *See* AR-140 at 83, AR-227 at 28. Based on Sierra Club's comment, as well as concerns raised by PSNH regarding fouling, Part I.A.11.a.1 of the Final Permit requires that the screens be constructed from material or coated with material designed to reduce fouling. Together, a margin

[83] The Final Permit incorporates a provision authorizing limited operation of an emergency intake system which operates without use of the wedgewire screen system in order to prevent severe property damage, such as when fouling interrupts delivery of sufficient cooling water necessary to prevent vortexing and air intrusion of the circulating water pumps. While blockages that would require use of the emergency intake are unpredictable, EPA does not anticipate that such blockages would be a frequent occurrence because the preventive measures described herein (use of a pressurized air system and an anti-fouling coating or alloy material) will reduce fouling. *See* Response to PSNH Comment V.B.7.

of error in the design velocity, the use of pressurized air to clean the screens, and an anti-fouling screening material will ensure that the screens are maintained in order to meet the permit requirement for through-screen velocity. The Final Permit also requires that the through-screen velocity be monitored, for example, with a differential pressure monitor, which will alert the permittee to take proper measures if fouling or clogging impede the proper operation of the screens.

As EPA has described it here, the pilot study is necessary to optimize the design of the screens (*e.g.*, slot size, velocity, frequency of pressurized air bursts, screen material) to achieve the highest entrainment reductions while ensuring that the operation of the screens can be maintained. This study is essential to finalizing the design of the screens, not to ensure that the screens are "available," as Sierra Club suggests. In other words, the one year, site-specific study to evaluate methods of minimizing negative effects from fouling is "a sensible idea," whose purpose is not to determine in the first instance whether the technology is available at Schiller Station, but rather to determine the optimal design of the screens. Fact Sheet at 169. EPA concluded, after considering the facts of this case, including the relative costs and benefits (both quantitatively and qualitatively) of closed-cycle cooling and wedgewire screens, that wedgewire screens are the BTA for entrainment at Schiller Station. EPA has responded to Sierra Club's comments that closed-cycle cooling should be selected as the BTA in responses to comments IV.A.1 through IV.A.3.

Sierra Club proposes including closed-cycle cooling as the default alternative BTA should pilot testing demonstrate that the screens are unable to maintain the desired through-screen velocity. The permittee must comply with all conditions of the permit, including the requirement to install and operate a wedgewire screen system that achieves a through-screen velocity no greater than 0.5 fps. EPA expects that the permit will ensure that the BTA for controlling entrainment and impingement mortality will be met and including an additional "default" alternative BTA is neither necessary nor appropriate.

In footnote 186 of the comment, Sierra Club notes that the installation of cylindrical wedgewire screens would be in an area "where New Hampshire hopes to reestablish eelgrass habitat" and questions if the screens "will be compatible with returning this area to eelgrass habitat." Sierra Club did not provide a reference for, nor was EPA (in communication with NHDES, *See* AR-425) able to corroborate, the assertion that New Hampshire "hopes" to reestablish eelgrass habitat in the relatively limited area that would be occupied by the wedgewire screens nor that this area has ever historically supported eelgrass habitat. The Great Bay Estuary Eelgrass Mapper, which presents the results of eelgrass surveys back to 1948, indicates that eelgrass has never been recorded in the vicinity of Schiller Station's CWISs (where the proposed screens will be located), and recent surveys (2013 to 2016) have not observed eelgrass in the vicinity of the station. The closest recorded occurrence of eelgrass was a relatively small patch (about 7,200 ft^2) observed about 900 feet upstream from the CWISs in surveys in 2001 and 2002, although later surveys (in 2004 through 2016) do not record the presence of this patch again.[84] While the

[84] Great Bay Estuary Eelgrass, a program-specific interactive map produced and maintained by New Hampshire Department of Environmental Services GIS, is available at https://www.des.nh.gov/onestop/gis.htm and last accessed on January 3, 2018.

benthic habitat in the relatively limited area in front of the CWISs will be disturbed during installation of the screens, to EPA's knowledge there is currently no eelgrass in this area that would be impacted. The airburst mechanism could potentially limit growth of new eelgrass at the screens, but its influence on the waterbody is limited to the immediate area of the screen installation and is unlikely to conflict with restoration or natural growth of eelgrass outside of this relatively small area. For this reason, EPA does not believe that the wedgewire screens would be incompatible with eelgrass growth outside of the limited area in front of Schiller Station's CWISs. In addition, as there are likely more desirable areas targeted for restoration, the screens will not have a significant impact on the ability of NHDES or others to restore eelgrass in the Piscataqua River. *See, e.g.*, AR-404 at 32.

Sierra Club Comment IV.B.7 Conclusion on Wedgewire Screens

No screening technology can deliver the entrainment reductions or thermal benefits of a closed-cycle cooling system. Closed-cycle cooling is the only option that meets the BTA standard of minimizing (not just reducing) adverse environmental impact. Closed-cycle cooling is the only technology that can provide entrainment reductions of 97% to 100%, nearly comparable impingement reductions, and the complete elimination of thermal discharge into the Piscataqua.

EPA noted that its preliminary determination to require Schiller to install closed-cycle cooling was made "in the absence of any site specific information regarding the 'availability' of wedgewire screens for use at Schiller Station." [188] But information about the availability of wedgewire screens is not relevant – even if they are an available technology, wedgewire screens are not the best technology available. Indeed, EPA has estimated that "closed-cycle cooling can reduce entrainment mortality for fish eggs and larvae by as much as 97%, whereas the wedgewire screen options with the three smallest slot sizes are estimated to reduce such entrainment mortality by 37%, 44% or 49%, respectively." [189] And juvenile endangered sturgeon and salmon may be among the hundreds of millions of eggs and larvae entrained at Schiller. Further, wedgewire screens provide no ancillary thermal benefit to the Piscataqua River. Even under ideal circumstances, wedgewire screens are nowhere near the performance of a closed-cycle cooling system.

[188] *Id.*

[189] Schiller Permit Factsheet at 155.

EPA Response to Sierra Club Comment IV.B.7:

Sierra Club comments that since closed-cycle cooling delivers the greatest entrainment reductions (and thermal discharge reduction benefits), it is "the only option that meets the BTA standard of minimizing (not just reducing) adverse environmental impact" from cooling water intake structures. Based on this comment, Sierra Club argues that only the technology that achieves the greatest reduction in entrainment possible can satisfy CWA § 316(b)'s standard of providing the best technology available for minimizing adverse environmental effects.

Although EPA agrees that retrofitting an open-cycle power plant with closed-cycle cooling technology would achieve the greatest reduction in entrainment (and thermal discharge) from among the known options,[85] EPA disagrees that this makes closed-cycle cooling the *only* technology that can meet the BTA standard of CWA § 316(b). In *Entergy Corp. v. Riverkeeper, Inc.*, the Supreme Court rejected a similar argument, observing that "'minimize' is a term that admits of degree and is not necessarily used to refer exclusively to the 'greatest possible reduction.'" 556 U.S. 208, 219 (2009). *See also* Hudson Riverkeeper Fund v. Orange & Rockland Utils., 835 F. Supp. 160, 165 (S.D.N.Y. 1993) (noting that, in a site-specific, case-by-case analysis of § 316(b) requirements, "best available doesn't mean perfect"). Instead, the Court found that EPA has the discretion to determine "the extent of reduction that is *warranted under the circumstances*," a "determination that could plausibly involve a consideration of the benefits derived from reductions and the costs of achieving them." *Id.* (emphasis added).

Consistent with the *Entergy* decision, the 2014 CWA § 316(b) Final Rule does not mandate that the BTA for entrainment control is automatically the technology that would achieve the largest entrainment reduction. The Rule specifies, instead, that the BTA for entrainment control is to be based upon a site-specific determination of "the maximum reduction in entrainment *warranted* after consideration of factors relevant for determining the best technology available for minimizing adverse environmental impact at each facility." 40 C.F.R. § 125.98(f) (emphasis added). Permitting authorities are to determine the BTA based on their consideration of the relevant factors and their judgment of how much of a reduction in entrainment is *warranted* in a particular case. The factors to be considered in determining the maximum reduction warranted include the numbers and type of organisms entrained, but also the costs and benefits of entrainment reduction and many other site-specific issues. *See* 40 C.F.R. § 125.98(f)(2) and (3). Consistent with this, the Final Rule defines "minimize" to mean "reduce to the smallest amount, extent, or degree *reasonably* possible." 40 C.F.R. § 125.92(r) (emphasis added). Thus, the BTA should achieve the maximum reduction in entrainment that is *warranted* or, stated differently, it should reduce entrainment to the smallest amount *reasonably* possible. [86] A variety of considerations may factor into the determination of how much entrainment reduction is reasonable under the facts of each case.

Rather than focusing solely on the technology that achieves the maximum reduction in entrainment, the BTA for entrainment is determined based on consideration of a number of factors. *See* 40 C.F.R. § 125.98(f)(2) and (3). The "factors relevant for determining the best technology available for minimizing adverse environmental impact at each facility" are listed in 40 C.F.R. § 125.98(f). *See also* 40 C.F.R. § 125.94(d). The Final Rule specifies some factors that *must* be considered in the BTA determination, and others that *may* be considered. The mandatory factors are listed at 40 C.F.R. § 125.98(f)(2) and include the numbers and types of organisms

[85] EPA notes that "dry" cooling tower systems use no water and fully eliminate entrainment and impingement, whereas "wet" cooling tower systems can reduce water withdrawals and entrainment/impingement by an estimated 95% or more. For wet cooling towers, a relatively small amount of water is still needed for cooling tower "makeup water" and if that water is withdrawn from a water body, some entrainment and impingement could still occur. As discussed herein, if gray water is used for makeup water, then no water withdrawals would be needed and entrainment/impingement could be eliminated. EPA is not aware of any existing open-cycle facilities that have converted to closed-cycle cooling using dry cooling towers. EPA *is* aware of open-cycle facilities that have converted to closed-cycle cooling using wet cooling towers and the Agency's analysis, and Sierra Club's comments, have focused on that option. *See* Fact Sheet, pp. 141-147.

[86] As the Supreme Court wrote in *Entergy*, "… whether it is 'reasonable' to bear a particular cost may well depend on the resulting benefits …." 556 U.S. at 225-26.

entrained, impacts of changes in particulates emissions or other pollutants, land availability, remaining useful plant life, and quantified and qualitative social benefits and costs of available technologies. The discretionary factors are listed at 40 C.F.R. § 125.98(f)(3) and include entrainment impacts on the waterbody, thermal discharge impacts, credit for flow reductions resulting from recent unit retirements, impacts on the reliability of energy delivery, impacts on water consumption, and the availability of process water, gray water, waste water, reclaimed water, or other waters for reuse as makeup water. "The weight given to each factor is within the Director's discretion based upon the circumstances of each facility." 40 C.F.R. § 125.98(f)(2).

For the Schiller Station Draft Permit, EPA considered a variety of factors. For instance, EPA determined that the remaining useful life of the plant warrants considering the installation of new entrainment controls, that there is sufficient land available to accommodate new technology, and that the impacts associated with particulate emissions, energy reliability, and consumptive water use will not limit the availability of either cooling towers or wedgewire screens at Schiller Station. *See* Fact Sheet at 165-66. As Sierra Club points out in its comments, EPA recognized that gray water could possibly provide a sufficient supply of make-up water for use with wet cooling towers (in Comment IV.A.2.c), although there is no source of water sufficient to replace the Piscataqua River water used for the existing once-through system. *See* Fact Sheet at 145-46. EPA also notes that Schiller Station has not experienced a recent unit retirement that might affect the assessment of the facility's entrainment effects. *See* 40 C.F.R. § 125.98(f)(3)(iii). In addition, EPA determined that the permit's limits on Schiller Station's thermal discharges under the existing Section 316(a) variance are protective of the balanced, indigenous population of fish and shellfish in the river and, as such, thermal discharge impacts do not affect the BTA determination under CWA Section 316(b). *See* 40 C.F.R. § 125.98(f)(3)(ii); Fact Sheet at 55-70, 165. *See also* Responses to Sierra Club Comments IV.A.1, IV.C.1, and IV.C.2.

In response to comments on the Draft Permit, EPA also reassessed its analysis of Schiller Station entrainment and estimates that at design flow, the CWISs entrain approximately 145 million fish eggs and larvae and an additional 593 million macrocrustacean larvae annually. EPA continues to maintain that the entrainment losses caused by Schiller Station's CWISs:

> . . . represent avoidable mortality to aquatic organisms in a productive river of public importance that is subject to cumulative stresses from, among other sources, municipal storm water runoff, industrial discharges, land use changes, upstream flow alterations, and other power plant withdrawals. These losses are avoidable in the sense that available technology could be added to the Facility at an appropriate cost that would enable Schiller Station to continue generating electricity while harming far fewer aquatic organisms.

Fact Sheet at 158. Several of the species entrained at Schiller Station are desirable to recreational and commercial fisherman (*e.g.*, winter flounder, Atlantic herring, Atlantic cod, hake, striped bass, Jonah crab, cancer crab, American lobster) and/or are targets of fishery management plans or restrictions managed by the New England Fishery Management Council (*e.g.*, silver hake, red hake, Atlantic herring, Atlantic cod, haddock, winter flounder, windowpane flounder, pollock). *See* Fact Sheet at 90. In addition, Schiller Station also entrains rainbow smelt larvae, which is a federal Species of Concern and continues to support a popular recreational fishery in Great Bay.[87] *See* AR-350.

EPA, in both the Fact Sheet and in this Response to Comments, has clearly characterized the entrainment (and impingement) at Schiller Station's CWIS as an adverse environmental impact. EPA must establish site-specific entrainment controls that will result in the maximum reduction in entrainment warranted based on consideration of the relevant factors for this site and facility, including consideration of the social costs and benefits. The Final Rule also recognizes that the permitting authority "may reject an otherwise available technology as a BTA standard for entrainment if the social costs are not justified by the social benefits." *See* 40 C.F.R. § 125.98(f)(4). In addition, if all technologies have social costs not justified by social benefits, or have unacceptable adverse impacts that cannot be mitigated, then the Rule allows the permitting authority to determine that no additional controls are necessary. *Id.*

While Schiller Station's entrainment effects are substantial, taking into account the number and types of organisms entrained, it is also true that at the design flow of about 125 MGD, Schiller Station withdraws only a relatively small portion (about 0.3%) of the tidal prism of the Piscataqua River. Fact Sheet at 158; *see also* Response to PSNH Comment V.B.2.c. No comments have been submitted to contradict EPA's conclusion in the Fact Sheet that there is no evidence that entrainment at Schiller Station is "causing or significantly contributing to declines in local populations of the affected species of aquatic organisms or to disruptions in the local community or assemblage of organisms in the Piscataqua River." *Id.* EPA also concluded that the Draft Permit conditions, including the BTA, will satisfy the requirements of the Endangered Species Act, the Magnuson-Stevens Act, and the Coastal Zone Management Act. *See* Fact Sheet at 158. There have been no comments on the Draft Permit that would alter these conclusions regarding the impacts of entrainment. Again, these conclusions are based on an analysis of the facts of this case. The facts in another case could lead to different conclusions.

In both the Fact Sheet and this Response to Comments, EPA has explained that entrainment at Schiller Station is an adverse environmental impact under CWA § 316(b). The statute requires that the location, design, construction, and capacity of the facility's CWISs must reflect the BTA for minimizing adverse environmental impact. Schiller Station's existing once-through cooling system is not currently equipped with any technology for reducing entrainment. That said, operation of the Station's coal-fired Units 4 and 6 has declined in recent years such that the actual cooling water withdrawal is less than the design flow at which EPA estimated entrainment impacts. *See* Response to Sierra Club Comment IV.B.3. According to ISO New England, the resource mix of the region's installed generating capacity has shifted dramatically towards natural gas as a result of "economic and environmental factors."[88] Where coal made up about

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[87] The loss of rainbow smelt due to entrainment and/or impingement by power plant intakes was not identified as one of the potential causes of the recent decline in populations. Nevertheless, entrainment is an additional source of mortality that, if reduced, may, along with other conservation measures and strategies (*e.g.*, improving water quality, restoring spawning habitat), enhance recovery of regional populations.

[88] ISO New England, Resource Mix, "Mix of Supply Resources Has Changed Over Time," *available at* https://www.iso-ne.com/about/key-stats/resource-mix (last accessed Dec. 28, 2017).

18% of the region's energy production in 2000, it comprised about 4% in 2016, while natural gas-powered production increased from 15% to 49% in the same time frame.[89] The decline in coal-fired generation in New England, and at Schiller Station, is not expected to reverse in the near future.[90]

Despite this decline in coal-fired generation, PSNH requested operation of the CWISs at design flow in its permit applications.[91] Therefore, EPA has evaluated the potential entrainment losses at the design flow, while at the same time recognizing that Schiller Station's current operational cooling water flow actually results in lower entrainment. The change in the resource mix in recent years has caused Schiller Station's coal-fired units (Units 4 and 6) to transition to serving as peaking units, meaning that they run at very low capacity for much of the year except when demand for electricity is high (typically during winter and summer).

For the biomass unit (Unit 5), however, on average, Schiller Station's cooling flows and fuel consumption from 2014 through 2016 remained consistently high throughout the year, with the exception of April when scheduled maintenance occurs. At the coal-fired units (4 and 6), cooling flows and fuel consumption were highest in January and February, declined in March, reached an annual low (less than 10% of DIF) in May and June, and then remained relatively low (less than 25% of DIF) until December. The seasonal shifts in generation are especially relevant to the potential entrainment impacts at this facility because the seasonal cooling water withdrawals are inversely related to seasonal entrainment densities. The density of early life stages in the Piscataqua River is highest in late spring and summer when the generation at Units 4 and 6, and thus the total cooling flows at these units, are less than 30% of capacity. Accounting for the actual average monthly operating flows from 2014 through 2016, the total annual entrainment at Schiller Station would be about 315.7 million, with about 67 million fish eggs and larvae and an additional 248 million macrocrustacean larvae entrained (excluding green crab). If operating at DIF, closed-cycle cooling would save nearly 175 million additional early life stages annually as compared to fine-mesh wedgewire screens, but this difference decreases to about 81 million more early life stages at AIF. To be clear, even at AIF the CWISs clearly entrain a large number of early life stages and represent an adverse environmental impact; however, in weighing the social costs and benefits of closed-cycle cooling and wedgewire screens, EPA has considered the actual operating conditions and their potential effect on actual entrainment at the Facility.

In responding to comments on the Draft Permit, EPA revised the estimated reductions in entrainment for macrocrustacean larvae exposed to wedgewire screens, eliminated green crab from the enumeration of entrainment losses at Schiller Station, and corrected a technical error in the entrainment estimates. EPA now estimates that, at the design flow with the existing once-

[89] *Id*.

[90] *Id.* Of course, EPA cannot be certain how the energy markets will evolve. Only a relatively short time ago, the relative growth in natural gas-powered generation was not foreseen.

[91] In addition, a new entity (GSP Schiller, LLC, a subsidiary of Granite Shore Power, LLC) acquired the facility on January 10, 2018. As of this writing, EPA is unaware of the new owner's plans regarding future capacity of the facility. *See* AR-358.

through system, Schiller Station entrains about 145 million fish eggs and larvae and about 593 million macrocrustacean larvae annually. Both wedgewire screens and closed-cycle cooling will reduce this entrainment. Closed-cycle cooling will reduce entrainment by approximately 97% (or more), while entrainment reductions achieved by wedgewire screens are expected to be less. EPA conservatively estimates that 0.8 mm wedgewire screens will save at least 54 million fish eggs and larvae and nearly 475 million macrocrustacean larvae from entrainment each year at design flow. EPA has acknowledged in responding to comments that it expects additional fish larvae to avoid entrainment with wedgewire screens, but the Agency is unable to precisely quantify this incremental improvement for larvae based on available data. *See* Responses to PSNH Comment V.B.5 and Sierra Club Comments IV.B.4 and 6. In other words, EPA expects that 0.8 mm wedgewire screens will reduce entrainment of fish larvae by at least 37% (compared to a 97% reduction with closed-cycle cooling) but actual entrainment reductions are likely to be greater.

While closed-cycle cooling is likely to achieve greater entrainment reductions than wedgewire screens, the incremental improvements would have high costs. EPA's BTA determination is appropriately based on consideration of the factors listed at 40 C.F.R. §§ 125.98(f)(2) and (3), including consideration of the quantified and qualitative social benefits and costs of the technologies. EPA calculated the total social cost over the life of the compliance technology (typically 30 years for closed-cycle cooling) to be the full value of the resources used without accounting for any tax effects. The social cost of closed-cycle cooling is considerably more than that for wedgewire screens.

For the Draft Permit, EPA determined that the cost of closed-cycle cooling is not warranted by the benefits, but that fine-mesh wedgewire screens will make improvements at a relatively lower cost that *is* warranted by the benefits.[92] *See* Fact Sheet at 155-58. For the Final Permit, EPA revised its cost estimates for both technologies in response to comments on the Draft Permit and converted the present value estimates from a private to a social cost basis. EPA estimates the present value social cost for closed-cycle cooling (in 2016 dollars) is about $97.8 million (at 7% discount rate) to $111.9 million (at 3% discount rate). The social cost of wedgewire screens, on the other hand, is estimated to be about $6.9 million.[93] The above-discussed estimates of

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[92] PSNH included a claim of confidential business information (CBI) for all cost estimates in both the 2008 and 2014 engineering reports. *See* AR-140 and 227. Because of the claim of CBI, EPA did not release cost information for any technology. *See* Fact Sheet at 150. Sometime later, however, PSNH's cost estimates for closed-cycle cooling were made publicly available in an unrelated proceeding before the New Hampshire Public Utilities Commission ("NHPUC"). *See* AR-353. In addition, PSNH included its wedgewire screens cost estimates in its comments on the Draft Permit without asserting any claim of CBI, an indication of waiver. 40 C.F.R. § 122.7(a). EPA subsequently confirmed with PSNH that the previous claim of confidentiality with respect to the cost estimates for both technologies had been withdrawn. *See* Response to Sierra Club Comment IV.A.2.b. Consequently, EPA has used the actual cost values in this response rather than a relative index as it did in the Fact Sheet.

[93] The capital cost of wedgewire screens is based on the total cost value estimated by Enercon for wedgewire screens in 2014, updated to 2016 dollars. An additional multiplier was used to account for the potential increase associated with fine-mesh screens based on cost estimates for coarse and fine mesh screens at Indian Point Energy Center. *See* PSNH Comments Appendix 4 to Exhibit 1 and AR-393. For the Draft Permit, EPA assumed the useful life of wedgewire screens would be 15 years and that the screens would be replaced once for comparison with the 30-year period for closed-cycle cooling. The Final Rule assumes that the useful life of a submerged near-shore passive

entrainment levels and costs associated with various technologies are arrayed in Table 6, immediately below.

Table 6. Estimates of number of organisms entrained, percentage reduction in entrainment (at design flow), and social cost of the existing, open-cycle cooling system, wedgewire screen technology, and closed-cycle cooling system retrofit.			
	Current Open-Cycle System	**Wedgewire Screen**	**Closed-Cycle Cooling**
Number of Organisms Entrained (annually)	Approximately 145 million fish eggs & larvae Approximately 593 million macrocrustacean larvae	Approximately 91 million fish eggs & larvae* Approximately 118 million macrocrustacean larvae	Approximately 4.35 million fish eggs & larvae Approximately 17.7 million macrocrustacean larvae
Percentage Reduction in Entrainment	0%	Approximately 37% reduction* in entrainment of fish eggs and larvae Approximately 80% reduction in entrainment of macrocrustaceans	Approximately 97% reduction
Social Cost of New Entrainment Reduction Technology	$0.00	Approximately $6.9 Million ($2016)	Approximately $97.8 Million to approximately $111.9 Million ($2016)

* It is expected that wedgewire screens can achieve greater reductions than presented here, as more fish larvae are likely to be able to avoid the screens than is reflected in these numbers, but EPA is unable to quantify this expected additional screen avoidance and, therefore, has used the 37% estimate.

There is no question that closed-cycle cooling will reduce entrainment more than wedgewire screens. However, as stated above, the standard for establishing site-specific entrainment requirements is "the maximum reduction in entrainment warranted after consideration of factors relevant for determining the best technology available for minimizing adverse environmental impact at each facility." 40 C.F.R. § 125.98(f). In addition to considering the reduction in the number of organisms entrained that could be achieved by the two primary technologies under evaluation, EPA also considered that the species entrained in the highest concentrations (*e.g.*, cunner eggs) are not experiencing regional population declines, and that there is no evidence that Schiller Station's entrainment is causing broader-scale effects such as regional population-level declines of the affected species or destabilization of the assemblage of fish residing in the Piscataqua River.

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screen installation is 30 years; therefore, EPA recalculated capital costs for the Final Permit based on a 30-year life for screens. *See* TDD at 8-48. The annual operations and maintenance costs are not expected to increase as compared to the existing system based on analysis by Enercon. AR-140 at 90.

EPA also considered that the species that are experiencing local and regional declines (winter flounder, Atlantic cod, rainbow smelt, Atlantic herring) comprise a relatively small percentage of total entrainment at Schiller Station (less than 1.5% combined). Moreover, at Schiller Station, entrained individuals from these four species tended to be larger, post-yolk sac larvae (greater than 10 mm). Studies reviewed in Response to PSNH Comment V.B.5 suggest that larvae greater than 10 mm are the most likely to avoid entrainment at wedgewire screens through active swimming. Wedgewire screens may therefore benefit these species more than EPA has estimated, thereby reducing the differences in entrainment between wedgewire screens and closed-cycle cooling at this facility with respect to these species. Furthermore, as EPA noted earlier in this response, these four species are also desirable to recreational and commercial fisherman and/or subject to fishery management plans or restrictions. In addition, EPA considered that the permit's thermal effluent limits have been determined to be protective of the balanced, indigenous population of fish in the river, and that two of the generating units (Units 4 and 6) have operated well below design capacity in recent years and are expected to continue to do so going forward.

EPA factored all these considerations into its qualitative assessment of the social benefits of the technological options for reducing entrainment. From all of this, EPA has concluded that the considerable cost of closed-cycle cooling, at approximately $100 million, is not justified by the social benefits to the waterbody that would be provided by the admittedly near-elimination of entrainment that it could achieve, but that the approximate $7 million cost of wedgewire screens *is* warranted by the social benefits of the significant entrainment reductions that *it* can achieve. In other words, consistent with 40 C.F.R. § 125.98(f)(4), EPA has rejected closed-cycle cooling as the BTA on the basis that the social costs are not justified by the social benefits, but has determined that the social costs of wedgewire screens are justified by the social benefits. Thus, EPA concludes that wedgewire screens will achieve the maximum reduction in entrainment warranted in light of all of the relevant factors and weighing the social costs and benefits of each available technology.

Finally, EPA acknowledges the current uncertainty surrounding the status of Schiller Station. On October 12, 2017, Eversource Energy announced the sale of its generating assets in New Hampshire, including Schiller Station, as part of the comprehensive restructuring and rate stabilization agreement entered into with New Hampshire Public Utilities Commission in 2015. *See* AR-360. The sale of its fossil fuel plants, to Granite Shore Power LLC, closed on January 10, 2018. The buyer is required to operate the plants, including Schiller Station, for at least 18 months following the date of sale but the plant's future beyond this date is uncertain. EPA recognizes that circumstances regarding the operation of Schiller Station may change in the future, but the current Final Permit is well designed to address the current circumstances.

Sierra Club Comment IV.C Schiller Must Convert to a Closed-Cycle Cooling System to Control Thermal Discharges Pursuant to Section 316(a) of the Clean Water Act

Sierra Club Comment IV.C.1 EPA Region 1 Cannot Renew Schiller's Thermal Discharge Variance because PSNH Has Not Carried its Burden Due to its Failure to Submit a Cumulative Impacts Analysis

PSNH has not carried its burden of proof because it has not submitted a cumulative impacts analysis that evaluates the impact of the proposed alternative heat limits in light of other significant impacts on the protection of a balanced, indigenous population of fish, shellfish and wildlife in the Piscataqua River.

In seeking a 316(a) variance, whether for the first time or upon renewal, the burden rests with a permit applicant to demonstrate that the alternative limits it seeks will assure protection of a balanced indigenous population of shellfish, fish and wildlife considering the "cumulative impact of its thermal discharge together with all other significant impacts on the species affected." [190] At the very least, PSNH must provide enough information about Schiller's past discharges to demonstrate that "no appreciable harm has resulted…to a balanced, indigenous community of shellfish, fish and wildlife in and on the body of water," or alternatively, "[t]hat despite the occurrence of such previous harm, the desired alternative effluent limitations…will nevertheless assure the protection and propagation of a balanced, indigenous community…"[191]

The cumulative issues PSNH failed to consider are wide-ranging and include existing turbidity and eutrophication in the Piscataqua River, the effect of Schiller's own discharge of suspended solids on eelgrass, the nearby Newington Plant, and the worsening effects of climate change. By failing to consider the cumulative impact of these environmental issues, PSNH has not met its burden of showing that a variance is warranted.

Sierra Club is principally concerned with the failure of PSNH and EPA to consider climate change which stands to exacerbate the thermal loading already occurring in the Piscataqua River. This calls for heightened attention to Schiller's impacts on temperature-sensitive aquatic organisms, particularly eelgrass, and the Piscataqua's ability to sustain a balanced indigenous population of fish and wildlife.

In considering whether to grant alternative thermal discharge effluent limits under Section 316(a) of the Clean Water Act, NPDES permit writers must take account of the "cumulative impact of [] thermal discharge together with all other significant impacts on the species affected." [192] Climate change has and will continue to have a significant impact on many aquatic species. In Section 5.2.2.7 of the 2010 NPDES Permit Writer's Manual, EPA provides the following guidance for permit writers on how to address climate change:

> Climate Change Considerations -Evaluation of requests for variances under CWA section 316(a) requires consideration of the change to the ambient water temperature because of an effluent discharge. The studies provided by applicants to support their requests frequently include historical thermal data for the receiving water. Permitting authorities should be aware that the effects of global climate change could alter the thermal profile

of some receiving waters making the historical record of thermal conditions less representative of future conditions. Where appropriate, water quality models should take these potential changes into account. [193]

When evaluating BAT for thermal discharges and considering renewal of the existing Section 316(a) variance at Schiller, EPA must incorporate the anticipated impacts of climate change into its analysis. Petrudev's analysis of Schiller's thermal discharges includes consideration of the effects of climate change. Petrudev points out that "waters in the Piscataqua/Great Bay region are warming and the thermal discharges from Schiller in combination with the higher ambient temperatures is likely to adversely affect fish and macrocrustaceans such as rainbow smelt, Atlantic herring, tautog, Atlantic tomcod, river herring, and American lobster in ways or to an extent not addressed" by PSNH. [194]

Before continuing the variance, EPA must require PSNH to submit a supplemental cumulative impacts analysis addressing, among other impacts, climate change. Since PSNH has not carried its burden to justify a thermal discharge variance, EPA should deny the variance application. [195]

[190] 40 C.F.R. § 125.73(a); see also Hanlon Thermal Memo.

[191] 40 C.F.R. § 125.73(c)(1).

[192] 40 CFR § 125.73(a).

[193] EPA, EPA-833-K-10-001, NPDES PERMIT WRITER'S MANUAL § 5.2.27 (2010)

[194] Petrudev Report at 5-3.

[195] Or, at the very least, EPA should order PSNH to complete a supplemental cumulative impacts analysis and only extend the variance until that analysis is complete.

EPA Response to Sierra Club Comment IV.C.1:

Comment IV.C.1. contains a number of separate, specific comments related to PSNH's request for a CWA § 316(a) variance and EPA's proposed determination to grant that request. In order to organize and clarify EPA's discussion of the comments, we have divided our response into individual parts that address the individual issues raised by the Sierra Club's comment. These individual responses are included below as Responses IV.C.1.a to d. In addition, Sierra Club's comments above cite to a report (Petrudev, 2016) that it submitted in support of its comments on the proposed NPDES Permit. EPA has also carefully considered this report and responds to issues raised in the report in response to Sierra Club's comment below.

Response IV.C.1.a: Burden of Proof

As discussed in Response to PSNH Comment V.A and Response to Sierra Club Comment III.D (above), EPA agrees with the commenter that permittees bear the initial burden of demonstrating that they should receive an NPDES permit with thermal discharge limits based on a CWA § 316(a) variance. In this case, PSNH was obliged to demonstrate that the thermal discharge limits applicable under the CWA's technology-based and/or water quality-based requirements would be more stringent than necessary to assure the protection and propagation of the BIP in the affected portion of the Piscataqua River. In addition, permittees, such as PSNH, bear the burden of demonstrating that the requested alternative thermal limits will assure the protection and propagation of the BIP.

The comment also recognizes that in seeking renewal of a CWA § 316(a) variance, a thermal discharger can make a "retrospective" demonstration, a "prospective" demonstration, or both. The former type of demonstration seeks to show that past thermal discharges have not appreciably harmed the BIP and will be maintained, whereas the latter type of demonstration seeks to show that the proposed future thermal discharges will assure the protection and propagation of the BIP. *See* Fact Sheet at 15-16. The comment argues that PSNH's demonstration was inadequate due to a failure to assess the potential cumulative effect of Schiller Station's thermal discharge along with other adverse impacts. While the comment lists a number of other possible stressors to the BIP – namely, existing turbidity and eutrophication in the Piscataqua River, the effect of Schiller's discharge of suspended solids on eelgrass, and thermal discharges from the nearby Newington Station power plant – it states that "Sierra Club is principally concerned with the failure of PSNH and EPA to consider climate change …."

EPA will address the cumulative impact and climate change comments below, but here responds in a more general way to this comment. At the outset, it is important to remember that PSNH requested both a renewal of its CWA § 316(a) variance with the existing thermal discharge limits *and* a further relaxation of those thermal limits. Specifically, in its supplemental permit application, PSNH also proposed a 5ºF *increase* in the permit's maximum discharge temperature (from 95ºF to 100ºF) and delta-T limit (from 25ºF to 30ºF). EPA has rejected PSNH's request to further relax the permit's thermal discharge limits. EPA concluded that PSNH failed to carry its burden to demonstrate (prospectively) that those limits would assure the protection and propagation of the BIP under CWA § 316(a). All the data and analysis regarding conditions under the existing permit involve discharges of 95ºF or less. PSNH provided no supporting information or predictive modeling to support that the BIP will be adequately protected with a maximum discharge temperature of 100ºF and a maximum delta-T of 30°F. Thus, EPA agrees with the comment that PSNH did not carry its burden with regard to the requested relaxation of the permit's thermal discharge limits and has responded accordingly.

EPA does not, however, agree with the Sierra Club's comment that PSNH failed to meet its burden in requesting renewal of its existing CWA § 316(a) variance, including retention of the existing maximum thermal discharge limit of 95ºF and the delta-T limit of 25°F. While EPA explained in the Fact Sheet that a long term historical database of river temperatures and fish assemblages in the Piscataqua River did not exist, and that no clear record of environmental data from before the facility began operation was available to support a comparison of conditions before and after Schiller Station began operation, EPA evaluated the best available information to assess the effects of Schiller Station's discharges under the existing CWA § 316(a) variance and whether protection and propagation of the BIP would be assured going forward. *See* Fact Sheet at 62.

As noted in Section 6.4.2 of the Schiller Station Fact Sheet, EPA sent PSNH a Clean Water Act § 308 Information Request Letter, dated May 4, 2010 (clarified and amended by a follow-up letter from EPA, dated June 1, 2010). As part of the request, PSNH was directed to characterize Schiller Station's thermal plume. From August 15, 2010, through November 14, 2010, the permittee was required to collect continuous temperature data using a series of thermistors placed at several depths in eleven locations in the Piscataqua River, in the vicinity of the Station's discharge. This information, along with operational thermal discharge data from the facility and thermal plume data collected in the Piscataqua River by EPA, was used to assemble a reasonable characterization of the horizontal and vertical dimensions of the thermal discharge plume. The difference in temperature of the plume from ambient river conditions was also characterized. EPA compared this thermal information with scientific literature that evaluated the temperature sensitivity of various life stages of representative species that occur in the Piscataqua River. *See* Fact Sheet at 47-69. From this analysis, EPA concluded that "… Schiller Station's thermal discharge has not harmed the BIP in the relevant area of the Piscataqua River and would not be expected to do so in the future." *Id.* at 69. Having considered the public comments submitted in response to the Draft Permit, EPA continues to find that the record supports its judgment that renewal of Schiller Station's CWA § 316(a) variance with the existing thermal discharge limits will assure the protection and propagation of the BIP in the Piscataqua River. EPA finds that this analysis embodies a reasonable analysis of the relevant issues and does not agree that it should order PSNH to submit a revised or supplemental CWA § 316(a) variance application.

Response IV.C.1.b.: Consideration of Cumulative Impacts

As stated above, Sierra Club comments that PSNH failed to carry its burden of proof under CWA § 316(a) because it has not demonstrated that the alternative thermal discharge limits that it seeks will assure the protection and propagation of the BIP after taking account of the "cumulative impact of its thermal discharge together with all other significant impacts on the species affected." The commenter further states that PSNH failed to submit a cumulative impacts analysis as was needed to assess the impact of the proposed alternative heat limits in light of a range of other issues including existing turbidity and eutrophication in the Piscataqua River, the effect of Schiller Station's discharge of TSS on eelgrass, thermal discharge from nearby Newington Station, and climate change.

First, with regard to Schiller Station's thermal discharge, EPA judged that the overall thermal impact to the river is highly localized and does not persist throughout the waterbody (*See* Section 6.4.4 of the Fact Sheet). Indeed, EPA's determination about the limited nature of Schiller Station thermal plume is echoed by a report that Sierra Club submitted in support of its comments, which states that "… the [Schiller thermal] plume is localized, somewhat buoyant and well mixed with the tidal flows." (Petrudev 2016, Section 4.1, page 4-2). *See also id.*, p. page 5-3 (other specific issues raised by the report (Petrudev 2016) are addressed in other parts of this document). EPA recognizes that the report's author also urges that additional thermal data is needed to fully understand the impact of the thermal plume from Schiller (pages 4-14, 4-15), but EPA maintains that the data demonstrate that the facility's thermal plume is relatively minor and the evidence indicates that it does not contribute to material or detectable cumulative impacts to the overall lower Piscataqua River.

In light of this determination, EPA judged that a separate, even more detailed cumulative impacts analysis of each pollutant in combination with the thermal plume was not necessary in this particular case, though EPA did specifically consider and assess whether other power plant thermal discharges to the Piscataqua River could create cumulative impacts of concern. Thus, EPA included an appropriate general statement in the Fact Sheet to address the potential for compounding effects of the thermal discharge with other pollutants already in the waterbody, together with a specific discussion of the thermal discharges from Newington Station. EPA stated as follows:

> [f]urthermore, EPA also has taken into account whether appreciable harm might have been caused by the Facility's thermal discharge interacting with other types of pollutant discharges or other thermal discharges. With regard to the former, EPA does not see any pollutants being discharged by Schiller Station or other dischargers that would combine with the Facility's thermal discharge in a way that would have appreciably harmed the BIP or that would undermine assurance of the protection and propagation of the BIP going forward. With regard to the latter, EPA considered the thermal discharges from PSNH's Newington Station power plant and the EP Newington Energy, LLC, power plant both of which lie along the Piscataqua River upstream of Schiller Station. Neither of these discharges, however, presents a significant adverse cumulative thermal effect in conjunction with Schiller Station's discharge. Newington Station currently operates only infrequently and, therefore, contributes little heat to the river (see Newington Station Capacity Factor Information (AR-253)). The EP Newington Energy facility operates with a closed-cycle cooling system using wet cooling towers and has only a relatively small thermal discharge (specifically, 4.0 MGD of cooling tower blowdown; *see* NPDES Permit No. NH0023361).

Fact Sheet, p. 69. *See also id.*, pp. 50-51, 68-70.

In order to respond to this comment in even greater detail, EPA individually discusses the potential impacts listed by the Sierra Club as they relate to the thermal discharge and cumulative impacts to the Piscataqua River. Responses to these specific pollutants and potential impacts are presented in Response IV.C.1.c, below.

Response IV.C.1.c.: Specific Water Quality Concerns that Sierra Club Argues Need Additional Analysis as Possible Cumulative Impacts in Conjunction with Schiller Station's Thermal Discharge

The specific waterbody stressors of concern to the commenter are discussed individually in the following subsections.

Response IV.C.1.c.(1): Existing Turbidity and Eutrophication in the Piscataqua River

NHDES characterizes the Great Bay Estuary as having the classic signs of eutrophication: increasing nitrogen concentrations, low dissolved oxygen, and disappearing eelgrass habitat. *See* AR-329. The degree to which designated uses are impaired based on these indicators of eutrophication varies among the locations in the estuary. Eelgrass in the Lower Piscataqua River has declined by nearly 30% since 1990. *Id*. Based on the significant decline in eelgrass, the

CWA § 303(d) list identifies the Lower Piscataqua River South (the segment including Schiller Station) as impaired for eelgrass estuarine bioassessments, which is one of six quantitative indicators for eutrophication assessments used to determine compliance with the water quality standards for nutrients (Env-Wq 1703.14) and biological and aquatic community integrity (Env-Wq 1703.19). The other indicators include dissolved oxygen, dissolved oxygen saturation, chlorophyll-a, water clarity, and total nitrogen. *Id.*

Turbidity is an optical determination of water clarity and is related to the amount of light that can penetrate the water. Sunlight is necessary to support eelgrass growth. In addition, turbidity can inhibit photosynthesis, which in turn reduces oxygen levels in the water. Increased temperatures can exacerbate the effects of turbidity on the water because the amount of oxygen water can hold decreases as temperatures increase. However, in the case of the lower Piscataqua River, as noted previously, the thermal plume from Schiller is highly localized, buoyant, becomes well mixed, and does not persist throughout the waterbody (See Section 6.4.4 of the Fact Sheet). As a result, the Schiller Station thermal plume will not exacerbate any impacts from high turbidity throughout the water column or for any appreciable distance in the near-field of the river. In addition, the segment of the Piscataqua River that includes Schiller Station is listed in the 2012 CWA § 303(d) List as potentially attaining water quality standards for light attenuation, although additional data are needed. Accordingly, no measurable cumulative impacts from elevated turbidity and the thermal plume have been reported or are expected. It should also be noted that the Schiller Station permit has effluent limits to control total suspended solids (TSS) based on the values in the Steam Electric Effluent Limitations Guidelines (ELGs). *See Fact Sheet, pp.* 25, 28, 31, 32.

EPA agrees that eutrophication plays a major role in the challenge to the overall health of the Great Bay/Piscataqua River ecosystem. Specifically, researchers (*e.g.*, Lee 2004) and regulators (EPA, NHDES) have identified nitrogen loading in Great Bay and the Piscataqua River as a primary contributor to the loss of eelgrass habitat in Great Bay and the Piscataqua River. *See* AR-396. EPA and a number of partners are working together to address the complex problem of nitrogen loading in Great Bay. Runoff (*e.g.*, from lawns, farms, septic systems), groundwater flow, and discharges from 18 municipal wastewater treatment plants are the primary sources of nutrient loading in the watershed. *See* AR-359. Discharges of effluent from Schiller Station typically contain relatively low levels of nitrogen (0.1 to 0.3 mg/L) and the process water waste streams authorized by this permit are not expected to be a significant source of nitrogen. Still, the Final Permit includes monitoring requirements for total nitrogen in process water at Outfalls 016 and 017. As noted previously in response to comments submitted by PSNH, EPA will pursue additional nitrogen monitoring requirements for stormwater discharges from this facility under either the MSGP (which authorizes stormwater discharges) or a request for additional information under Section 308 of the CWA, or both.

Finally, increased water temperatures can magnify negative impacts in a eutrophic system (*e.g.*, increased plant respiration and oxygen consumption, triggering of harmful algal blooms, reduced oxygen solubility). However, the evaluation of the thermal discharge from Schiller Station reveals that the thermal impact to the river is highly localized and does not persist throughout the waterbody (See Section 6.4.4 of the Fact Sheet). Because the thermal plume has a relatively minor effect on this river system, the thermal discharge from Schiller Station, as regulated by the permit, has not and will not contribute to increased negative impacts from eutrophication within the Great Bay Estuary.

Response IV.C.1.c.(2): The Impact of Schiller Station's Suspended Solids Discharge on Eelgrass

The Sierra Club comments that EPA did not consider the cumulative negative impact of Schiller Station's discharge of suspended solids on eelgrass. Suspended solids can inhibit eelgrass growth by decreasing light availability and smothering eelgrass. *See* AR-359. As an example, Moore et al. (1996) compared eelgrass growth at several sites in Chesapeake Bay and observed that eelgrass at the site with the highest concentrations of TSS (30-40 milligrams per liter (mg/l) during spring) experienced poor survival. *See* AR-400. During the summer and fall of 2015, EPA collected water quality data in the mainstem of the Piscataqua River and measured ambient TSS values ranging from 9.5 mg/l (August 18, 2015) to 29 mg/l (October 1, 2015). Because TSS could potentially have adverse effects on eelgrass, EPA has considered the potential for TSS in Schiller Station's effluent to contribute to ambient TSS levels in the Piscataqua River.

TSS discharges from Schiller Station are transported to the receiving water at much lower flows than the thermal effluent (360,000 gallons per day as opposed to 40 million gallons per day). *See* Fact Sheet Attachment E. Thus, even before mixing with the Piscataqua River, the area potentially impacted by these discharges is even less than the relatively small area affected by Schiller Station's thermal discharge plume. The Final Permit regulates total suspended solids (TSS) from Schiller Station Outfalls 006, 011, 015, 016, 017, and 018. For each outfall, TSS discharges are limited by an average monthly value of 30 mg/l and a maximum daily value of 100 mg/l. These effluent limits are based on the limits set in the Steam Electric Effluent Limitations Guidelines (ELGs) for low volume wastes (*see* 40 C.F.R. § Part 423.12(b)(3)) and benchmark values for stormwater. *See* 65 Fed. Reg. 64,767. From 1990 to 2014, the maximum concentration of TSS in effluent at Outfall 016 did not exceed these limits and the mean value of the maximum daily concentrations was 8.42 mg/L while the mean monthly average concentration was 4.75 mg/L, indicating that TSS concentrations are generally very low. *See* Fact Sheet Attachment B.

EPA does not expect TSS in the Station's effluent to cause or contribute to eelgrass loss in the Piscataqua River due to the low volume of the TSS surface discharge, the technology-based effluent limits, and the high degree of dilution provided by the high energy, tidally influenced receiving water. EPA expects that TSS discharged from the Schiller Station outfalls would be well mixed and undetectable within a short distance from the discharge outfalls. EPA concludes that discharges of suspended solids from Schiller Station will not have a significant impact on eelgrass in the Piscataqua River or Great Bay. Moreover, given the limited extent of the thermal plume, EPA does not expect any cumulative impacts of the thermal plume and TSS in the effluent. EPA discusses the impacts of the thermal plume on eelgrass below.

Response IV.C.1.c.(3): The Impact of Schiller Station's Thermal Plume on Eelgrass

EPA also considered the potential effects of Schiller Station's thermal discharge plume on eelgrass and determined that the facility's thermal discharges have not had, and are not expected in the future to have, a detectable adverse effect on eelgrass in the Piscataqua River estuary. This is due to the quite limited scope of the facility's thermal discharge relative to the river's flow, temperature and currents in that area.

The distribution of eelgrass in the Piscataqua River has declined significantly since 1990. *See* Fact Sheet at 160, AR-329. As discussed above, researchers have identified nitrogen loading in, rather than thermal sensitivity, as the predominant reason for the loss of eelgrass habitat, including in the Great Bay/Piscataqua River ecosystem. *See* AR-380, AR-359. EPA and a number of partners in Great Bay, including NHDES, are working together to address the complex problem of nitrogen loading. *See* Fact Sheet at 27, 31, 33, 35, 44.

In 2016, surveyors observed an eelgrass bed at the mouth of the Piscataqua River in Portsmouth Harbor, approximately 3 miles downstream from the Schiller Station, and a small eelgrass bed on the Maine side of the river along the shore approximately 2 miles upstream from the station. See AR-410. EPA considered whether the discharge of heat from Schiller Station, as well as TSS, has the potential to impact these existing eelgrass beds or to interfere with restoration of eelgrass beds elsewhere in the river. A water temperature of 25°C (77°F) is recognized as the point at which thermally sensitive eelgrass communities become stressed. *See* AR-401(Rasmussen 1977 *in* Moore 2012). An upper limit range of 28°C to 30°C (82.4°F to 86.0°F) has been proposed as a critical threshold for growth, and water temperatures exceeding 30°C (86.0°F) for prolonged periods have been associated with large scale declines and transplant failures in Chesapeake Bay. *See* AR-387, AR-399, AR-407. Schiller Station's thermal discharge does not approach these levels. Ambient water temperatures in the Piscataqua River, measured continuously from August 15 through November 14, 2010, recorded a maximum instantaneous temperature of 22.2°C (72.0°F) at the near surface. EPA also collected additional ambient water temperature data to supplement data gathered in 2010. In the summer and fall of 2015, ambient river temperature data were collected continuously every 15 minutes at several locations in the mainstem of the Picataqua River, at a depth of approximately 2 meters. *See* AR-414. The highest temperature recorded from July 22 to July 29, 2015, was 22.3°C (72.1°F). From August 5 through September 1, 2015, the highest temperature recorded was also 22.3°C (72.1°F). From September 1 through September 16, 2015, the maximum temperature recorded was 21.1°C (70.0°F) and from September 16 through October 1, 2015, the maximum temperature recorded was 19.5°C (67.1°F).

In addition, the thermal plume is highly localized, buoyant, becomes well mixed and does not persist throughout the waterbody. In the discharge area immediately surrounding the outfalls, the buoyant plume's effect on water temperature decreases with greater depth in the river. As such, the thermal plume from the station would not be expected to come in contact with eelgrass habitat and influence the growth or survival of these aquatic organisms. *See* Fact Sheet, Section 6.4.4. Three months of temperature data (August through November 2010) collected from temperature monitors placed near the surface, at mid-depth and near the bottom of the river confirm that temperatures at mid-depth and bottom locations were at or near ambient river temperatures. *See* Fact Sheet, Table 6-B. Possible elevated ambient river temperatures observed in the future as a result of climate change impacts, for example, (discussed in more detail in Response to Sierra Club Comment IV.C.1.c.(5) and IV.C.1.d) would have to result in the near benthic water column of the river increasing in temperature by approximately 3°C (5.4°F) before negative impacts would begin to be observed on these aquatic organisms. Based on current information, EPA does not expect to see those kinds of water temperature changes in the foreseeable future.

Based on available information, including ambient river temperature monitoring in 2010 and 2015 and information about the relative size and depth of the thermal plume, Schiller Station's thermal plume will not impact eelgrass in the Piscataqua River. Further, ambient temperature monitoring suggests that current ambient temperatures, including any changes in water temperature due to climate change, do not approach levels shown to negatively impact eelgrass at this time.

Response IV.C.1.c.(4): Newington Station's Thermal Discharge Combined With Schiller Station's Thermal Discharge

In addition to the issues described above (turbidity, suspended solids, eutrophication, and eelgrass), the Sierra Club comments that the permitting process failed to take into consideration potential cumulative impacts from the nearby PSNH Newington Station Power plant. This is incorrect. In the Fact Sheet for the Schiller Station Draft Permit, EPA expressly considered and discussed the potential for cumulative effects from the thermal discharge from Newington Station, along with any effects from the EP Newington Energy, LLC power station:

> … EPA considered the thermal discharges from PNSH's Newington Station power plant and the EP Newington Energy, LLC, power plant, both of which lie along the Piscataqua River upstream of Schiller Station. Neither of these discharges, however, presents a significant adverse cumulative thermal effect in conjunction with Schiller Station's discharge. Newington Station currently operates only infrequently and, therefore, contributes little heat to the river (*see* Newington Station Capacity Factor Information (AR-253)). The EP Newington Energy facility operates with a closed-cycle cooling system using wet cooling towers and has only a relatively small thermal discharge (specifically 4.0 MGD of cooling tower blow down, *see* NPDES Permit No. NH0023361 (available on EPA's website at http://www.epa.gov/region1/npdes/permits/2012/finalnh0023361permit.pdf)

Fact Sheet, p. 69. *See also* Fact Sheet, pp. 50-51.

The Fact Sheet included a surface map of river temperatures generated from field data collected on August 31, 2010. *See* Fact Sheet, Fig. 6-2. This thermal plume map, which reflects reasonable worst case thermal conditions, was generated by EPA by plotting the temperature and position data collected during multiple transect runs in the Piscataqua River in the vicinity of Schiller Station using a boat mounted temperature sonde. The map also captures the surface thermal discharge from PSNH's Newington Station. The plume from Newington Station mixes with ambient river water upstream of Schiller Station and does not come in contact with Schiller's thermal plume. In addition, river temperature data were collected using an array of fixed, continuous temperature monitors placed in the Piscataqua River at different depths and locations near the Schiller Station outfalls from August 15 through November 14, 2010, (see

Section 6.4.3 of the Fact Sheet). Analysis of the temperature records from these monitors also indicates that the thermal plume from Newington Station does not interact with the thermal plume from Schiller Station.

Based on this information, EPA judged that further evaluation of potential cumulative impacts from the two nearby facilities is not warranted. Under the current operational profile of PSNH Newington Station and EP Newington, these thermal discharges in question meet protective limits, have no history of exceedances, and are generally considered to be minor volumetric discharges when compared with the high tidal energy and overall volume of the Piscataqua River. Again, Newington Station's capacity factor has substantially declined (*see* AR-301) and, as a result, EPA is even more confident that its thermal discharge, when considered with Schiller Station's, does not pose a significant cumulative thermal discharge impacts.

Response IV.C.1.c.(5): Climate Change Combined With Schiller Station's Thermal Discharge

Sierra Club's comments particularly stress that it believes that PSNH and EPA have failed to consider the cumulative impacts of climate change along with Schiller's thermal discharge to the Piscataqua River. The key point is that Schiller Station's thermal discharge plume, as discussed previously, is buoyant, highly localized, and does not persist throughout the waterbody. *See* Fact Sheet, Section 6.4.4. As a result, the thermal discharge from Schiller Station does not contribute a significant adverse cumulative impact to the overall thermal profile of the Piscataqua River, or even the area of the river near the facility. *See* Fact Sheet, p. 52, Fig. 6-2. As a result, EPA does not agree that PSNH needs to submit a supplemental cumulative impacts analysis at this time to address the issues raised by Sierra Club.

Sierra Club submitted a supporting technical report with its comments on the Draft Permit which states that as a result of climate change, "[m]id-century temperatures are predicted to increase by 3 to 5°C, and end-of-the-century temperatures to increase as much as 4 to 6°C" as a result (Petrudev 2016, Section 5; from CSNE 2011). Yet, these predicted temperature increases are air temperatures, not water temperatures. Increasing air temperatures will contribute to higher water temperatures over time, but the water temperature increase in the Piscataqua River will likely not be of the same magnitude as predicted air temperature increases because more energy is needed to raise water temperatures than to raise air temperatures, and because of other complex factors that influence the thermal profile of a large tidal river like the Piscataqua River. The Sierra Club's report discusses the predicted air temperature increases (3 to 6°C) and refers to them as "ambient temperatures" without clarifying that associated river and coastal water temperature increases would not likely be of the same magnitude. The Sierra Club report also cites to a scientific paper and states that "Tlusty, et al. (2008), indicated that winter temperatures in the North Atlantic are up to 3°C above average." But that paper indicates that such water temperature increases are not uniform. The paper states that: "Ocean temperatures have increased 0.6[degrees]C over the past 100 y (Millennium Ecosystem Assessment 2005), with winter temperatures in the North Atlantic as much as 3[degrees]C higher than average (Drinkwater et al. 2003)." This does not indicate that such increases will occur in the Piscataqua, much less that Schiller Station's discharge will combine with ambient changes to have an adverse cumulative effect on the BIP.

In a May 17, 2012, letter to the NRC discussing relicensing of the Pilgrim Nuclear Power Station, NOAA (2012) explained that ocean temperatures in the northeast have been increasing, but not to the same magnitude as air temperature increases, and not to the same degree as the ocean temperature increases discussed in Petrudev (2016). NOAA stated that:

> For example, there has been an increase in Boothbay Harbor's (Maine) temperature of about 1°C since 1970, and that, assuming that there is a linear trend in increasing water temperatures and decreasing pH, one could anticipate a 0.03-0.04°C increase each year, with an increase in temperature of 0.6-0.8°C between now and 2032…" and a 0.003-0.004 unit drop in pH per year, with a drop of 0.06-0.08 units between now and 2032. Given this small increase, it is not likely that over the proposed 20-year operating period that any water temperature changes would be significant enough to affect the conclusions reached by us in this consultation." (See pg. 28 of the NOAA letter to NRC, 2012)

EPA does not presently have sufficient data to even attempt to make precise predictions about future ambient water temperatures in the Piscataqua River. Moreover, such an analysis is currently beyond the scope of this NPDES permit renewal. That said, temperature monitoring required by the permit (continuous cooling water intake temperatures) over the next five years will provide valuable information regarding the long term ambient water temperatures in the Piscataqua River. This data will assist in evaluating any effects of Schiller Station's thermal discharge and climate change on the Piscataqua River going forward.

Response IV.C.1.d.: Impacts of Schiller Station's Thermal Discharge and Predicted Climate Change on Temperature Sensitive Organisms

In its comments – specifically, in the Petrudev Report – Sierra Club identified six species that are likely to be adversely affected from future increases in ambient river temperatures as a result of climate change coupled with thermal discharges by Schiller Station and other sources. *See* AR-312. These six species are as follows: rainbow smelt, Atlantic herring, river herring, American lobster, tautog, and Atlantic tomcod. EPA has carefully considered Sierra Club's comments, as well as the supporting discussion provided in Petrudev's Report, about the potential effects from Schiller Station's thermal discharge, combined with other stressors, such as climate change, on fish and macrocrustaceans in the Piscataqua River, with an emphasis on these six species. From this evaluation, EPA reconfirms its conclusion that renewing Schiller Station's CWA § 316(a) variance will assure the protection and propagation of the BIP, including the species identified by the Sierra Club. This conclusion is supported by the findings that, as explained previously, the Schiller Station thermal plume is highly localized, buoyant, and well mixed, and it does not persist throughout the waterbody. *See* Fact Sheet Section 6.4.4. Moreover, water temperatures, even within the plume, are not high enough to cause significant adverse effects to the BIP.

In Section 6.4.4 of the Fact Sheet, EPA identified a list of twelve representative important species (RIS) found in the Piscataqua River near Schiller Station. *See* Fact Sheet at 56-62. The RIS were selected because they were representative of the BIP and included thermally sensitive species. If these species are protected, then less sensitive species will be protected as well. EPA's

RIS included four of the six species raised by Sierra Club (namely, rainbow smelt, Atlantic herring, river herring, and American lobster). EPA conducted a critical temperature assessment that compared temperatures for causing adverse effects (*e.g*., mortality, avoidance) for the different life stages of a number of RIS species, including rainbow smelt and river herring, against the water temperatures likely to be experienced in the Piscataqua River with Schiller Station's thermal discharge under the renewed CWA § 316(a) variance. *See* Fact Sheet at 56-69. EPA concluded that the thermal plume allows a sufficient zone of passage for swimming and drifting organisms, represents little to no impediment to fish migration, occupies only a small portion of the water column (at its maximum, only a 12% cross-sectional area of the bank-to-bank area of the river), and will not contact sediment or benthic species. In addition, EPA concluded that the majority of early life stages of fish in the Piscataqua River will pass by Schiller Station without coming into contact with the plume and the relatively small percentage that may encounter the plume will likely be transported past the mixing zone within a matter of minutes and will not be exposed for a long enough duration or high enough temperatures to be deleterious to aquatic life. *See* Fact Sheet at 63-68. EPA notes that neither Sierra Club nor Petrudev has identified any deficiency or particular weakness in the critical temperature assessment in the Fact Sheet. Nonetheless, Sierra Club has raised particular concerns about the thermal impacts of the plume, both independently and in combination with climate change, that EPA addresses here.

As noted above, in support of Sierra Club's comments, Petrudev evaluated the impact of Schiller Station's existing thermal discharges on fish passage and fish populations, including whether Schiller's thermal discharges allow for the protection and propagation of a BIP. EPA largely agrees with Petrudev's generic review of the types of adverse impacts that a thermal discharge could have on aquatic life, including mortality, changes to reproduction capacity and fecundity, altered habitat or community structure, and advanced hatching. *See* Petrudev Report at 4-1 to 2. EPA notes that the rise in ambient temperature from the references in the section (5.5 – 12°F) are generally higher than the rise in temperature in the thermal plume at Schiller Station (2 - 4°F, with a narrowly localized hot spot at the outfall) under reasonably worst-case conditions. *See* Fact Sheet at 64. In particular, EPA disagrees with Petrudev's suggestion that the same changes in benthic cover and fish assemblages resulting from the thermal plume at a facility in Brazil could be occurring at Schiller Station. The delta-T from this facility was measured as 8°C (14.4°F) approximately 320 feet from the discharge, the once-through cooling water flow was reported as 2.7 billion gallons per day, and the facility in question discharged into a bay. Not only have these types of environmental impacts *not* been documented in the vicinity of Schiller Station, but EPA concludes that these types of impacts are unlikely to be caused by the thermal plume from Schiller for the reasons already discussed in this document (*e.g.*, the limited scope and intensity of the Schiller thermal plume relative to the segment of the Piscataqua River that receives the discharge). Thermal effects that may have occurred as a result of the Brazilian facility's thermal discharge do not indicate that similar effects would occur due to Schiller Station's thermal discharge.

Petrudev's evaluation included a preliminary thermal risk assessment to evaluate the impact of the existing thermal discharges of fish passage and fish populations on four representative species: rainbow smelt, Atlantic herring, winter flounder, and Atlantic menhaden (Petrudev did note that Atlantic tomcod, American lobster and tautog were not included in the risk assessment because sufficient data was not available). The assessment compared exposure temperatures to thermal effects benchmarks at specific life stages (*e.g.*, egg/incubation, larvae, young-of-year/fry/juveniles) for each of the species evaluated. Exposure temperatures were calculated from the available temperature data evaluated for the Draft Permit, which was collected in the Piscataqua River from August 15 to November 15, 2010. *See* Fact Sheet Section 6.4.4. Petrudev's thermal assessment indicated that river temperatures would not impact Atlantic menhaden larvae, winter flounder juveniles, rainbow smelt larvae, rainbow smelt juveniles, or Atlantic herring eggs. *See* Petrudev Report at 4-10 to 12.

Petrudev's analysis indicated that river temperatures could impact rainbow smelt eggs at mid-depth at all stations (including reference stations). Petrudev states:

> Rainbow smelt spawn in late March to late May and eggs incubate for about 2 to 3 weeks. Eggs are negatively buoyant and adhesive and attach to substrates such as gravel or submerged vegetation.

Petrudev Report at 4-14. Based on these life history attributes, however, EPA concludes that the thermal plume will not impact rainbow smelt eggs because they are not present at mid-depth (where the thermal assessment indicates impacts could occur) and are unlikely to be present during the time period for which Petrudev evaluated temperatures (August to November).[94] The conclusion that thermal impacts are unlikely because the life stage at issue would not be present is supported by the fact that, in addition to the plume stations, the thermal assessment suggests that both reference stations would have exceedances of preferred temperatures for eggs at mid-depth. *See also* Pertrudev at 4-14 ("Exceedances also occurred at both reference sites 1 and 11 suggesting that effects due to thermal plumes (sites 2 to 10) may not occur"). The comments and supporting analysis submitted by Sierra Club offer no other evidence that rainbow smelt is likely to be adversely affected by the thermal plume, alone or in combination with climate change, nor do its comments suggest that EPA wrongly concluded that the thermal plume would not affect adult rainbow smelt in the Piscataqua River during spring. *See* Fact Sheet at 68. Based on EPA's previous analysis and its review of the analysis in the Petrudev Report, EPA maintains that the existing thermal plume will be protective of rainbow smelt in the Piscataqua River.

Petrudev's analysis also indicated that river temperatures could impact Atlantic herring juveniles at the surface (at 10 of 11 stations, including one reference station) and at mid-depth (at four stations). Petrudev concludes, however, that "juvenile herring would likely exhibit an avoidance response to the area if temperature exceedances occur." Petrudev Report at 4-15. EPA agrees with Petrudev that individuals could avoid the plume if temperatures exceed the preferred temperature for juvenile herring. As the Fact Sheet (at 63-64) explains, the width and depth of the river unaffected by the thermal plume allows a sufficient zone of passage for both swimming and drifting organisms. Further, avoidance temperatures are triggered well before the fish is exposed to potentially lethal temperature values. Because a large area of the river is unaffected

[94] Petrudev also recognizes that the rainbow smelt's life history attributes would minimize the potential that the plume could affect this life stage, stating "the summary of HQ values included data for June-August for rainbow smelt eggs when eggs have likely already hatched and therefore results may be somewhat misleading." Petrudev Report at 4-14. EPA assumes "June-August" refers to both temperature data from the Piscataqua River and data used to derive thermal benchmarks, as river data was only available for August to November.

by the thermal plume, adult and juvenile fish, including Atlantic herring, can avoid elevated water temperatures long before the fish would be exposed to upper lethal temperature values, if any were to occur. *Id*. at 65. EPA concludes that in the event that the plume does cause an avoidance response for juvenile Atlantic herring, this behavior it is unlikely to adversely affect the fish. Based on EPA's previous analysis and its review of the analysis in the Petrudev Report, EPA maintains that the existing thermal plume will be protective of Atlantic herring in the Piscataqua River.

In addition to the temperature assessment, Petrudev asserts that waters in the Piscataqua River/Great Bay region are warming due to the effects of climate change and that the thermal discharges from Schiller in combination with the higher ambient temperatures is likely to adversely affect fish and macrocrustaceans such as rainbow smelt, Atlantic herring, tautog, Atlantic tomcod, river herring, and American lobster. Petrudev, summarizing the results of a UNH climate model (AR-319), states that mean annual temperatures have warmed "1 to 2°C" since the 1970s, that mid-century temperatures are predicted to increase by "3-5°C," and that increases as much as "4 to 6°C" may occur by the end-of-the-century. *See* Petrudev at 5-1. Petrudev then provides examples of some species that could be adversely affected by a predicted increase of 3-6°C in ambient temperature. To clarify two important points, however, the UNH climate model presents the temperatures evaluated in the report as degrees *Fahrenheit*, not *Celsius*, and the predicted changes that Petrudev cites in his review are increases in ambient *air* temperatures between 2010 and 2069 and between 2070 and 2099, which do not translate to identical increases in sea surface temperatures. In other words, the predicted increase in regional ambient air temperatures of 3 to 6°F (1.5 – 3.3°C) from the UNH model does not directly translate to a predicted increase of 3 to 6°F in the ambient temperature of the Piscataqua River. The UNH model did not evaluate the predicted rise in river temperatures, but did observe that sea surface temperatures in the Gulf of Maine have increased, on average, 0.52°F per decade from 1970 to 2008. In other words, it is likely that ambient temperatures in the Piscataqua River, as in the Gulf of Maine, are trending upwards, and will be influenced by continued air temperature increases, but the magnitude of the increase in water temperatures will likely be substantially less than Petrudev asserts in his review.

Petrudev provides that a 3-6°C increase in ambient water temperature, either due to climate change or thermal discharge at Schiller, or both, would have an impact on American lobster, tautog, and Atlantic tomcod. *See* Petrudev at 5-1 to 2. As discussed above, however, the climate change model does not predict a 3-6°C increase in river temperatures. Moreover, the available data for Schiller Station's thermal plume does not suggest that critical temperatures will be exceeded for the species listed above. First, because, as discussed above, the actual expected increase in river temperatures is likely to be much less than 3°C, and second, because the impacts of the thermal plume are likely to be minimal. The thermal plume from Schiller Station is highly localized, buoyant, well mixed and does not persist throughout the waterbody. *See* Fact Sheet at 63-4. The highest rise in temperature (delta-T) observed under reasonably worst case conditions on August 31, 2010 was 3.6°F (2°C). Even Petrudev recognizes the limited extent of the plume in his comment, characterizing it as "localized, [and] somewhat buoyant, and [indicating that] the exposure time to elevated temperatures may be of short duration for organisms due to the high tidal influence." Petrudev Report at 5-3.

Petrudev provides a range of preferred temperatures for various life stages of each species, but presents no evidence that temperatures in the Piscataqua River are currently exceeding, or are predicted to exceed, these preferred temperatures during the time of year when the life stages are present over any meaningful timeframe for this permit proceeding. As the Fact Sheet explains, even if Schiller Station's thermal plume was to approach temperatures that could cause avoidance behavior, more than 88% of the total bank-to-bank cross-section of the river is unaffected by the plume at its widest point and, within the plume, any impacts of elevated temperatures would likely be of short duration because the high energy tidal flow of the river fosters vigorous mixing. *See* Fact Sheet at 63. Drifting organisms, such as tautog and river herring eggs and larvae, as well as American lobster larvae, would be exposed to elevated temperatures for only a matter of minutes (as compared to the 30-minute or longer exposure times that are typically used to derive upper lethal temperatures) and to lower delta-Ts (2-4°F) and lower maximum temperatures (82.4°F) than the values found to have lethal impacts to drifting organisms at shorter durations (*e.g*, delta-Ts of 16-20°F and maximum temperatures of 87-89°F). *See* Fact Sheet at 64-65. For swimming organisms, such as juvenile Atlantic tomcod, the modest size of the thermal plume allows fish to easily move to unaffected areas of the river. *Id*. In addition, the plume is primarily a near-surface feature that occupies a small portion of the water column and does not contact the sediment or benthic species or life stages, such as Atlantic tomcod eggs. For this reason, there will be no impacts from the plume on drifting organisms, swimming organisms, or early, benthic life stages.

As noted previously in response to this comment, EPA is satisfied that granting the § 316(a) thermal variance is protective of the BIP, including the species identified by the Sierra Club. Moreover, because any impacts of the thermal plume are expected to be confined to the upper portion of the water column in a small area of the river less than 200 feet from the outfalls, EPA believes that the addition of the thermal plume would not contribute to adverse impacts even if river temperatures warm over the next decade. EPA cannot anticipate how the UNH climate model's predicted increase in air temperatures of 3-6°F over the next 50 years will affect water temperatures and aquatic life in the Piscataqua River at this time. However, the permittee must reapply for the variance from technology- and water quality-based standards granted under § 316(a) of the CWA during each permit cycle. Petrudev notes that additional thermal data under all seasonal conditions would better inform any assessment of the potential thermal impacts of Schiller Station on the Piscataqua River. While EPA has found that it has reasonably adequate data for drawing the necessary conclusions for the new Final Permit for Schiller Station, EPA generally agrees that having even more key, representative data will further strengthen the basis for analysis to support future permit determinations. EPA has included the collection of continuous cooling water intake and discharge temperature data in the Final Permit, intended to be used for permit compliance as well as a long-term water temperature database to support such future permit decisions. EPA will continue to review river conditions to determine if the variance will continue to protect the BIP in the future, including in the event that ambient river temperatures increase as a result of climate change.

Sierra Club Comment IV.C.2 Sierra Club Agrees with EPA that, in the Absence of a Thermal Discharge Variance, Schiller Must Convert to a Closed-Cycle Cooling System

Schiller must comply with BAT standards on thermal pollution.[196] Schiller's once-through cooling system does not represent BAT for reducing or eliminating thermal discharges. Schiller must also meet the applicable water quality standards for the Piscataqua River. Sierra Club agrees with EPA that wet, mechanical draft cooling towers are the best available technology for controlling heat, will assure compliance with water quality standards, and will assure protection of a balanced, indigenous population of fish, shellfish and wildlife in and on the Piscataqua River. Because, as noted above, a 316(a) variance at Schiller is not warranted, Schiller should install cooling towers to comply with Section 301 (BAT) standards on thermal pollution.

[196] See 33 U.S.C. §§ 1311(b)(2)(F) (requiring that BAT effluent limitations be established for all non-toxic pollutants by 1989), 1362(6) (defining "pollutant" to include heat).

EPA Response to Sierra Club Comment IV.C.2:

Contrary to the comment above, and as explained in prior responses to comments, EPA has determined that it should grant Schiller Station's request for thermal discharge limits based on a CWA § 316(a) variance. As a result, EPA has included such variance-based limits in the Final Permit. Accordingly, the Schiller Station thermal discharge limits are not based on technology standards or water quality standards. While EPA agrees with the commenter that in the absence of a CWA § 316(a) variance, thermal discharge limits would be based on technology standards and/or water quality standards, this is not relevant here because EPA *is* granting a variance.[95]

That said, EPA explained in the Fact Sheet for the Draft Permit that NHDES found that the variance-based thermal discharge limits would satisfy New Hampshire water quality standards for the Piscataqua River. Specifically, EPA requested concurrence from NHDES that the thermal limits contained in the 1990 permit attain water quality standards, are supportive of state policy, and are protective of the existing uses of the Piscataqua River. In response to this request, NHDES sent EPA a letter dated September 4, 2013, agreeing that the thermal limits in the 1990 permit can be continued in the reissued permit based on review of the thermal study, changes at the facility (including decommissioning of Unit 3), and discussions with NH Department of Fish and Game. *See* AR-146. Furthermore, NH DES issued a water quality certification for the Final Permit on February 27, 2018. *See* AR-434.

In addition, EPA notes that the commenter agrees with the Agency's determination, as explained in the Fact Sheet, that the BAT for controlling thermal discharges from Schiller Station would be to convert to closed-cycle cooling using mechanical draft cooling towers, but EPA also notes, once again, that the thermal discharge limits for Schiller Station's Final Permit are based on a CWA § 316(a) variance, not on technology-based requirements.

Sierra Club Comment IV.D Protection for Endangered Species

Sierra Club Comment IV.D.1 EPA Should Require Closed-Cycle Cooling System to Protect Endangered Species and Their Habitat

As noted above, Schiller is located along a reach of the Piscataqua River in which three endangered species of fish are found: Atlantic sturgeon, shortnose sturgeon, and Atlantic salmon. PSNH's failure to detect these species in its limited sampling is not surprising. Endangered species are, by definition, rare. And after reviewing Normandeau's sampling protocol, Petrudev concludes that "[t]he entrainment sampling design for Schiller was not robust enough for periods of high entrainment…[and] was not designed to detect species of low abundance such as ESA listed species found in the Piscataqua River."[197] As discussed above, both EPA and NMFS have recognized that all three endangered species are present in the Piscataqua and may use the river, the upstream Salmon and Cocheco rivers, and the larger Great and Little Bay Estuaries for spawning and rearing – or in the case of the Atlantic sturgeon, they may do so again if the species recovers.

Under Section 9 of the Endangered Species Act, PSNH is strictly prohibited from killing, harming, or destroying these animals, from adversely modifying designated critical habitat, or from adversely affecting any habitat in a way that jeopardizes the recovery of these species. [198] Further, the Piscataqua could soon be designated a critical habitat under the Endangered Species Act. The National Marine Fisheries service has not yet designated critical habitat for the Atlantic sturgeon, but is legally obligated to do so and the designation is overdue. Historically, the Great and Little Bay Estuaries and the Piscataqua were an important breeding habitat for the sturgeon. Thus, Schiller may soon be located in – and may soon adversely modify – designated critical Atlantic sturgeon habitat.

Finally, Sierra Club notes that the sturgeon and salmon species discussed above are only a subset of the species evaluated by EPA (headquarters) in its Biological Evaluation of the new Section 316(b) regulations. In the Biological Evaluation prepared by EPA for those rules, EPA reported to the Fish and Wildlife Services and the National Marine Fisheries Service that the following additional species also have habitat range that overlaps with Schiller's cooling water intake: loggerhead turtles; green sea turtles; leatherback turtles; kemp's ridley turtle; hawksbill turtles; piping plover; Atlantic least tern; and roseate terns. To Sierra Club's knowledge, EPA has not considered the impact of Schiller's intake system (including loss of prey species) on these endangered species.

EPA cannot authorize PSNH to continue to operate a once-through cooling system that takes endangered individuals, jeopardizes the recovery of the species, and adversely modifies vital habitat for juvenile sturgeon and salmon. [199] The most viable measure to protect both shortnose and Atlantic sturgeon is to convert Schiller to a closed-cycle cooling system. Closed cycle cooling is technically and economically feasible. And short of a complete plant shutdown, there is no other option that will offer as much protection to these species. Closed-cycle cooling system is the only viable alternative that reduces the risk of sturgeon and salmon mortality "to the maximum extent practicable" as required by the Endangered Species Act, 16 U.S.C. § 1539.

[197] Petrudev report at 3-1.
[198] See 16 U.S.C. §§ 1538-39.
[199] See Strahan v. Coxe, 127 F.3d 155, 163 (1st Cir. 1997) (government agency violates ESA if private actions that are regulated and specifically authorized by government result in take of listed species).

EPA Response to Sierra Club Comment IV.D.1:

Contrary to this comment, as part of EPA's consultation with the National Marine Fisheries Service (NMFS) under Section 7 of the Endangered Species Act (ESA), the agencies agreed that the only ESA-listed protected species present in the action area of the Schiller Station discharge would be the Atlantic sturgeon and the shortnose sturgeon. Therefore, EPA's consultation with NMFS further assessed only these two species. EPA has considered the other species mentioned in the comment – *i.e.*, loggerhead turtle; green sea turtle; leatherback sea turtle; kemp's ridley sea turtle; hawksbill sea turtle; piping plover; Atlantic least tern; and roseate tern – but these species are not expected to be present and did not need to be addressed further through an ESA consultation.

Since publication of the Draft Permit for Schiller Station, however, NMFS designated critical habitat for the Atlantic sturgeon, with the Final Rule designating critical habitat for five Distinct Population Segments (DPS) of the Atlantic sturgeon, effective as of September 18, 2017. Furthermore, the newly designated critical habitat includes the segment of the Piscataqua River in the vicinity of the Schiller Station discharge. As a result, EPA reinitiated its ESA section 7 consultation with NMFS to address this designated critical habitat. EPA has completed this consultation and NMFS has concurred with EPA's determination that "the proposed action is not likely to adversely affect any ESA-listed species or designated critical habitat under [NMFS] … jurisdiction." *See* NMFS concurrence letter completing consultation, dated January 2, 2018 (AR-379); EPA revised letter to NMFS reinitiating consultation and incorporating Atlantic sturgeon critical habitat, dated December 15, 2017 (AR-378); EPA initial reinitiating consultation letter, dated November 17, 2017 (AR-377); EPA consultation letter to NMFS for Schiller Station, dated January 26, 2016, (AR-376); NMFS concurrence letter to EPA, dated May 11, 2016, (AR-375); and Fact Sheet Attachment E. Thus, EPA has complied with the ESA for issuance of the Final Permit for Schiller Station.

Endangered Atlantic salmon are not present in the Piscataqua River. The Gulf of Maine DPS of Atlantic salmon is listed as endangered under the ESA, but these wild salmon are not found in the Pisacataqua River. The Gulf of Maine DPS is found in the freshwater range covering the watersheds from the Androscoggin River northward along the Maine coast to the Dennys River. The listing covers all associated conservation hatchery populations used to supplement these natural populations. The critical habitat rule divided the DPS range into three recovery units, termed Salmon Habitat Recovery Units (or SHRUs): (1) The Merrymeeting Bay SHRU, which covers the Androscoggin and Kennebec basins, and extends east to include the Sheepscot, Pemaquid, Medomak, and St. George watersheds; (2) the Penobscot Bay SHRU, which covers the entire Penobscot basin and extends west to, and includes, the Ducktrap watershed; and (3) the Downeast SHRU, including all coastal watersheds from the Union River east to the Dennys River (Status Review of Atlantic Salmon, NMFS, September 2006). Thus, an ESA consultation for endangered Atlantic salmon is not required for the Schiller Station NPDES permitting action.

Juvenile Atlantic salmon *not* listed as threatened or endangered *are* expected to be present in the Piscataqua River, but EPA considered potential effects of the permit action on these organisms. Potential impacts to juvenile Atlantic salmon not associated with the Gulf of Maine endangered DPS were addressed in the discussion of Essential Fish Habitat species in Attachment D of the Schiller Station Fact Sheet. EPA satisfied its EFH consultation requirements under the 1996 Amendments (PL 104-267) to the Magnuson-Stevens Fishery Conservation and Management Act (16 U.S.C. §1801 et seq. (1998)) through the analysis in Attachment D and a letter submitted to NMFS, dated November 19, 2015. *See* AR-310.

As mentioned above, while the commenter suggests that loggerhead, green, leatherback, kemp's ridley, and hawksbill sea turtles may have a general habitat range that overlaps the coastal and near shore areas of the Piscataqua River, both EPA and NMFS have agreed that the only endangered species likely to be found in the action area of the Schiller Station discharge are the Atlantic sturgeon and the shortnose sturgeon. *See* AR-374, AR-375. Therefore, EPA did not include an evaluation of the presence/absence of sea turtles in the action area as part of the informal consultation with NMFS under the ESA. Furthermore, there is no evidence suggesting an adverse effect on these species from impacts to their prey or any other impacts. In addition, EPA also determined that the piping plover, Atlantic least tern and roseate tern are not expected to be in the action area of the Schiller Station discharge and, therefore, that no consultation was required. *See* AR-416.

Sierra Club Comment IV.D.2 Schiller Must Consult with FWS and NMFS Regarding Impacts to Endangered Species.

There is no indication in the administrative record that EPA has complied with the new 316(b) regulations by providing to NMFS or FWS a copy of PSNH's NPDES application, the draft permit, the permit fact sheet, and "any specific information the Director has about threatened or endangered species and critical habitat that are or may be present in the action area." [200] Likewise it is unclear whether EPA has afforded NMFS a 60-day period to review those materials. If NMFS and FWS have not had an early opportunity to comment on the draft permit, EPA has violated the requirements of its own regulations and deprived itself of the chance to receive expert feedback that could substantively alter the permit's endangered species protections.

Sierra Club requests that all correspondence between EPA and the Services be included in the administrative record and made public immediately.

[200] 40 C.F.R. § 125.98(h)

EPA Response to Sierra Club Comment IV.D.2:

EPA effectively initiated its information consultation with NMFS for the Schiller Station NPDES permit renewal with an exchange of emails in December 2012 (AR-374). This email exchange referenced additional information that had been developed by the agencies in the context of an ESA consultation for the NPDES permit for the upstream EP Newington Energy Power Plant.

The Draft Permit and Fact Sheet for Schiller Station were published on the EPA Region 1 NPDES Permit website at https://www.epa.gov/nh/public-notice-draft-permit-schiller-station-portsmouth-nh-nh0001473 on September 30, 2015. The Fact Sheet explained that, based on an analysis of potential impacts to listed species (included as Attachment E to the Fact Sheet), a formal consultation pursuant to Section 7 of the ESA was not required and that EPA was seeking concurrence from NMFS with this preliminary determination. Fact Sheet at 174. At the same time, materials making up the administrative record for the Draft Permit, including PSNH's permit application (AR-044) and supplemental application (AR-139) were made publicly available on the website. Also that same day, NMFS and the United States Fish and Wildlife Service (USFWS) were notified as part of the standard public notice procedures that the Draft Permit and supporting documents were available on the EPA Region 1 website. *See* AR-257.

On January 26, 2016, EPA submitted a letter to NMFS seeking concurrence with EPA's preliminary determination regarding formal consultation. *See* AR-376. EPA did not seek written concurrence from the USFWS because no protected species under the jurisdiction of the USFWS were judged to be in the action area for the Schiller Station NPDES permit. As noted in Response to Sierra Club Comment IV.D.1, NMFS concurred with EPA's findings in a letter dated May 11, 2016 (AR-375), thus completing informal consultation.

On September 14, 2017, however, NMFS designated critical habitat for the Atlantic sturgeon, including the Piscataqua River. As a result, EPA reinitiated the consultation. As the Fact Sheet explained, an ESA consultation is reinitiated if a new species is listed or critical habitat designated that may be affected by the identified action. Fact Sheet at 174. EPA assessed the potential impacts of the federal action on the newly designated Atlantic sturgeon critical habitat in the Piscataqua River and determined that a formal consultation pursuant to Section 7 is not required. EPA reinitiated informal consultation with NMFS, assessing potential effects to Atlantic sturgeon critical habitat in a letter dated November 17, 2017, (AR-377) and a subsequent letter to NMFS dated December 15, 2017 (AR-378). NMFS provided a letter of concurrence completing informal consultation, dated January 2, 2018 (AR-379). This is discussed in more detail in other responses above.

EPA has provided NMFS with the necessary documentation and sufficient time to review the materials to ensure that the Final Permit is protective of federally listed species. Further, the documentation in the administrative record and the correspondence from NMFS concurring with EPA's findings confirm that both USFWS and NMFS have been properly consulted regarding the potential impacts of the federal action on listed species and critical habitat under their respective jurisdictions. Neither USFWS nor NMFS have suggested that the consultation process completed for the Schiller Station NPDES Permit was insufficient or inconsistent with the ESA.

Sierra Club Comment IV.E. EPA Has Failed to Consider Unpermitted Discharges Associated with Schiller's Leaking Coal Ash Landfill

For thirty years, the Schiller landfill was a receptacle for harmful industrial waste streams, including fly ash, a byproduct of burning coal known to contain heavy metals and other toxic pollutants. EPA has failed to consider evidence that Schiller's coal ash landfill is leaking, that a contaminated groundwater plume has migrated beyond the perimeter of the landfill, and has likely already traveled the short distance to the Piscataqua River and caused surface water pollution. Despite infrequent monitoring (and Sierra Club proposes that the permit be revised to require at least quarterly groundwater monitoring), high levels of manganese above standards have been detected in the groundwater. There is no place for the contaminated groundwater plume to go but towards the Piscataqua River, and the plume has had decades to travel there. These discharges are not authorized under the current NPDES permit and, as such, constitute violations of Sections 301 and 402 of the Clean Water Act.[201] EPA must thoroughly study the unpermitted discharge, and address it accordingly in the final Schiller permit.

EPA should not renew the permit without considering the possibility of ongoing unpermitted discharges.

[201] 33 U.S.C. §§ 1311(a) ("Except as in compliance with this section and sections 1312, 1316, 1317, 1328, 1342, and 1344 of this title, the discharge of any pollutant by any person shall be unlawful."), 1342. See also Dague v. City of Burlington, 935 F.2d 1343, 1354-55 (2d Cir. 1991) (discharge of pollution into groundwater is subject to regulation under the Clean Water Act if the groundwater is "directly hydrologically connected" to waters of the United States), rev'd in part on other grounds (award of attorney's fees), 505 U.S. 557); New York

EPA Response to Sierra Club Comment IV.E:

This comment is not relevant to this permit proceeding as NPDES permits only apply to point source discharges. The comment describes a possible leak in the landfill, which does not constitute a point source discharge[96] and is regulated outside of this NPDES permit. EPA has confirmed with NHDES that this is regulated by Groundwater Management Permit GWP-198404088-P-002 issued under the *Contaminated Site Management* Rules (Env-Or 600), per authority in RSA 485-C, the Groundwater Protection Act (see Section 485-C:6-a). One condition of the Groundwater Management Permit (page 2) states that "[t]he permittee shall not cause groundwater degradation that results in a violation of surface water quality standards (N.H. Admin. Rules Env-Wq 1700) in any surface water body." The appropriate office at NHDES will handle the necessary regulatory oversight to ensure water quality continues to be protected and legal requirements are met.

Sierra Club Comment V. Conclusion

In light of these considerations, Sierra Club respectfully asks that EPA:

[96] In the 2015 Steam Electric Guidelines, EPA defined a new waste stream called "combustion residual leachate." 40 C.F.R. § 423.11(r) ("The term combustion residual leachate means leachate from landfills or surface impoundments containing combustion residuals. Leachate is composed of liquid, including any suspended or dissolved constituents in the liquid, that has percolated through waste or other materials emplaced in a landfill, or that passes through the surface impoundment's containment structure (e.g., bottom, dikes, berms). Combustion residual leachate includes seepage and/or leakage from a combustion residual landfill or impoundment unit ...."). To the extent that the landfill leachate identified by Sierra Club above falls within this definition, it does not affect EPA's conclusion that this source of waste is not regulated under the NDPES program. EPA, in the 2015 rulemaking, made clear that this new waste stream must be *discharged by a point source* to be covered by the NPDES program. "Regarding the non-point source discharges, the final rule does not define whether something is a point source; that is outside the scope of this final rulemaking. As is the case for any ELGs, the final rule requirements only apply to NPDES permitted discharges or discharges to POTWs." Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category: EPA's Response to Public Comments Part 4 of 10, p. 4-273.

- follow through on its initial BTA determination by requiring Schiller to reduce adverse environmental impacts to a degree consistent with the performance of a closed-cycle cooling system. By requiring the use of closed-cycle cooling, EPA will also reduce thermal pollution in the Piscataqua, protect impaired eelgrass habitat, and offer much-needed protections for endangered populations of sturgeon and salmon.
- deny the application for a thermal discharge variance;
- complete the endangered species consultation process contemplated by federal regulations, and then ensure protection of endangered species by requiring use of a closed-cycle cooling system; and
- further investigate the extent of unpermitted discharges from the Schiller coal ash landfill and require that these discharges stop (since the best available technology for a landfill is not to leak).

On behalf of Sierra Club, thank you for your consideration and we look forward to EPA's response.

EPA Response to Sierra Club Comment V.

Sierra Club concludes its comments by reiterating the requested changes to the permit: that EPA require closed-cycle cooling as the BTA for impingement and entrainment under CWA § 316(b), deny the permittee's request for a thermal discharge variance under CWA § 316(a), complete the endangered species consultation process, and investigate discharges from the coal ash landfill. EPA has responded to each of these issues in detail in the responses above. In its Responses to Sierra Club Comments IV.B.1 through IV.B.7, EPA maintains that BTA for Schiller Station, after consideration of the relevant factors and consistent with the Final Rule, is fine-mesh wedgewire screens. EPA also explains its conclusion that closed-cycle cooling is not necessary to reduce thermal pollution (in Response to Comment IV.C.2), protect eelgrass (in Response to Comment IV.C.1.c.), or protect endangered species (in Response to Comment IV.D.1). EPA also maintains that the permit's thermal discharge limits will assure the protection and propagation of a balanced, indigenous population of fish and other organisms in and on the Piscataqua River. See Responses to Sierra Club Comments IV.C.1 and IV.C.2. EPA explains in Response to Sierra Club Comments IV.D.1 and IV.D.2 that the Agencies have completed consultation on endangered species consistent with federal regulations. Finally, EPA explains that discharges from the coal ash landfill via groundwater do not constitute a point source discharge and, as such, are regulated separately from this NPDES permit in Response to Sierra Club Comment IV.E.

CONSERVATION LAW FOUNDATION

Letter of January 27, 2016 from CLF to EPA

RE: Comment on Draft National Pollutant Discharge Elimination System (NPDES) Permit No. NH0001743 for Public Service Company of New Hampshire's (PSNH) Schiller Station

Conservation Law Foundation (CLF) appreciates the opportunity to comment on the above-referenced Draft National Pollutant Discharge Elimination System (NPDES) Permit (Draft Permit) for Public Service Company of New Hampshire's (PSNH) Schiller Station (Schiller), located at 400 Gosling Road in Portsmouth, New Hampshire.

CLF is a non-profit, member-supported organization that works to protect New England's environment for the benefit of all people. CLF operates advocacy centers in Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont and, among other issues, works to protect the health and sustainability of our region's water resources as well as to reduce the environmental and public health impacts of the energy sector. In New Hampshire, this work has included substantial, ongoing efforts to restore and protect the health of the Great Bay estuary, including but not limited to the Piscataqua River, and to ensure compliance with the Clean Water Act and other regulations relative to PSNH fossil-fuel generating units.

CLF Comment I. CLF Comments

CLF is aware of comments to be submitted by Sierra Club relative to the Draft Permit and we hereby support and adopt the requests made by Sierra Club with respect to needed amendments to the Draft Permit, including but not limited to the need to require closed cycle cooling or its equivalent at Schiller to reduce adverse environmental impacts. It is clear that closed cycle cooling is both economically and technically achievable at Schiller and is the best treatment available (BTA). CLF also provides the following comments based on our unique experience with the Great Bay estuary and its environmental condition and needs.[1]

[1] For more than a decade, CLF has been actively engaged in Clean Water Act Section 303(d) listing and NPDES permitting processes to address problems, discussed *infra*, in the Great Bay Estuary. Four years ago, CLF established the Great Bay-Piscataqua Waterkeeper program, which is devoted solely to restoring and protecting the health of the Great Bay estuary.

EPA Response to CLF Comment I

CLF's comment expresses its support for comments submitted by the Sierra Club. In the text farther above, EPA has already responded in detail to Sierra Club's comments above and incorporates those responses here to the extent necessary. CLF also asserts that converting to closed-cycle cooling is the BTA under CWA § 316(b) at Schiller Station. EPA has also already responded in detail to this viewpoint in its responses to the Sierra Club's comments because Sierra Club stated the same view in its comments. Again, EPA incorporates those responses here to the extent necessary.

CLF Comment I.A The Great Bay Estuary – A National Treasure

The Great Bay Estuary is a large, tidally-dominated estuarine system comprised of two large, inland embayments – Great Bay and Little Bay – connected to the Gulf of Maine by the powerful tides of the Piscataqua River, which forms the border between New Hampshire and Maine. With a total drainage area of 930 square miles spanning 39 communities in New Hampshire and another ten in Maine, the Great Bay estuary receives fresh water flows from seven major rivers (the Oyster, Bellamy, Lamprey, Squamscott, Winnicutt, Cocheco and Salmon Falls Rivers), and several small creeks. The mixing of these fresh waters with the influx of tidal flows provides for a unique, sensitive, and highly productive natural resource that stands at the center of New Hampshire's coastal heritage.

The estuary contains a broad diversity of habitat types, including eelgrass (the cornerstone of the estuary's ecosystem), salt marshes, mudflats, channel bottom, and rocky intertidal areas. This diversity makes the estuary a critical breeding and nursery ground for finfish, shellfish and other invertebrates, as well as an important food source for many fish, mammals, birds and invertebrates. Fish species depending on the estuary are numerous. In fact, as further discussed infra, the Great Bay estuary is designated Essential Fish Habitat (EFH) by the National Marine Fisheries Service for numerous fish species.

The value of the Great Bay estuary is well recognized. As EPA stated in September 2015, in a technical memorandum addressing the State of New Hampshire's draft 2012 Section 303(d) list of impaired waters:

> The Great Bay Estuary is a unique resource in the State of New Hampshire and has been designated by EPA, pursuant to §320 of the Clean Water Act, as one of twenty-eight estuaries of national significance. The Great Bay Estuary is a national treasure and a valuable resource to New Hampshire. [2]

In addition to its designation as an estuary of national significance, Great Bay has been designated part of the National Estuarine Research Reserve, and is the subject of study by the Piscataqua Region Estuaries Partnership (formerly the NH Estuaries Program) and researchers at the University of New Hampshire's Jackson Estuarine Research Reserve. In recent years, EPA has expended considerable effort through the Clean Water Act's NPDES permitting program to control major sources of pollution in the estuary, with a focus on wastewater treatment facilities[3] and stormwater.[4] It also took recent enforcement action against the operator of a scrap metal facility located on the shores of the Piscataqua River in Portsmouth for its illegal discharges of stormwater pollution associated with industrial activities.[5]

In light of the significant value of the Great Bay estuary, including the Piscataqua River, which is a critical component of the estuary, and in light of ongoing efforts to restore and protect its health, it is essential that EPA strengthen the Draft Permit to incorporate greater protections.

[2] *See* EPA Technical Support Document (Attachment A to EPA Review of New Hampshire's 2012 Section 303(d) List), at 2, available at http://des nh.gov/organization/divisions/water/wmb/swqa/2012/documents/2012-303d-approval.pdf.

[3] EPA has been actively engaged in NPDES permitting matters addressing wastewater treatment facilities, including their contributions of nitrogen pollution, in Portsmouth, Exeter, Newmarket, Dover and Rochester, to name a few.
[4] EPA is in the process of finalizing a new general permit for New Hampshire Small Municipal Separate Storm Sewer Systems (MS4s). See Draft New Hampshire Small MS4 General Permit, available at http://www3.epa.gov/region1/npdes/stormwater/MS4_2013_NH.html. The most recent iteration of the draft general permit contains special provisions addressing water quality issues in the Great Bay estuary.
[5] In part as a result of pollution problems at this site (the Market Street Terminal in Portsmouth), the site's owner, the Pease Development Authority, declined renewal of a lease for the operator, Grimmel Industries, causing it to vacate the property.

EPA Response to CLF Comment I.A:

In its comment, CLF generally characterizes the natural resources in Great Bay and the Piscataqua River and summarizes various activities by State and Federal entities to study and preserve the estuary. EPA concurs that the Great Bay Estuary includes a diversity of habitat types, is an important breeding and nursery ground for finfish, shellfish and other invertebrates, and provides foraging habitat for many fish, mammals, birds and invertebrates. *See* Fact Sheet at 159-64. EPA also concurs with CLF's opinion regarding the substantial ecological importance of the Great Bay Estuary. Indeed, EPA and New Hampshire have kept that view in mind throughout the development of the new NPDES permit for Schiller Station. *See, e.g.*, Fact Sheet at 162-63. CLF suggests that the ecological sensitivity and importance of the Great Bay Estuary demand a more stringent NPDES permit for Schiller Station, but this comment does not specify what changes should be made to the Draft Permit. EPA disagrees with this part of CLF's comment. EPA finds that the Final Permit for Schiller Station is appropriately stringent under the requirements of the CWA and in light of the need to provide protection for the Great Bay Estuary. In the responses to comments set forth below, EPA evaluates and responds to CLF's comments regarding specific ways that it would like to see the permit made more stringent.

CLF Comment I.B The Great Bay Estuary – A Resource in Decline, Cumulative Impacts

As recently stated by EPA, "[T]here is substantial evidence that the Great Bay Estuary waters in question are impaired for the State's aquatic life designated use as evidenced by eelgrass loss, poor water clarity, and /or low levels of dissolved oxygen."[6] The NH Department of Environmental Services has similarly acknowledged that "[a]t this time the Great Bay Estuary exhibits many of the classic symptoms of too much nitrogen: low dissolved oxygen in tidal rivers, increased macroalgae growth, and declining eelgrass."[7]

Eelgrass serves as the cornerstone habitat for the Great Bay estuary, providing critical habitat for a wide variety of aquatic species. Regrettably, as stated above, eelgrass habitat in the estuary is in decline. More specifically, eelgrass habitat in water bodies throughout the estuary, including but not limited to the Piscataqua River, Little Bay and Great Bay, has decline[d] significantly.[8] In fact, eelgrass habitat in the Piscataqua River has nearly disappeared, creating a habitat disconnect for migratory fish species between the mouth of the estuary and Great Bay. Eelgrass in Little Bay also has essentially disappeared. Whereas eelgrass continues to survive in Great Bay, it is nonetheless declining significantly in terms of both areal extent and biomass.

The loss of eelgrass in the estuary means there is less habitat for aquatic species. Indeed, as a result of significant eelgrass declines, including in the Piscataqua River, water bodies throughout the estuary – again, including the Piscataqua River – are failing to meet designated aquatic life uses and are violating state water quality standards, including the critically important narrative water quality standard codified as Env-Wq 1703.19, which states:

> (a) The surface waters shall support and maintain a balanced, integrated, and adaptive community of organisms having a species composition, diversity, and functional organization comparable to that of similar natural habitats of a region.
>
> (b) Differences from naturally occurring conditions shall be limited to non-detrimental differences in community structure and function.

The significant loss of cornerstone habitat throughout the estuary means species that rely on such habitat are under greater stress, requiring greater protection. It is critical that EPA consider the cumulative impacts of Schiller and the ongoing loss of eelgrass habitat, as well as other signs of ecosystem degradation (e.g., poor water clarity, low dissolved oxygen, increasing presence of macroalgae), on the aquatic organisms that rely on the Great Bay estuary, and that it take necessary action, including the requirement of closed cycle cooling or an approach that will achieve equivalent protections, to protect aquatic organisms and ensure compliance with water quality standards, including but not limited to Env-Wq 1703.19.[9]

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[6] *See* EPA Technical Support Document, at 1, available at http://des.nh.gov/organization/divisions/water/wmb/swqa/2012/documents/2012-303d-approval.pdf.

[7] *See* N.H. Dept. of Envt'l Serv., Response to Public Comments on CALM, at 22, available at http://des.nh.gov/organization/divisions/water/wmb/swqa/2014/documents/2014-rsp-cmts-drft-calm.pdf (quoting Piscataqua Region Estuaries Partnership's 2013 State of the Estuaries report, available at http://prep.unh.edu/resources/pdf/2013%20SOOE/SOOE_2013_FA2.pdf)).

[8] *See* Seth Barker, Eelgrass Distribution in the Great Bay Estuary for 2013, (2013) available at http://scholars.unh.edu/prep/239/; Frederick T. Short, Eelgrass Distribution in the Great Bay Estuary for 2013, (2013), http://scholars.unh.edu/prep/348/; Frederick T. Short, Eelgrass Distribution in the Great Bay Estuary for 2012, (2012), available at http://scholars.unh.edu/prep/2/; Frederick T. Short, Eelgrass Distribution in the Great Bay Estuary for 2011, (2011), available at http://scholars.unh.edu/prep/3/; Frederick T. Short, Eelgrass Distribution in the Great Bay Estuary for 2010, (2010) http://scholars.unh.edu/prep/4/.

[9] Sierra Club's comments address other important standards and requirements applicable to Schiller's Draft Permit, including other water quality standards, technology requirements, cooling water systems, thermal discharges, and Endangered Species Act requirements), which CLF incorporates by reference.

EPA Response to CLF Comment I.B:

CLF's comment focuses on impaired water quality in the Great Bay Estuary, including, in particular, impairment of New Hampshire's designated use for aquatic life habitat. CLF's comment further focuses on the loss of eelgrass in Great Bay and the potential for Schiller Station, in combination with other stressors, to impact eelgrass and other aquatic life that relies on Great Bay. CLF also expresses concern over environmental stressors, including excessive nitrogen levels contributing to poor water clarity, low levels of dissolved oxygen, increased growth of macroalgae.

EPA has considered CLF's comments and notes that the Agency's responses to Sierra Club's comments, set forth above, include evaluation of cumulative impacts as well as other specific issues identified by CLF (*e.g.*, loss of eelgrass, water clarity, low dissolved oxygen) that may be pertinent to the Schiller Station NPDES permit. *See*, *e.g.*, Responses IV.C.1.b. through IV.C.1.d. EPA's responses to Sierra Club's comments are incorporated herein by this reference.

In general, Schiller Station's withdrawals of cooling water and discharges of effluent are limited by the Final Permit so that they satisfy the relevant requirements of the statute, including CWA §§ 301, 316(a), 316(b), 401 and 402. The permit's terms are also consistent with the overarching objectives of the CWA, including restoring and maintaining the chemical, 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 for recreation, in and on the water. *See* 33 U.S.C. § 1251(a). All of this is demonstrated in the record for the Schiller Station permit, including EPA's responses to comments on the Draft Permit, the Final Permit's requirements.

As CLF points out, the Piscataqua River, including the segment along which Schiller Station is located, is listed in New Hampshire's 2012 CWA 303(d) list as impaired for estuarine bioassessments under Env-Wq 1703.19 (biological and aquatic community integrity) due to the loss of eelgrass.[97] The limitations and conditions of the Final Permit, including requirements to control discharges of heat and TSS, will help ensure that the effluent will not cause or contribute to further loss of, or interfere with any recovery of, eelgrass in the Piscataqua River. EPA has also explained its conclusion that the permit's thermal discharge limits will assure the protection and propagation of a balanced, indigenous population of fish and other organisms in and on the Piscataqua River, and that the permit's cooling water intake structure-related requirements will satisfy CWA § 316(b)'s mandate that the design, location, construction, and capacity of cooling water intake structures reflect the Best Technology Available for minimizing adverse environmental impacts.

EPA's evaluation of Schiller Station's thermal discharges, based on site-specific water temperature data and analysis, reveals that their thermal effect on the river is highly localized, surface oriented, and does not persist or disperse widely through the waterbody (*see* Section 6.4.4 of the Fact Sheet). Because it is relatively minor in the context of water body that receives it, Schiller Station's thermal discharge, as regulated by the permit, does not, and will not, contribute to increased negative impacts from eutrophication and other stressors that have been identified in the Great Bay/Piscataqua River system. A discussion of eelgrass and the thermal discharge from Schiller Station is included in EPA's Response to Sierra Club Comment IV.C.1.c., above.

Schiller Station's TSS discharges are discussed in EPA Response to Sierra Club Comment IV.C.1.c.(1) and (2), above, and the Final Permit's TSS limits are expected to be protective of

[97] See New Hampshire's 2012 Section 305(b)/303(d) List Technical Support Document: Assessments of Aquatic Life Use Support in the Great Bay Estuary for Chlorophyll-a, Dissolved Oxygen, Water Clarity, Eelgrass Habitat, and Nitrogen. https://www.des.nh.gov/organization/divisions/water/wmb/swqa/2012/documents/a05-gb-n-2012-303d-tsd.pdf

water quality. In addition, the flow volume of the various process waste streams that contribute TSS to Schiller Station's effluent is small and makes a relatively minor contribution to the Piscataqua River (about 1% of the overall effluent flow). Taking this into consideration, EPA concludes that this discharge will not cause or contribute to low water clarity in the Piscataqua River. EPA also notes that, according to the NHDES 2012 CWA 303(d) List, the segment of the lower Piscataqua River that includes the discharge is listed as potentially attaining the standard for light attenuation, although additional data are necessary to confirm this finding. In other words, based on the current water quality assessment, water clarity is not currently impaired in this segment.

Regarding low DO levels in the Great Bay Estuary, EPA first notes that both Great Bay and Portsmouth Harbor typically meet water quality standards for dissolved oxygen, and the segment of the Piscataqua River that includes Schiller Station's discharges is listed as fully supporting aquatic life uses based on dissolved oxygen concentrations. The tidal rivers that flow into the estuary (*e.g.*, Squamscott and Lamprey Rivers) do experience periods of low dissolved oxygen. *See* AR-329, AR-359. EPA recognizes that aquatic organisms will increase respiration and consume more oxygen as water temperatures rise. This respiration removes oxygen from the water, which can contribute to lowering dissolved oxygen levels in an aquatic habitat. EPA also recognizes that, all other things being equal, warmer water will hold lower levels of dissolved oxygen than cooler water. When dissolved oxygen levels fall too low, resident species will be stressed and habitat may become unsuitable for them. However, in this site-specific case, dissolved oxygen levels in the receiving water are not expected to be reduced in a meaningful way as a result of the relatively minor, localized thermal plume from Schiller Station. The temperatures in the thermal plume are neither sufficiently high nor persistent enough to increase the respiration of aquatic organisms in a defined area to the extent that dissolved oxygen levels would be affected (*see* Section 6.4.4. of the Schiller Station Fact Sheet). Moreover, the thermal plume is neither hot enough nor extensive enough to have a significant effect on dissolved oxygen saturation in the receiving water. In EPA's view, based on current information, any DO sags within the Piscataqua River Estuary cannot be attributed to the thermal discharge from Schiller Station. *See* Response to Sierra Club Comments VI.C.1.c. and VI.C.1.d.

EPA further recognizes that the discharge of thermal effluent into a sensitive ecosystem can alter the balance and species diversity of algae in the system. In some cases, thermal pollution can trigger algal blooms of nuisance or harmful algae in a system. However, these negative environmental impacts are generally observed in more confined, low energy aquatic or marine ecosystems, where thermal pollution can result in a marked increase in water temperature in a specific area for an extended period of time. The thermal discharge from Schiller Station, as described throughout this document, is highly localized and does not persist throughout the waterbody. The high energy of the fast moving, cold tidal currents found in the Piscataqua River mix and dissipate the plume quickly. This does not allow the thermal discharge to impact macroalgae growth in the Piscataqua River.

CLF comments that EPA should "take necessary action, including the requirement of closed cycle cooling or an approach that will achieve equivalent protections, to protect aquatic organisms and ensure compliance with water quality standards, including but not limited to Env-Wq 1703.19." As explained in Response to Sierra Club Comment IV.C.2, EPA determined that it should grant Schiller Station's request for thermal discharge limits based on a CWA § 316(a) variance. EPA has determined that the thermal limits included in the Final Permit will protect aquatic organisms consistent with CWA § 316(a) and will comply with New Hampshire water quality standards, including Env-Wq 1703.19, which has a similar standard to that in CWA § 316(a). NHDES, both during development of the Draft Permit and in certifying the Final Permit under § 401 of the CWA, agrees that the thermal limits under the § 316(a) variance are consistent with New Hampshire water quality standards and protective of the existing uses of the Piscataqua River. *See* AR-146 (2013 Letter) and AR-434. In addition, because EPA determined that the Final Permit's thermal limits based on the CWA § 316(a) variance are protective of the balanced, indigenous population, it has granted a variance from the technology-based limits, which would be based on closed-cycle cooling as the best available technology for controlling thermal discharges temperature. This CWA § 316(a) variance could also serve as a variance from water quality standards-based limits if Schiller Station's thermal discharge would not be able satisfy New Hampshire's water quality standards, but EPA concludes that the state's standards will be met.

In addition to the potential impact of the discharge on the Piscataqua River, EPA has considered the potential impact of the withdrawal of cooling water from the river and the implication of its determination of the "best technology available" for Schiller Station's cooling water intake structures on the aquatic community. Withdrawal of cooling water through Schiller Station's CWISs has no direct impact on eelgrass in Great Bay or the Piscataqua River; however, the CWISs at Schiller Station currently impinge and entrain aquatic organisms at every life stage. The impingement and entrainment mortality represents an adverse environmental impact that must be minimized under § 316(b) of the CWA. This mortality is a function of the limitations of the existing technology, which has not been upgraded since their original installation some 50 years ago. Moreover, this mortality is avoidable in that the Station can continue to generate electricity while reducing these adverse effects by implementing technology designed to reduce impingement and entrainment. In light of the public importance attributed to these ecological resources, which CLF describes in its comments, it would be anomalous for the NPDES permit to allow Schiller Station to kill large numbers of the river's fish, at various life stages, through entrainment and impingement by using CWISs that essentially have no effective means of preventing such mortality. *See* Fact Sheet at 163. It would also be anomalous to develop appropriately protective effluent limits, only to allow the facility's regulated cooling water intake structures to kill or otherwise harm large numbers of aquatic organisms by foregoing any intake equipment upgrades.

After consideration of the relevant factors in establishing site-specific entrainment requirements listed at 40 C.F.R. § 125.98(f)(2) and (3), EPA determined that the relatively modest costs of wedgewire screens are warranted by the benefits that they would produce. The far greater costs of closed-cycle cooling, at a difference of two orders of magnitude, are not warranted by the additional benefits that they would provide. Wedgewire screens, at a design through-screen velocity no greater than 0.5 fps, would also comply with the BTA standard for impingement mortality at 40 C.F.R. § 125.94(c)(2). Compliance with the BTA measures for minimizing entrainment and impingement by Schiller Station will substantially reduce avoidable mortality to millions of aquatic organisms in the affected segment of the Piscataqua River. EPA came to this decision after weighing the relevant factors and other site-specific aspects, including the number of organisms entrained by Schiller Station, the relatively small percentage of the tidal flux of the Piscataqua River withdrawn by the Facility's CWISs, the absence of evidence indicating that impingement and entrainment losses at the Facility are causing or contributing to declines in overall aquatic health of the Piscataqua River, and the finding that the existing thermal discharge is not harming the river's balanced, indigenous population. *See also* Responses to Sierra Club Comment IV.B.7 and CLF Comment I.C.

Making the proposed upgrades would also be consistent with New Hampshire WQS. NHDES has designated the relevant segment of the Piscataqua River a Class B water. Class B waters are "considered as being acceptable for fishing, swimming, and other recreation purposes and, after adequate treatment, for use as water supplies." (RSA 485-A:8, II). Though the standard for Class B waters does not include any specific numeric criteria that apply to cooling water intakes, it is nevertheless clear that permits must include any conditions 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. *See* Fact Sheet at 163-4. Achieving substantial reductions in impingement and entrainment by Schiller Station's CWIS will increase the number of recreational and forage fish (eggs, larvae, juveniles, and adults), as well as invertebrate species in the affected segment of the Piscataqua River. These improvements are also likely to contribute to increased populations of these organisms. In turn, reducing adverse impacts from impingement and entrainment could provide a number of direct, indirect, and non-use benefits both within the river and the estuary.

CLF Comment I.C The Great Bay Estuary – Essential Fish Habitat

Essential Fish Habitats (EFHs) were created to protect and manage the Nation's fishery resources to "prevent overfishing, to rebuild overfished stocks, to insure conservation, to facilitate long-term protection of essential fish habitats, and to realize the full potential of the Nation's fishery resources."[10] Fisheries are important both commercially and recreationally as a source of employment and contributor to the nation's economy generally.[11, 12]

Schiller is located in the EFH for eleven species at various life stages: Atlantic cod, Atlantic herring, Atlantic sea scallop, haddock, pollock, red hake, white hake, windowpane flounder, yellowtail flounder, Atlantic mackerel, and bluefish.[13] These species, as they are commercially fished, are important not only ecologically but economically to both New Hampshire and Maine as a source of employment and livelihood. Of these species, Atlantic cod, Atlantic herring, pollock, red hake, white hake and windowpane flounder, are estimated to be impinged at Schiller annually.[14] Atlantic cod, Atlantic herring, haddock, Atlantic mackerel, pollock, hake, and windowpane flounder are estimated annually to be entrained.[15] Further, a Piscataqua River tributary, the Cocheco River, is EFH for Atlantic salmon.[16]

In light of these estimates and the importance of these species to the economy and ecosystem, and in light of the added stress on fish species resulting from habitat loss in the estuary (see discussion supra), EPA should have recommended closed cycle cooling – the most effective option for reducing impingement and entrainment – as the BTA for Schiller's CWIS, as the technology would provide for the long-term protection of these species.[17] The final permit must be amended accordingly.

[10] 16 U.S.C.A. § 1801(a)(6).

[11] *Id*. at § 1801(a)(1) and (3).

[12] It should be noted that because of this, only commercially fished species are managed through EFHs.

[13] NOAA, Summary of Essential Fish Habitat (EFH) and General Habitat Parameters for Federally Managed Species, available at http://www.greateratlantic fisheries.noaa.gov/hcd/efhtables.pdf.

[14] Draft NPDES Fact Sheet (Fact Sheet), Attachment D, EFH Assessment, 193.

[15] *Id*. at 190-91.

[16] *See* supra note 15.

[17] Draft Permit Fact Sheet at 71, 152, 155.

EPA Response to CLF Comment I.C:

EPA considered a number of factors in selecting the best technology available to minimize adverse impacts to, not only essential fish habitat species, but all aquatic species and life stages in the Piscataqua River. The fine-mesh wedgewire screen option proposed by EPA will reduce entrainment through physical exclusion and hydrologic bypass, as well as potentially by larval avoidance (for larger larvae). In addition, wedgewire screens will achieve a through-screen velocity no greater than 0.5 fps. This technology is consistent with the BTA standards for impingement mortality in the Final Rule. *See* 40 C.F.R. § 125.94(c)(2). The reduction in impingement and entrainment achieved through use of wedgewire screens will contribute to increased populations of juvenile and adult fish, including the commercially and recreationally important EFH species identified in the comment and assessed in the Fact Sheet (Attachment D). Reducing the loss of eggs and larvae aside from the contribution to adult populations is valuable because of the role these organisms play as prey for larger organisms and other benefits that they may provide, such as contributing to species' compensatory reserve. *See* Fact Sheet at 159.

The standard for establishing site-specific entrainment requirements is "the maximum reduction in entrainment warranted after consideration of factors relevant for determining the best technology available for minimizing adverse environmental impact at each facility." 40 C.F.R. § 125.98(f). EPA considered the site-specific conditions at Schiller, including not only the numbers of organisms entrained by the Facility, but also that its CWISs withdraw only a relatively small percentage of the tidal flux of the Piscataqua River, that there is no evidence indicating that impingement and entrainment losses at the Facility are causing or contributing to overall aquatic health (including EFH), that the existing discharge of heated effluent is not harming the balanced, indigenous population of organisms in the river, and that two of the generating units (Units 4 and 6) have operated well below design capacity in recent years and are expected to continue to do so during this permit cycle. After considering the potential costs and benefits of the available technologies (both qualitative and quantitative), EPA maintains that the considerable social cost of closed-cycle cooling (at about $100 million dollars) is not justified by the benefits to the waterbody that would be provided by this technology, but that wedgewire screens (at a social cost of about $7 million) will achieve the maximum reduction in entrainment warranted. *See* Responses to Sierra Club Comments IV.A.1, IV.B.2, and IV.B.6.

The conditions and limitations contained within the Final Permit that govern Schiller Station's cooling water withdrawals and pollutant discharges are protective of aquatic life, including those species with EFH designation in the Piscataqua River. These permit conditions and limitations are also protective of designated EFH. Impacts associated with issuance of this permit to the EFH species, their habitat and forage, have been minimized to the extent that no significant adverse impacts are expected and further mitigation is not warranted. EPA has consulted with the National Marine Fisheries Service Habitat Conservation Division regarding potential EFH impacts from this federal action (EFH Letter and Attachment 1 from EPA to NMFS, dated November 19, 2015; AR-310). *See* Response to Sierra Club Comment IV.D. NMFS has not provided EPA with any additional conservation recommendations.

CLF Comment I.D The Exacerbating Problem of Climate Change

On top of all the stresses discussed above, the ongoing problem of climate change introduces yet a further – and exacerbating – stress that will adversely affect the health and habitat value of the Great Bay estuary. Climate change threatens Great Bay with sea level rise, tidal changes, pH changes, UV radiation damage, sediment hypoxia and anoxia, increases in water temperature, and increased precipitation.

As New Hampshire's surface waters are required to sustain biological integrity by maintaining a "balanced, integrated, and adaptive community," climate change must be considered a potential threat to the biological integrity of the Piscataqua River and the estuary as a whole.[18] Climate change has the potential to significantly alter the Great Bay estuary's and Piscataqua River's biological integrity through changes in the ecosystem and aquatic environment. EPA should require the most effective technology, closed-cycle cooling, as the BTA for thermal discharge and impingement and entrainment mortality reduction in order to protect the estuary from the exacerbating impacts of climate change, and to protect biological integrity consistent with New Hampshire water quality standards.[19]

For the foregoing reasons, CLF urges EPA to amend and finalize its Draft Permit to incorporate much needed protections – including closed cycle cooling – to ensure the biological integrity of the Piscataqua River and Great Bay estuary, and to ensure compliance with the requirements of the Clean Water Act. CLF appreciates the opportunity to provide these comments.

[18] Env. Wq. 1703.01(b); Id. at 1702.07.

[19] Draft Permit Fact Sheet at 71, 152, 155.

EPA Response to CLF Comment I.D:

CLF comments that EPA should require the most effective technology to reduce thermal discharges and minimize impingement and entrainment, closed cycle cooling, in order to protect the estuary from the exacerbating impacts of climate change and to protect biological integrity consistent with New Hampshire water quality standards. Regarding the potential effects of temperature, an examination of projected future changes to the Piscataqua River due to climate change in combination with the facility's thermal discharges is included in EPA's Response to Sierra Club's Comments VI.C.1.c.(6) and IV.C.1.d. From this evaluation, EPA concludes that granting renewal of Schiller Station's CWA § 316(a) thermal variance will be protective of the

BIP and, because any impacts of the thermal plume are expected to be confined to the upper portion of the water column in a small area of the river less than 200 feet from the outfalls, EPA finds that the addition of the thermal plume will not contribute to adverse impacts even if river temperatures warm over the next decade. In light of these minimal impacts, EPA maintains that the thermal limits based on the § 316(a) variance are protective of the biological community, even taking cumulative impacts into account, and that the further reduced discharge temperatures that would be achieved through the use of closed-cycle cooling are not necessary to protect the BIP in the Piscataqua River. In addition, the permittee must reapply for the variance from technology- and water quality-based standards granted under § 316(a) of the CWA for each new permit cycle. EPA will continue to review river conditions to determine if future renewals of the variance will continue to protect the BIP, including in the event that ambient river temperatures increase as a result of climate change.

Turning to the requirements for the CWISs under § 316(b), the standard for establishing site-specific entrainment requirements is “the maximum reduction in entrainment warranted after consideration of factors relevant for determining the best technology available for minimizing adverse environmental impact at each facility.” 40 C.F.R. § 125.98(f). EPA considered the site-specific conditions at Schiller, including not only the numbers of organisms entrained by the Facility, but also that its CWISs withdraw only a relatively small percentage of the tidal flux of the Piscataqua River, that there is no evidence indicating that impingement and entrainment losses at the Facility are causing or contributing to overall aquatic health, that the existing discharge of heated effluent is not harming the balanced, indigenous population of organisms in the river, and that two of the generating units (Units 4 and 6) have operated well below design capacity in recent years and are expected to continue this pattern during this permit cycle. After considering the costs of the available technologies and the potential benefits (both qualitative and quantitative), EPA maintains that the considerable social cost of closed-cycle cooling (at about $100 million dollars) is not justified by the benefits. EPA concluded that wedgewire screens (at a social cost of about $7 million) will achieve the maximum reduction in entrainment warranted in light of the relevant factors and the magnitude of the ecological impact. *See* Responses to Sierra Club Comments IV.A.1, IV.B.2, and IV.B.6. At this time, EPA cannot predict the potential effects of climate change on the biological community years into the future. As such, the additional consideration of climate change does not warrant the substantial additional costs associated with closed-cycle cooling for minimizing entrainment, and does not alter the determination that the alternative technology, wedgewire screens, is feasible, has costs that are warranted by the benefits, and complies with the BTA standards for impingement mortality.

NH0001473
Permit Modification for Transfer of Ownership

Permit Modification for Transfer of Ownership

AUTHORIZATION TO DISCHARGE UNDER THE NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM PERMIT

In accordance with the substantive and procedural requirements of the Federal Clean Water Act, 40 CFR Section 122.61(b) and/or 40 CFR Section 122.63(d), the Environmental Protection Agency ("EPA") acknowledges the transfer of ownership and coverage under permit number NH0001473 from Public Service Company of New Hampshire (Schiller Station) to:

GSP Schiller LLC

This transfer of ownership permit modification is effective on January 10, 2018. The authorization to discharge expired at midnight, October 11, 1995. However, since a timely application was filed, this permit has been administratively continued pursuant to 40 CFR §122.6, 48 Fed. Reg. 14158, April 1, 1983.

Thus, GSP Schiller LLC located at 400 Gosling Road, Portsmouth, NH 03801, is authorized to discharge to the Piscataqua River in compliance with effluent limitations in the permit issued on September 11, 1990.

This permit consists of 24 pages in Part I including effluent limitations, monitoring requirements, etc., 22 pages in Part II (dated April 6, 1990) including General Conditions and Definitions, 7 pages of a May 31, 1991 minor modification, and 1 page of a January 24, 1995 minor modification. These conditions remain in effect for the new owner.

Signed this 16th day of January, 2018

Ken

Ken Moraff, Director
Office of Ecosystem Protection
Environmental Protection Agency
Region 1
Boston, MA

DRAFT AUTHORIZATION TO DISCHARGE UNDER THE NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES)

In compliance with the provisions of the Federal Clean Water Act, as amended, (33 U.S.C. §§1251 et seq.; the "CWA"),

Public Service Company of New Hampshire, dba Eversource
Schiller Station

is authorized to discharge from the facility located at

Schiller Station
400 Gosling Road
Portsmouth, NH 03801

to receiving waters named: **Piscataqua River**
(USGS Hydrologic Basin Code 01060003)

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 sixty (60) days after the date of signature.*

This permit supersedes the permit issued on September 11, 1990.

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 consists of: 30 pages in Part I which includes effluent limitations, monitoring and reporting requirements and conditions; as well as 25 pages in Part II which includes General Conditions and Definitions.

Signed this ___ day of ___________, 20__

____
Ken Moraff, Director
Office of Ecosystem Protection
U.S. Environmental Protection Agency
Region I - New England
Boston, Massachusetts

* If no comments requesting a change to the draft permit are received, the permit will become effective upon the date of signature.

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 from outfall number **001: non-contact cooling water and roof and northwest yard drains** to the Piscataqua River. Such discharges shall be limited and monitored by the permittee as specified below.

Effluent Characteristic	**Discharge Limitations**		**Monitoring Requirements**	
	Average Monthly	**Maximum Daily**	**Frequency**[5]	**Sample Type**
Flow (million gallons/day [MGD])	40	40	Quarterly[6]	Recorder
Total Residual Oxidant (mg/L)[1]	--	0.2[2]	Daily – when in use	Grab
Oil & Grease (mg/L)	15	20	Quarterly[6]	Grab
Temperature (°F)	Report	95[3]	Hourly – when on-line	Grab
Temperature Rise (°F)	Report	25[4]	Hourly – when on-line	Calculate[7]

Samples taken in compliance with the monitoring requirements specified above shall be taken at a representative point prior to discharge into the receiving water.

1 Total residual oxidant (TRO) may not be discharged for more than two hours in any one day unless the facility can demonstrate to the Regional Administrator that the unit in this particular location cannot operate at or below this level of oxidation. The term "Regional Administrator" means the Regional Administrator of Region 1 of the U.S. Environmental Protection Agency.

2 This TRC limit shall not be exceeded at any time (instantaneous maximum); not a maximum daily limit.

3 The 95°F temperature limit shall not to be exceeded at any time (instantaneous maximum). At no time shall the discharge cause the receiving water to exceed a maximum temperature of 84°F at a distance of 200 feet in any direction from the point of discharge.

4 The temperature rise limitation is increased from 25°F to 30°F for a two-hour period per day during condenser maintenance.

5 If no sampling is required for a particular parameter and monitoring period, the permittee should enter the appropriate No Data Indicator Code (NODI) in the monthly Discharge Monitoring Report (DMR).

6 This parameter shall be monitored during each calendar quarter (January-March, April-June, July-September, and October-December) and reported on the monthly DMR following the end of each calendar quarter (i.e., April, July, October, and January).

7 Temperature rise is defined as the difference between the influent (ambient) temperature and the effluent (discharge) temperature.

2. During the period beginning on the effective date and lasting through the expiration date, the permittee is authorized to discharge from outfall numbers **002 (Unit #4), 003 (Unit # 5) and 004 (Unit #6): non-contact cooling water and condenser hotwell drains**. Such discharges shall be limited and monitored by the permittee as specified below.

Effluent Characteristic	**Discharge Limitations**		**Monitoring Requirements**	
	Average Monthly	**Maximum Daily**	**Frequency**[5]	**Sample Type**
Outfall 002 Flow (MGD)	43.5	52.2	Continuous	Recorder
Outfall 003 Flow (MGD)	50.2	50.2	Continuous	Recorder
Outfall 004 Flow (MGD)	50.2	50.2	Continuous	Recorder
Total Residual Oxidants (mg/L)[1]	--	0.2[2]	Daily – when in use	Grab
Temperature (°F)	Report	95[3]	Hourly – when on line	Grab
Temperature Rise (°F)	Report	25[4]	Hourly – when on line	Calculate[6]

Samples taken in compliance with the monitoring requirements specified above shall be taken at a representative point prior to discharge into the receiving water.

[1] Total residual oxidants (TRC) may not be discharged for more than two hours in any one day from any one unit unless the facility can demonstrate to the Regional Administrator that the unit in this particular location cannot operate at or below this level of oxidation. The term "Regional Administrator" means the Regional Administrator of Region 1 of the U.S. Environmental Protection Agency.

[2] This TRC limit shall not be exceeded at any time (instantaneous maximum); not a maximum daily limit.

[3] The 95°F temperature limit shall not to be exceeded at any time (instantaneous maximum). At no time shall the discharge cause the receiving water to exceed a maximum temperature of 84°F at a distance of 200 feet in any direction from the point of discharge.

[4] The temperature rise limitation is increased from 25°F to 30°F for a two-hour period per day during condenser maintenance.

[5] If no sampling is required for a particular parameter and monitoring period, the permittee should enter the appropriate No Data Indicator Code (NODI) in the monthly Discharge Monitoring Report (DMR).

[6] Temperature rise is defined as the difference between the influent (ambient) temperature and the effluent (discharge) temperature.

3. During the period beginning on the effective date and lasting through the expiration date, the permittee is authorized to discharge from outfall number **006: emergency boiler blowdowns, deaerator overflows and roof drains**. The outfall consists of 6 pipes; 2 for each of Units 4, 5, and 6. Such discharges shall be limited and monitored by the permittee as specified below.

Effluent Characteristic	Discharge Limitations				Monitoring Requirements	
	Average Monthly	Maximum Daily	Min	Max	Frequency[3]	Sample Type
Flow[1] (Gallons)	--	Report	--	--	When in use	Estimate
pH[2] (S.U.)	--	--	6.5	8.0	When in use	Grab
Total Suspended Solids (mg/L)	30	100	--	--	When in use	Grab
Oil & Grease (mg/L)	15	20	--	--	When in use	Grab
Total Nitrogen (mg/L)	--	Report	--	--	Quarterly, when in use[4]	Grab

Samples taken in compliance with the monitoring requirements specified above shall be taken at a representative point prior to discharge into the receiving water. The continuous blowdown sampling station shall be at a representative point.

[1] The discharge consists only of boiler blowdowns during an emergency condition or when a boiler experiences a severe disruption. The duration and amount of flow shall be estimated when a discharge occurs. The amount (gallons) shall be reported in the monthly DMR and the duration (hours) shall be submitted as an attachment. The flow estimate shall not include the steam portion of the discharge.

[2] The permittee shall evaluate pH control methods for the emergency blowdowns. If the discharge pH is not able to be maintained within the range of 6.5 to 8.0 standard units, the permittee is required to route this discharge to the on-site WWTP for pH neutralization.

[3] If no sampling is required for a particular parameter and monitoring period, the permittee should enter the appropriate No Data Indicator Code (NODI) in the monthly Discharge Monitoring Report (DMR).

[4] This parameter shall be monitored during each calendar quarter (January-March, April-June, July-September, and October-December) and reported on the monthly DMR following the end of each calendar quarter (i.e., April, July, October, and January).

4. During the period beginning on the effective date and lasting through the expiration date, the permittee is authorized to discharge from outfall number **011: Schiller Station Tank Farm drains and stormwater**. The effluent from 3 individual pipes combine to create the culverted outfall. Such discharges shall be limited and monitored by the permittee as specified below.

Effluent Characteristic	**Discharge Limitations**				**Monitoring Requirements**	
	Average Monthly	**Maximum Daily**	**Min**	**Max**	**Frequency**[5]	**Sample Type**
Flow (GPD)	300,000	600,000	--	--	Daily	Estimate
Total Suspended Solids (mg/L)	30	100	--	--	Quarterly[6]	Grab
Oil & Grease (mg/L)	15	20	--	--	Quarterly[6]	Grab
pH[1] (S.U.)	--	--	6.5	8.0	Monthly	Grab
Group I Polycyclic Aromatic Hydrocarbons (PAHs)[2,4] (ug/l)						
Benzo(a)anthracene	--	Report	--	--	Quarterly[6]	Grab
Benzo(a)pyrene	--	Report	--	--	Quarterly[6]	Grab
Benzo(b)fluoranthene	--	Report	--	--	Quarterly[6]	Grab
Benzo(k)fluoranthene	--	Report	--	--	Quarterly[6]	Grab
Chrysene	--	Report	--	--	Quarterly[6]	Grab
Dibenzo(a,h)anthracene	--	Report	--	--	Quarterly[6]	Grab
Indeno(1,2,3-cd)pyrene	--	Report	--	--	Quarterly[6]	Grab
Group II Polycyclic Aromatic Hydrocarbons (PAHs)[3,4] (ug/l)						
Acenaphthene	--	Report	--	--	Quarterly[6]	Grab
Acenaphthylene	--	Report	--	--	Quarterly[6]	Grab
Anthracene	--	Report	--	--	Quarterly[6]	Grab
Benzo(g,h,i)perylene	--	Report	--	--	Quarterly[6]	Grab
Fluoranthene	--	Report	--	--	Quarterly[6]	Grab
Fluorene	--	Report	--	--	Quarterly[6]	Grab
Napthalene	--	Report	--	--	Quarterly[6]	Grab
Phenanthrene	--	Report	--	--	Quarterly[6]	Grab
Pyrene	--	Report	--	--	Quarterly[6]	Grab
Total Nitrogen (mg/L)	--	Report	--	--	Quarterly[6]	Grab

* See footnotes on next page

Samples taken in compliance with the monitoring requirements specified above shall be taken at a representative point prior to discharge into the receiving water. The combined discharge of the 3 individual pipes shall be considered a representative sampling point.

[1] The pH shall not be less than 6.5 standard units (S.U.) nor greater than 8.0 S.U., unless due to naturally occurring conditions. The pH sampling only may be reduced to a single grab sample from any of the 3 pipes. The pH shall be within 0.5 S.U. of the rainfall pH when the rainfall pH is outside of the above range. Rainfall pH shall be monitored when the discharge is monitored and shall be reported as an attachment to the monthly DMR. If there is no rainfall to sample, the permittee should submit the appropriate No Data Indicator Code (NODI) in the attachment.

[2] Group I PAHs comprise seven known animal carcinogens.

[3] Group II PAHs comprise nine priority pollutant PAHs which are not considered carcinogenic alone, but which can enhance or inhibit the response of the carcinogenic PAHs.

[4] The quantitative methodology used for PAH analysis must achieve a minimum level for analysis (“ML”) using approved analytical methods in CFR Part 136. The ML is not the minimum level of detection, but rather the lowest level at which the test equipment produces a recognizable signal and acceptable calibration point for an analyte, representative of the lowest concentration at which an analyte can be measured with a known level of confidence. The ML for each Group I PAH compound must be <0.1 µg/L. The ML for each Group II PAH compound must be <1 µg/L. These MLs are based on those listed in Appendix VI of EPA’s Remediation General Permit. Sample results for an individual compound that is at or below the ML should be reported according to the latest EPA Region 1 *NPDES Permit Program Instructions for the Discharge Monitoring Report Forms (DMRs)*. These values may be reduced by modification pursuant to 40 CFR §122.62 as more sensitive tests become available or are approved by EPA and the State.

EPA believes these requirements are necessary for the protection of human health, to maintain the water quality standards established under Section 303 of the CWA, and to meet New Hampshire’s water quality criteria. Should monitoring data indicate the persistence of PAHs in concentrations that may cause or contribute to an excursion above water quality criteria, the permit may be modified, reissued or revoked pursuant to 40 CFR §122.62. Should monitoring indicate PAHs are not detected (using the proper MLs described above) over the first two years of the permit cycle, the permittee may request a reduction in monitoring frequency.

[5] If no sampling is required for a particular parameter and monitoring period, the permittee should enter the appropriate No Data Indicator Code (NODI) in the monthly Discharge Monitoring Report (DMR).

[6] This parameter shall be monitored during each calendar quarter (January-March, April-June, July-September, and October-December) and reported on the monthly DMR following the end of each calendar quarter (i.e., April, July, October, and January).

5. During the period beginning on the effective date and lasting through the expiration date, the permittee is authorized to discharge from internal outfall number **013: emergency overflow from the coal pile runoff basin into Outfall 018 (described in section I.A.9 below)**. This discharge shall consist only of stormwater from the coal pile area during an emergency condition resulting from an actual storm that exceeds the design storm (10-year, 24-hour occurrence). There shall be no discharge of process wastes, cleaning wastes or sanitary wastes from this discharge point. Such discharges shall be limited and monitored by the permittee as specified below.

Effluent Characteristic	Discharge Limitations				Monitoring Requirements	
	Average Monthly	Maximum Daily	Min	Max	Frequency[1]	Sample Type
Flow (GPD)	--	Report	--	--	When in use	Estimate
Flow[1] (Hours)	--	Report	--	--	When in use	Estimate
pH[2] (S.U.)	--	--	Report	Report	When in use	Grab

Samples taken in compliance with the monitoring requirements specified above shall be taken at a representative point prior to discharge into the receiving water.

[1] If no sampling is required for a particular parameter and monitoring period, the permittee should enter the appropriate No Data Indicator Code (NODI) in the monthly Discharge Monitoring Report (DMR).

[2] Rainfall pH shall be monitored when the discharge is monitored and shall be reported as an attachment to the monthly DMR. If there is no rainfall to sample, the permittee should submit the appropriate No Data Indicator Code (NODI) in the attachment.

6. During the period beginning on the effective date and lasting through the expiration date, the permittee is authorized to discharge from outfall number **015: treated effluent from WWTP #1**. This discharge will only be used during essential maintenance of WWTP #2; i.e., sludge removal from the fireside basin. Only treated plant demineralization reagent wastes, chemical lab drains, oil separator wastes, and other routine wastes from day-to-day operation may be discharged. WWTP #1 is not allowed to treat coal pile runoff or metal cleaning wastes. Such discharges shall be limited and monitored by the permittee as specified below.

Effluent Characteristic	Discharge Limitations				Monitoring Requirements	
	Average Monthly	Maximum Daily	Min	Max	Frequency[1]	Sample Type
Flow (GPD)	61,800	85,300	--	--	Continuous	Recorder
Total Suspended Solids (mg/L)	30	100	--	--	When in use	Grab
Oil & Grease (mg/L)	15	20	--	--	When in use	Grab
pH (S.U.)	--	--	6.5	8.0	When in use	Grab

Samples taken in compliance with the monitoring requirements specified above shall be taken at a representative point prior to discharge into the receiving water.

[1] If no sampling is required for a particular parameter and monitoring period, the permittee should enter the appropriate No Data Indicator Code (NODI) in the monthly Discharge Monitoring Report (DMR).

7. During the period beginning on the effective date and lasting through the expiration date, the permittee is authorized to discharge from internal outfall number **016: treated effluent from WWTP #2 during normal conditions**. This discharge may not include metal cleaning waste (chemical or non-chemical); treated metal cleaning waste is subject to requirements in section I.A.8 below for Outfall 017. Such discharges shall be limited and monitored by the permittee as specified below.

Effluent Characteristic	**Discharge Limitations**				**Monitoring Requirements**	
	Average Monthly	**Maximum Daily**	**Min**	**Max**	**Frequency[1]**	**Sample Type**
Flow (GPD)	216,000	360,000	--	--	Continuous	Recorder
Total Suspended Solids (mg/L)	30	100	--	--	Monthly	Grab
Oil & Grease (mg/L)	15	20	--	--	Monthly	Grab
pH (S.U.)	--	--	6.0	9.0	Continuous	Instantaneous
Total Nitrogen (mg/L)	--	Report	--	--	Quarterly[2]	Grab

Samples taken in compliance with the monitoring requirements specified above shall be taken at a representative point prior to mixing with discharge 018.

[1] If no sampling is required for a particular parameter and monitoring period, the permittee should enter the appropriate No Data Indicator Code (NODI) in the monthly Discharge Monitoring Report (DMR).

[2] This parameter shall be monitored during each calendar quarter (January-March, April-June, July-September, and October-December) and reported on the monthly DMR following the end of each calendar quarter (i.e., April, July, October, and January).

8. During the period beginning on the effective date and lasting through the expiration date, the permittee is authorized to discharge from internal outfall number **017: treated metal cleaning waste from WWTP #2 prior to comingling with any other waste streams**. Such discharges shall be limited and monitored by the permittee as specified below.

Effluent Characteristic	Discharge Limitations				Monitoring Requirements	
	Average Monthly	Maximum Daily	Min	Max	Frequency[1]	Sample Type
Flow (GPD)	Report	360,000	--	--	Continuous, when in use	Recorder
Total Suspended Solids (mg/L)	30	100	--	--	Daily, when in use	Grab
Oil & Grease (mg/L)	15	20	--	--	Daily, when in use	Grab
Total Copper (mg/L)	1.0	1.0	--	--	Daily, when in use	Grab
Total Iron (mg/L)	1.0	1.0	--	--	Daily, when in use	Grab
pH (S.U.)	--	--	6.0	9.0	Continuous, when in use	Instantaneous
Total Nitrogen (mg/L)	--	Report	--	--	Quarterly, when in use[2]	Grab

Samples taken in compliance with the monitoring requirements specified above shall be taken at a representative point prior to mixing with discharge 018.

1 If no sampling is required for a particular parameter and monitoring period, the permittee should enter the appropriate No Data Indicator Code (NODI) in the monthly Discharge Monitoring Report (DMR).

2 This parameter shall be monitored during each calendar quarter (January-March, April-June, July-September, and October-December) and reported on the monthly DMR following the end of each calendar quarter (i.e., April, July, October, and January).

9. During the period beginning on the effective date and lasting through the expiration date, the permittee is authorized to discharge from outfall number **018: Schiller Station yard drains and Newington Station Tank Farm yard drains and heater condensate drips**. Such discharges shall be limited and monitored by the permittee as specified below.

Effluent Characteristic	**Discharge Limitations**				**Monitoring Requirements**	
	Average Monthly	**Maximum Daily**	**Min**	**Max**	**Frequency**[5]	**Sample Type**
Flow (GPD)	300,000	600,000	--	--	Quarterly[6]	Estimate
Total Suspended Solids (mg/L)	30	100	--	--	Quarterly[6]	Grab
Oil & Grease (mg/L)	15	20	--	--	Quarterly[6]	Grab
pH[1] (S.U.)	--	--	6.5	8.0	Quarterly[6]	Grab
Group I Polycyclic Aromatic Hydrocarbons (PAHs)[2,4]						
Benzo(a)anthracene	--	Report	--	--	Quarterly[6]	Grab
Benzo(a)pyrene	--	Report	--	--	Quarterly[6]	Grab
Benzo(b)fluoranthene	--	Report	--	--	Quarterly[6]	Grab
Benzo(k)fluoranthene	--	Report	--	--	Quarterly[6]	Grab
Chrysene	--	Report	--	--	Quarterly[6]	Grab
Dibenzo(a,h)anthracene	--	Report	--	--	Quarterly[6]	Grab
Indeno(1,2,3-cd)pyrene	--	Report	--	--	Quarterly[6]	Grab
Group II Polycyclic Aromatic Hydrocarbons (PAHs)[3,4]						
Acenaphthene	--	Report	--	--	Quarterly[6]	Grab
Acenaphthylene	--	Report	--	--	Quarterly[6]	Grab
Anthracene	--	Report	--	--	Quarterly[6]	Grab
Benzo(g,h,i)perylene	--	Report	--	--	Quarterly[6]	Grab
Fluoranthene	--	Report	--	--	Quarterly[6]	Grab
Fluorene	--	Report	--	--	Quarterly[6]	Grab
Napthalene	--	Report	--	--	Quarterly[6]	Grab
Phenanthrene	--	Report	--	--	Quarterly[6]	Grab
Pyrene	--	Report	--	--	Quarterly[6]	Grab
Total Nitrogen (mg/L)	--	Report	--	--	Quarterly[6]	Grab

* See footnotes on next page

Samples taken in compliance with the monitoring requirements specified above shall be taken at a representative point prior to discharge into the receiving water. The combined discharge of the three individual pipes shall be considered a representative sampling point.

[1] The pH shall not be less than 6.5 standard units (S.U.) nor greater than 8.0 S.U., unless due to naturally occurring conditions. The pH sampling only may be reduced to a single grab sample from any of the 3 pipes. The pH shall be within 0.5 S.U. of the rainfall pH when the rainfall pH is outside of the above range. Rainfall pH shall be monitored when the discharge is monitored and shall be reported as an attachment to the monthly DMR. If there is no rainfall to sample, the permittee should submit the appropriate No Data Indicator Code (NODI) in the attachment.

[2] Group I PAHs comprise seven known animal carcinogens.

[3] Group II PAHs comprise nine priority pollutant PAHs which are not considered carcinogenic alone, but which can enhance or inhibit the response of the carcinogenic PAHs.

[4] The quantitative methodology used for PAH analysis must achieve a minimum level for analysis (“ML”) using approved analytical methods in CFR Part 136. The ML is not the minimum level of detection, but rather the lowest level at which the test equipment produces a recognizable signal and acceptable calibration point for an analyte, representative of the lowest concentration at which an analyte can be measured with a known level of confidence. The ML for each Group I PAH compound must be <0.1 µg/L. The ML for each Group II PAH compound must be <1 µg/L. These MLs are based on those listed in Appendix VI of EPA’s Remediation General Permit. Sample results for an individual compound that is at or below the ML should be reported according to the latest EPA Region 1 *NPDES Permit Program Instructions for the Discharge Monitoring Report Forms (DMRs)*. These values may be reduced by modification pursuant to 40 CFR §122.62 as more sensitive tests become available or are approved by EPA and the State.

EPA believes these requirements are necessary for the protection of human health, to maintain the water quality standards established under Section 303 of the CWA, and to meet New Hampshire’s water quality criteria. Should monitoring data indicate the persistence of PAHs in concentrations that may cause or contribute to an excursion above water quality criteria, the permit may be modified, reissued or revoked pursuant to 40 CFR §122.62. Should monitoring indicate PAHs are not detected (using the proper MLs described above) over the first two years of the permit cycle, the permittee may request a reduction in monitoring frequency.

[5] If no sampling is required for a particular parameter and monitoring period, the permittee should enter the appropriate No Data Indicator Code (NODI) in the monthly Discharge Monitoring Report (DMR).

[6] This parameter shall be monitored during each calendar quarter (January-March, April-June, July-September, and October-December) and reported on the monthly DMR following the end of each calendar quarter (i.e., April, July, October, and January).

10. During the period beginning on the effective date and lasting through the expiration date, the permittee is authorized to discharge from outfall numbers **020 and 021: intake screen wash (Outfall 020 serves intake for Unit 4; Outfall 021 serves intake for Units 5 and 6)**. Such discharges shall be limited and monitored by the permittee as specified below.

Effluent Characteristic[1,2]	**Discharge Limitations**		**Monitoring Requirements**	
	Average Monthly	**Maximum Daily**	**Frequency**	**Sample Type**
Outfall 020 Flow (GPD)	--	108,000	Monthly	Estimate
Outfall 021 Flow (GPD)	--	108,000	Monthly	Estimate

Samples taken in compliance with the monitoring requirements specified above shall be taken at a representative point prior to discharge into the receiving water.

1 The temperature of the discharge shall at no time exceed the temperature of the intake water used for this discharge.

2 All live fish, shellfish and other organisms collected or trapped on the intake screens should be returned to their habitat, sufficiently distant from the intake structures to prevent re-impingement. All solid materials removed from the screens shall be disposed of via land disposal.

11. During the period beginning on the effective date and lasting through the expiration date, the permittee is authorized to discharge from outfall number **023: stormwater runoff from parking lot containing two chemical loading zones**. Such discharges shall be limited and monitored by the permittee as specified below.

Effluent Characteristic	Discharge Limitations				Monitoring Requirements	
	Average Monthly	**Maximum Daily**	**Min**	**Max**	**Frequency**	**Sample Type**
Flow (GPD)	--	Report	--	--	Monthly	Estimate
pH[1] (S.U.)	--	--	6.0	9.0	Monthly	Grab

Samples taken in compliance with the monitoring requirements specified above shall be taken at a representative point prior to discharge into the receiving water.

[1] The pH shall be within 0.5 S.U. of the rainfall pH when the rainfall pH is outside of the above range. Rainfall pH shall be monitored when the discharge is monitored and shall be reported as an attachment to the monthly DMR. If there is no rainfall to sample, the permittee should submit the appropriate No Data Indicator Code (NODI) in the attachment.

12. Water Quality Requirements

a. Discharges and water withdrawals shall not cause a violation of the water quality standards or jeopardize any Class B use of the Piscataqua River.

b. The thermal plumes from the station shall: (a) not block zones of fish passage, (b) not interfere with spawning of indigenous populations, (c) not change the balanced indigenous population of the receiving water, and (d) have minimal contact with surrounding shorelines.

c. The effluent shall not contain metals and/or materials in concentrations or in combinations which are hazardous or toxic to aquatic life or which would impair the uses designated by the classification of the receiving water.

d. Discharges to the Piscataqua River shall be adequately treated to ensure that the surface water remains free from pollutants in concentrations or combinations that settle to form harmful deposits, float as foam, debris, scum or other visible pollutants. They shall be adequately treated to ensure that the surface waters remain free from pollutants which produce odor, color, taste, or turbidity in the receiving water which is not naturally occurring and would render it unsuitable for its designated uses.

e. Pollutants which are not limited by the permit, but have been specifically disclosed in the last permit application, may be discharged at the frequency and level disclosed in the application, provided that such discharge does not violate sections 307 and 311 of the Act or applicable water quality standards.

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

a. Best Technology Available. The design, location, construction, and capacity of the permittee's cooling water intake structures (CWISs) shall reflect the best technology available (BTA) for minimizing adverse environmental impacts from the impingement and entrainment of various life stages of fish (e.g., eggs, larvae, juveniles, adults) by the CWISs. ***Nothing in this permit authorizes take for the purposes of a facility's compliance with the Endangered Species Act.*** The following requirements have been determined by the EPA to represent the BTA for minimizing impingement and entrainment impacts at this facility:

1. To minimize entrainment, the permittee shall install and operate a fine mesh wedgewire screen intake system for the CWIS's of Units 4, 5, and 6, with a pressurized system to clear debris from the screens. Periodic manual cleaning may also be required. For this permit, "fine mesh" is defined as a screen with a slot or mesh size no greater than 0.8 mm, unless the permittee can demonstrate through a site-specific study that a larger slot size is equally or more effective for reducing entrainment mortality as a 0.8 mm slot or mesh size. The wedgewire screen units must be positioned as close to the west bank of the Piscataqua River and the CWIS

as possible, while 1) meeting all operational specifications required by this permit; 2) meeting the conditions of any other permits for the equipment; and 3) assuring that the equipment performs as designed. Deflecting structures, such as debris-deflecting nose cones, are strongly recommended to eliminate the damage risk associated with free-floating debris from contacting the screen assembly.

2. To minimize impingement mortality, the permittee shall reduce the wedgewire screen through-screen velocity to a level no greater than 0.5 fps. The permittee shall verify that the through-screen velocity at the wedgewire screen surface is 0.5 fps or less through measurement or calculation.

3. Institute a best management practice (BMP) of shutting down the intake pumps associated with a particular generating unit to the extent practicable when that generating unit is not operating and water is not needed for fire prevention or other emergency conditions.

4. Schedule the annual Unit 5 outage during June to maximize the reduction in entrainment mortality. If the permittee has a capacity supply obligation, at the end of the current obligation, the permittee shall schedule yearly outages for Unit 5 in June and reconfigure subsequent capacity supply obligations to reflect the need for an annual outage in June.

5. No change in the location, design or capacity of the present structure, unless specified by this permit, can be made without prior approval by EPA.

b. Compliance Schedule. In order to comply with Part I.A.13.a 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 Part I.A.13.a of the permit. Specifically, steps for the installation and operation of equipment required to comply with Part I.A.13.a 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 in writing of compliance or non-compliance with the requirements for each milestone no later than fourteen (14) days following each specified deadline.

1. Design

i. The permittee shall complete pilot testing of wedgewire screens no later than twelve (12) months from the effective date of this permit.

ii. A demonstration report documenting the results of the pilot testing shall be submitted to EPA and NHDES within two (2) months of the completion of the pilot testing. The demonstration report shall include a preliminary design of the wedgewire screens at Schiller Station and include justifications for 1) the proposed screen slot size based on consideration of each option's ability to reduce entrainment mortality, avoid screen clogging, fouling or other maintenance issues, and any other relevant considerations; 2) the proposed material alloy choice for the equipment in order to reduce bio-fouling; and 3) the proposed optimal screen orientation in the river (i.e., parallel or perpendicular to the flow) in order to reduce entrainment and impingement mortality. The screen slot size and orientation selected will be subject to EPA approval and based upon the results of the pilot testing and demonstration report.

iii. Data collection, including but not limited to topographic and bathymetric surveys, geotechnical exploration, and other design and marine construction variables that need to be evaluated shall be completed no later than sixteen (16) months from the effective date of the permit.

iv. Within four (4) months of the completion of pilot testing and after correspondence from EPA, the permittee shall submit a final design for the wedgewire screens at Schiller Station.

2. Permitting

i. Within four (4) months of the completion of the pilot testing, the permittee shall commence the process to obtain all necessary permits and approvals for installation and construction of the wedgewire screens, including those required by U.S. Army Corps of Engineers (ACOE), National Marine Fisheries Service (NMFS), NHDES, New Hampshire Division of Coastal Zone Management, local conservation commissions, and others as necessary. This shall include the engineering to support the permitting, the permit applications, and all necessary supplementary data.

ii. From the commencement of the permitting process and until all permits and approvals are issued, the permittee shall provide timely and complete responses to all requests from each permitting and approval authority.

iii. Within eight (8) months from the commencement of the permitting process, the permittee shall complete submission of all necessary permit applications and notices necessary to install wedgewire screens at the Units 4, 5, and 6 CWISs.

3. Construction

i. Within twelve (12) months of the completion of the pilot testing, the permittee shall enter into an Engineering, Procurement and Construction agreement with the permittee's contractor.

ii. No later than nine (9) months after obtaining all permits and approvals, the permittee shall complete site preparation for the installation of wedgewire screens for the Units 4, 5 and 6 CWISs. The permittee shall minimize environmental and navigational impacts during construction and installation. In addition, EPA will work with representatives of Schiller Station and, as appropriate, the ISO to schedule any necessary downtime of the power plant that will minimize or eliminate any effects on the adequacy of the region's supply of electricity.

iii. The permittee shall complete installation, operational modifications, test, startup and commissioning of the wedgewire screens for the CWIS's of Units 4, 5 and 6 no later than twenty (20) months from obtaining all permits and approvals.

14. Water Treatment Chemicals

a. The Regional Administrator or the Director shall be notified in advance of any addition and/or change of chemicals containing pollutants not approved for water discharge and may require additional feasibility studies.

b. The permittee may add and/or change maintenance chemicals containing pollutants not currently approved for water discharge only if the permittee can demonstrate through testing that each of the 126 priority pollutants in 40 CFR Part 423.15(j)(1) is not detectable in the final discharge.

15. Maintenance, Diagnostic and Repair Materials

The use of Rhodamine WT dye and fine wood sawdust is allowed when the need arises, provided that the permittee: 1) notify EPA and NHDES at least thirty (30) days prior to the addition of these materials to any water stream that will ultimately be discharged to the Piscataqua River and 2) meets the requirements in Part I.A.1 of this permit. The initial notification shall include the following projections:

Rhodamine WT Dye

a. The expected maximum concentration of Rhodamine WT dye that will be discharged to the receiving water before dilution and the projected duration of the maximum concentration;

b. The total volume of Rhodamine WT dye to be introduced and the resulting average concentration expected at the outfall before dilution; and

c. The beginning time and duration the material is expected to be discharged to the receiving water at detectable levels, before dilution.

Fine Wood Sawdust

a. The total amount in pounds of sawdust introduced and the expected maximum total suspended solids (TSS) concentration of the effluent before dilution and the projected duration of the maximum concentration; and

b. The beginning time and duration the material is expected to be discharged to the receiving water at detectable levels, before dilution.

16. Mixing Zone Requirements

a. The mixing zone is defined as 200 feet upstream (flood tide) and 200 feet downstream (ebb tide) of the discharge from outfalls 001, 002, 003 and 004, with a width of 200 feet from the shoreline.

b. The mixing zone criteria for the plume are such that at no time shall the temperature of the receiving water outside the mixing zone exceed a maximum temperature of 84°F at any point beyond a distance of 200 feet in any direction from the point of discharge. Brief excursions are allowed only during tidal reversal periods (i.e., the period lasting 15 minutes before and 15 minutes after slack tide).

c. Outside the mixing zone, the natural seasonal cycle of the receiving water shall remain unchanged by the discharge, the annual spring and fall temperature and salinity changes shall be gradual, and large day to day temperature and salinity fluctuations shall be avoided.

d. Heated backwash of the intake for biofouling, ice control, or any other purpose is prohibited.

17. Other Requirements

a. There shall be no discharge of polychlorinated biphenyl (PCB) compounds such as those commonly used for transformer fluid. The permittee shall dispose of all known PCB equipment, articles, and wastes in accordance with 40 CFR 761.

b. Water drawn from fuel oil tanks shall not be discharged into the Piscataqua River.

c. Chlorine only may be used as a biocide. No other biocide shall be used without explicit approval from EPA.

e. The permittee shall comply with all existing federal, state, and local laws and regulations that apply to the reuse or disposal of solids, such as those which may be removed from water and waste treatment operations and equipment cleaning. At no time shall these solids be discharged to the Piscataqua River.

f. All existing manufacturing, commercial, mining, and silvicultural dischargers must notify the Regional Administrator as soon as they know or have reason to believe (40 CFR §122.42):

1. That any activity has occurred or will occur which would result in the discharge, on a routine or frequent 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 ug/l);

    ii. Two hundred micrograms per liter (200 ug/L) for acrolein and acrylonitrile; five hundred micrograms per liter (500 ug/L) for 2,4-dinitrophenol and for 2-methyl-4,6-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 CFR §122.21(g)(7); or

    iv. Any other notification level established by the Regional Administrator in accordance with 40 CFR §122.44(f).

2. 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 ug/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 CFR §122.21(g)(7); or

    iv. Any other notification level established by the Regional Administrator in accordance with 40 CFR §122.44(f).

3. 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.

18. Possible Permit Requirement Changes

a. This permit shall be modified, or alternatively, 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:

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

ii. Controls any pollutant not limited by this permit.

b. This permit may be modified, or alternatively, revoked and reissued to incorporate additional testing requirements, including chemical specific limits if any testing result required by this permit indicates that the discharge causes or has reasonable potential to cause or contribute to an exceedance of any State water quality criterion. Results of the analyses required by this permit are considered "New Information" and the permit may be modified as provided in 40 CFR Section 122.62(a)(2).

c. A relaxation of the pH limits is allowed if the permittee performs an in-stream dilution study that demonstrates that the in-stream standards for pH would be protected. If NHDES approves results from a pH demonstration study, this permit's pH limit range may be relaxed for some or all relevant outfalls. Note that with so many outfalls it would be difficult to show how one outfall either did or did not affect the downstream pH so an aggregate pH demonstration for all of outfalls may be required. Since it may be quite difficult to do such a study during worst case tidal conditions, the permittee should coordinate closely with NHDES in the development of any such study. The notification of the relaxation must be made by certified letter to the permittee from EPA-Region 1. The pH limit range cannot, however, be made less restrictive than the 6.0 - 9.0 S.U. limitations included in the applicable Steam Electric ELGs for the facility.

B. NON-NUMERIC TECHNOLOGY-BASED EFFLUENT LIMITATIONS AND ADDITIONAL REQUIREMENTS FOR STORMWATER

1. Control measures, including Best Management Practices (BMPs), shall be selected, designed, installed, and implemented at the Facility to 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 current EPA Multi-Sector General Permit (MSGP) (effective June 4, 2015). Specifically, BMPs must be selected and implemented to satisfy the following non-numeric technology-based effluent limitations:

   a. Minimization of exposure of manufacturing, processing, and material storage areas to stormwater discharges;
   b. Good housekeeping and/or control measures designed to maintain areas that are potential sources of pollutants, including, but not limited to, contaminated soil and groundwater;
   c. Preventative maintenance programs to avoid leaks, spills, and other releases of pollutants in stormwater discharged to receiving waters;
   d. Spill prevention and response procedures to ensure effective response to spills and leaks if or when they occur including proper procedures for cleanup water segregation;

e. Erosion and sediment controls designed to stabilize exposed areas and contain runoff using structural and/or non-structural control measures to minimize on-site erosion and sedimentation, and the resulting discharge of pollutants;
f. Runoff and run-on management practices to divert, infiltrate, reuse, contain, or otherwise reduce stormwater runoff;

2. The selection, design, installation, and implementation of control measures must be in accordance with good engineering practices and manufacturer's specifications. When selecting and designing control measures (including BMPs), the Permittee must address design considerations consistent with Part 2.1.1 of the current MSGP (effective June 4, 2015).

3. The Permittee shall conduct facility inspections. All areas with industrial materials or activities exposed to stormwater and all structural control used to comply with effluent limits in this permit shall be inspected, at least once per quarter, by qualified personnel with one or more members of the stormwater pollution prevention team. Inspections shall begin during the first full calendar quarter after the effective date of this permit. EPA considers quarters as follows: January to March; April to June; July to September; and October to December. Each inspection must include a visual assessment of stormwater samples (from the outfall), which shall be collected within the first 15 minutes of discharge, stored in a clean, clear glass or plastic container, and examined in a well-lit area for the following water quality characteristics: color, odor, clarity, floating solids, settled solids, suspended solids, foam, oil sheen, and other obvious indicators of pollution.

4. The Permittee shall take corrective action(s) as required below.

a. If any of the following conditions occur, the Permittee must review and revise the selection, design, installation, and implementation of control measures (including BMPs) to ensure that the condition is eliminated and will not be repeated in the future:

i. an unauthorized release or discharge or a release of a reportable quantity of pollutants as described in 40 C.F.R. §302;
ii. a discharge violates any permit condition, including a numeric effluent limit;
iii. a determination by the Permittee or EPA that the control measures (including BMPs) appear to be ineffective in achieving the general objectives of controlling pollutants in discharges or are not stringent enough for the discharge to meet applicable water quality standards;
iv. an inspection or evaluation of the Facility by an EPA official, or local, State, or Tribal entity, determines that modifications to the control measures are necessary to meet the non-numeric effluent limits in this permit; or
v. a finding by the Permittee during a quarterly inspection that control measures are not being properly operated and maintained.

b. If any of the following conditions occur, the Permittee must review the selection, design, installation, and implementation of control measures (including BMPs) to determine if modifications are necessary to meet the effluent limits in this permit:

i. a change in design, construction, operation, or maintenance, materials storage, or activities at the Facility that significantly changes the nature of pollutants discharged in stormwater from the Facility, or significantly increases the quantity of pollutants discharged; or
ii. new data identifies the integrity of the stormwater system and level of groundwater infiltration into the stormwater system.

c. If the Permittee determines that changes are necessary, any modifications to control measures (including BMPs) must be made before the next discharge if possible, or as soon as practicable following that discharge.

5. EPA's 2015 Multi-Sector General Permit addresses requirements for industrial activities at Steam Electric Generating Facilities in Part 8, Subpart O. Based on Section 8.O.4.4, which discusses Chemical Loading and Unloading, the following requirements apply to the parking lot at Schiller Station which is used for chemical loading and/or unloading (i.e., Outfall 023):

Minimize contamination of precipitation or surface runoff from chemical loading and unloading areas. Consider using containment curbs at chemical loading and unloading areas to contain spills, 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 loading and unloading in covered areas and storing chemicals indoors.

6. Additional or Enhanced BMPs related to Nitrogen

a. Stormwater Management in New Development and Redevelopment: new development and redevelopment stormwater management BMPs must be optimized for nitrogen removal; retrofit inventory and priority ranking shall include consideration of BMPs to reduce nitrogen discharges.

b. Good House Keeping and Pollution Prevention for Permittee Owned Operations: establish requirements for use of slow release fertilizers on permittee owned property currently using fertilizer; establish procedures to properly manage grass cuttings and leaf litter on permittee property, including prohibiting blowing organic waste materials onto adjacent impervious surfaces; increased street sweeping frequency of all municipal owned streets and parking lots to a minimum of two times per year, once in the spring (following winter activities such as sanding) and at least once in the fall (following leaf fall).

7. Nitrogen Source Identification Report

a. Within four years of the permit effective date the permittee shall complete a Nitrogen Source Identification Report. The report shall include the following elements:

i. Calculation of total area draining to the water quality limited water segments or their tributaries, incorporating updated mapping and catchment delineations,
ii. Identification, delineation and prioritization of potential catchments with high nitrogen loading
iii. Identification of potential retrofit opportunities or opportunities for the installation of structural BMPs during redevelopment

b. The final Nitrogen Source Identification Report shall be submitted to EPA as part of the year 4 annual report.

8. Potential Structural BMPs

a. Within five years of the permit effective date, the permittee shall evaluate all permittee-owned properties identified as presenting retrofit opportunities or areas for structural BMP installation identified in the Nitrogen Source Identification Report that are within the drainage area of the impaired water or its tributaries. The evaluation shall include:

i. The next planned infrastructure, resurfacing or redevelopment activity planned for the property (if applicable) OR planned retrofit date;
ii. The estimated cost of redevelopment or retrofit BMPs; and
iii. The engineering and regulatory feasibility of redevelopment or retrofit BMPs.

b. The permittee shall provide a listing of planned structural BMPs and a plan and schedule for implementation in the year 5 annual report. The permittee shall plan and install a minimum of one structural BMP as a demonstration project within the drainage area of the water quality limited water or its tributaries within six years of the permit effective date. The demonstration project shall be installed targeting a catchment with high nitrogen load potential. The permittee shall install the remainder of the structural BMPs in accordance with the plan and schedule provided in the year 5 annual report.

c. Any structural BMPs installed in the regulated area by the permittee or its agents shall be tracked and the permittee shall estimate the nitrogen removal by the BMP. The permittee shall document the BMP type, total area treated by the BMP, the design storage volume of the BMP and the estimated nitrogen removed in mass per year by the BMP in each annual report.

9. At any time, a permittee may submit information to EPA demonstrating that its discharge does not contain a measurable amount of nitrogen by characterizing its discharge using EPA approved lab methods. Such demonstration must be documented through long term monitoring using outfall characterization recommendations as rigorous as the method recommended by the National Research Council. The National Research Council recommends a minimum of 30 flow weighted composite samples collected over the course of 2-3 years on a variety of

storm sizes to characterize a discharge properly (http://www.epa.gov/npdes/pubs/nrc_stormwaterreport.pdf). A written request shall be sent to EPA summarizing the data collected and methods used to characterize each outfall's discharge. If EPA concurs that the discharge does not contain nitrogen, EPA will provide written concurrence to the permittee. Following written concurrence by EPA, the permittee is relieved of the requirements of Section I.B.6 through 8 of this permit as of the date of EPA's written concurrence and such concurrence shall be retained as part of the permittee's Stormwater Pollution Prevention Plan.

C. STORMWATER POLLUTION PREVENTION PLAN

1. The Permittee shall develop, implement and maintain a SWPPP designed to reduce or prevent the discharge of pollutants to waters of the United States. The SWPPP shall be a written document that is consistent with the terms of the permit and the current MSGP (effective June 4, 2015). The SWPPP must identify and describe the control measures (including BMPs) employed by the Permittee for all structural and/or operational controls used to control discharges from all external outfalls.

2. The SWPPP shall be updated and certified by the Permittee within 90 days of the effective date of this permit. The Permittee shall certify that the SWPPP has been prepared, that it meets the requirements of this permit, and that it reduces the pollutants in the discharge to the extent practicable. The SWPPP and certification shall be signed in accordance with the requirements identified in 40 C.F.R. §122.22. A copy of the SWPPP and certification shall be maintained at the Facility and made available to EPA, NHDES and/or the City of Portsmouth upon request.

3. The SWPPP shall be prepared in accordance with good engineering practices and shall be consistent with the general provisions for SWPPPs included in the current MSGP (effective June 4, 2015). In the current MSGP, the general SWPPP provisions are included in Part 5 and Part 8.P and Appendix D, and are specified, in part, above. Specifically, the SWPPP shall document the selection, design, installation, and implementation of control measures and contain the elements listed below:

    a. A pollution prevention team with collective and individual responsibilities for developing, implementing, maintaining, revising and ensuring compliance with the SWPPP;
    b. 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 I.C.3.c., below), stormwater monitoring points, stormwater inlets and outlets, and industrial activities exposed to precipitation such as, storage, disposal, and material handling;
    c. 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 or non-stormwater discharge sampling data;

d. A description of all stormwater controls, both structural and non-structural; and
e. A schedule and procedure for implementation and maintenance of the control measures, BMPs, quarterly inspections and corrective actions described in Part I.B above.

4. The Permittee shall amend and update the SWPPP within 14 days for 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 or that affect the SWPPP. Such changes may include, but are not limited to those listed in Part I.C.4. Any amended, modified, or new versions of the SWPPP shall be re-certified and signed by the Permittee in accordance with the requirements identified in Part. I.C.2. above.

5. The SWPPP shall document the control measures (including BMPs) implemented or to be implemented at the Facility to meet the non-numeric technology-based effluent limitations in Part I.B., and the information specified below for inspections, and corrective action(s).

   a. The Permittee shall document the following information for each inspection and maintain the records with the SWPPP:

      i. The date and time of the inspection and at which any samples were collected;
      ii. The name(s) and signature(s) of the inspector(s)/sample collector(s);
      iii. If applicable, why it was not possible to take samples within the first 15 minutes;
      iv. Weather information and a description of any discharges occurring at the time of the inspection;
      v. Results of observations of discharges, including any observed discharges of pollutants and the probable sources of those pollutants;
      vi. Any control measures and/or treatment system components needing maintenance, repairs or replacement; and
      vii. Any additional control measures needed to comply with the permit requirements.

   b. For corrective actions, the Permittee shall document conditions included in Part I.B.4.a and b within 24 hours of identifying such conditions. The Permittee shall document any corrective action(s) to be taken, or if no corrective action is needed, the basis for that determination, within 14 days of identifying such conditions. The Permittee shall document the following information, at a minimum:

      i. Identification of the condition triggering the need for corrective action review;
      ii. Description of the problem identified;
      iii. Date the problem was identified;
      iv. Summary of corrective action taken or to be taken (or, where you determine that corrective action is not necessary, the basis for this determination);
      v. Notice of whether SWPPP modifications are required as a result of this discovery or corrective action;
      vi. Date corrective action initiated; and
      vii. Date corrective action completed or expected to be completed.

6. The Permittee shall certify at least annually that the Facility is in compliance with the SWPPP requirement. If the Facility is not in compliance with any aspect of the SWPPP requirement, 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 Part. I.C.2. above.

7. The Permittee shall certify at least annually that the previous year's inspections and maintenance activities were conducted, results recorded, records maintained, and that the Facility is in compliance with this permit. Such annual certifications also shall be signed in accordance with the requirements identified in Part. I.C.2. above. If the Facility is not in compliance with any aspect of this permit, the annual certification shall state the non-compliance and the remedies which are being undertaken. The Permittee shall document in the SWPPP any violation of numeric or non-numeric effluent limitations with a date and description of the corrective actions taken.

8. The Permittee shall keep a copy of the current SWPPP and all SWPPP certifications (the initial certification, recertification, and annual certifications) signed during the effective period of this permit at the Facility and shall make it available for inspection by EPA and/or NHDES.

9. The SWPPP must be consistent with the terms of this permit, similar plans, and requirements of Section 311 of the CWA.

D. MONITORING AND REPORTING

The monitoring program in the permit specifies sampling and analysis, which will provide continuous information on compliance and the reliability and effectiveness of the installed pollution abatement equipment. The approved analytical procedures found in 40 CFR Part 136 are required unless other procedures are explicitly required in the permit. The permittee is obligated to monitor and report sampling results to EPA and the NHDES within the time specified within the permit.

Unless otherwise specified in this permit, the permittee shall submit reports, requests, and information and provide notices in the manner described in this section.

1. Submittal of DMRs and the Use of NetDMR

Beginning the effective date of the permit the permittee must submit its monthly monitoring data in Discharge Monitoring Reports (DMRs) to EPA and NHDES no later than the 15th day of the month following the completed reporting period. **For a period of six (6) months from the effective date of the permit**, the permittee may submit its monthly monitoring data in DMRs to EPA and NHDES either in hard copy form, or in DMRs electronically submitted using NetDMR. NetDMR is a web-based tool that allows permittees to electronically submit DMRs and other required reports via a secure internet connection. NetDMR is accessed from: http://www.epa.gov/netdmr. **Beginning no later than six (6) months after the effective date of the permit**, the permittee shall begin reporting monthly monitoring data using NetDMR, unless, in accordance with Part I.D.6, the facility is able to demonstrate a reasonable basis, such as technical or administrative infeasibility, that precludes the use of NetDMR for submitting DMRs. The permittee must continue to use the NetDMR after the permittee begins to do so. When a permittee begins submitting reports using NetDMR, hard copies to EPA and NHDES will no longer be required.

2. Submittal of Reports as NetDMR Attachments

After the permittee begins submitting DMR reports to EPA and NHDES electronically using NetDMR, the permittee shall electronically submit all reports to EPA and NHDES as NetDMR attachments rather than as hard copies, unless otherwise specified in this permit. This includes the NHDES Monthly Operating Reports (MORs). (See Part I.D.5 for more information on State reporting.) Because the due dates for reports described in this permit may not coincide with the due date for submitting DMRs (which is no later than the 15th day of the month), a report submitted electronically as a NetDMR attachment shall be considered timely if it is electronically submitted to EPA using NetDMR with the next DMR due following the particular report due date specified in this permit.

3. Submittal of Requests and Reports to EPA/OEP

The following requests, reports, and information described in this permit shall be submitted to the EPA/OEP NPDES Applications Coordinator in the EPA Office Ecosystem Protection (OEP).

A. Transfer of permit notice
B. Request for changes in sampling location
C. Request for reduction in monitoring frequency
D. Change in location, design or capacity of cooling water intake structures
E. Wedgewire screen pilot testing demonstration report
F. Final design plans for the wedgewire screen installation

These reports, information, and requests shall be submitted to EPA/OEP electronically at R1NPDES.Notices.OEP@epa.gov or by hard copy mail to the following address:

U.S. Environmental Protection Agency
Office of Ecosystem Protection
EPA/OEP NPDES Applications Coordinator
5 Post Office Square - Suite 100 (OEP06-03)
Boston, MA 02109-3912

4. Submittal of Reports in Hard Copy Form

The following notifications and reports shall be submitted as hard copy with a cover letter describing the submission. These reports shall be signed and dated originals submitted to EPA.

A. Written notifications required under Part II
B. Reports and DMRs submitted prior to the use of NetDMR
C. 316(b) compliance schedule milestone reports

This information shall be submitted to EPA/OES at the following address:

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

5. State Reporting

Unless otherwise specified in this permit, duplicate signed copies of all reports, information, requests or notifications described in this permit, including the reports, information, requests or notifications described in Parts I.D.3 and I.D.4 also shall be submitted to the State electronically via email to the permittee's assigned NPDES inspector at NHDES-WD or in hard copy to the following address:

New Hampshire Department of Environmental Services
Water Division
Wastewater Engineering Bureau
P.O. Box 95
Concord, New Hampshire 03302-0095

An annual report on the impinged lobsters and other biota detected from any screen wash sampling in July and August is to be sent to the NH Fish and Game Department's Marine Division Chief at the following address:

NH Fish and Game Department
Marine Division
225 Main Street
Durham, NH 03824

6. Submittal of NetDMR Opt-Out Requests

NetDMR 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 be 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-SMR)
Boston, MA 02109-3912

And

<u>**Attn: Compliance Supervisor**</u>
New Hampshire Department of Environmental Services (NHDES)
Water Division
Wastewater Engineering Bureau
P.O. Box 95
Concord, New Hampshire 03302-0095

7. Verbal Reports and Verbal Notifications

Any verbal reports or verbal notifications, if required in Parts I and/or II of this permit, shall be made to both EPA and to NHDES. This includes verbal reports and notifications which require reporting within 24 hours. (As examples, see Part II.B.4.c.(2), Part II.B.5.c. (3), and Part II.D.1.e.) Verbal reports and verbal notifications shall be made to EPA's Office of Environmental Stewardship at:

617-918-1510

Verbal reports and verbal notifications shall also be made to the permittee's assigned NPDES inspector at NHDES –WD.

E. STATE PERMIT CONDITIONS

This NPDES discharge permit is issued by the U.S. Environmental Protection Agency under Federal and State law. Upon final issuance by the EPA, the NHDES-WD may adopt this permit, including all terms and conditions, as a State permit pursuant to RSA 485-A:13.

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 the permit as issued by the other Agency, unless and until each Agency has concurred in writing with such modification, suspension or revocation.

NPDES PART II STANDARD CONDITIONS
(January, 2007)

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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. <u>Inspection and Entry</u>

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. <u>Reporting Requirements</u>

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. <u>Definitions for NPDES Permit Sludge Use and Disposal Requirements</u>.

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
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FACT SHEET

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

NPDES PERMIT NO.: **NH0001473**

PUBLIC COMMENT PERIOD: **September 30, 2015 – November 28, 2015**

PUBLIC NOTICE NO.: **NH-008-15**

NAME AND ADDRESS OF APPLICANT:

Public Service Company of New Hampshire
P.O. Box 330
Manchester, NH 03105

NAME AND ADDRESS OF FACILITY WHERE DISCHARGE OCCURS:

Schiller Station
400 Gosling Road
Portsmouth, NH 03801

RECEIVING WATER: **Piscataqua River (USGS Hydrologic Basin Code: 01060003)**

CLASSIFICATION: **Class B**

SIC CODE: **4911** NAICS Code(s): **221112**

CURRENT PERMIT
ISSUED: **9-11-1990**
EFFECTIVE: **10-11-1990**
EXPIRED: **10-10-1995**
APPLICATION REC: **6-1-1995**
RENEWED APP REC: **9-13-2010**

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1. Proposed Action, Facility Type, and Location of Discharge and Water Withdrawal

Schiller Station, located on the southwestern bank of the Piscataqua River in Portsmouth, New Hampshire, is a four-unit, 163 megawatt (MW) steam electric generating facility (referred to hereinafter as either Schiller Station, Schiller, the Facility, or the Station). The Station is owned and operated by Public Service of New Hampshire (PSNH), a subsidiary of the Northeast Utilities System ("NU"). Recent media reports indicate that NU has changed its corporate name, as well as the name of PSNH and its other subsidiaries, to Eversource Energy (Eversource). Schiller Station began generating electricity in 1952.

The Station's three main generators are designated as 4, 5, and 6; all rated at 48 MW each. Units 4 and 6 are equipped with dual fuel boilers capable of firing either pulverized bituminous coal or #6 fuel oil. Unit 5 was converted to a dual fuel fluidized bed boiler that burns wood chips and/or other low grade wood products for its primary fuel. The remaining unit, designated CT-1, is a 19 MW combustion turbine fired with #1 fuel oil that is typically operated only during periods of highest seasonal peak demand. When operating at peak capacity, Schiller Station can produce enough energy to supply 65,000 homes.

Historically, Schiller Station has functioned as a base-load power plant. Schiller's wood-burning unit has maintained a capacity factor of around 80 percent, but conditions have changed for Schiller's coal-burning units in recent years due to fluctuations in the availability and cost of various types of fuel. Lower prices for natural gas have led to greatly reduced capacity factors for coal-burning units, including Schiller. (Oil-burning units already had low capacity factors due to the relatively high price of oil.) In 2011 and 2012, the capacity factor for Schiller's coal-burning units dropped off to around 10 percent for much of the year, with increased operation during the cold winter months. In essence, these units run during periods of peak demand, especially during the winter. In 2014, extreme cold weather, further shifts in relative fuel prices, and limitations on the natural gas transmission system that restrict natural gas imports into the region, led to winter peak operations approaching 80 percent. After the winter, however, the units' capacity factor dropped off again to around 10 percent or less.

As part of its process for generating electricity, Schiller Station uses an open-cycle (or "once-through") cooling system. The Facility withdraws water from the Piscataqua River through its cooling water intake structure (CWIS) and uses it to condense the steam sent through the electrical generating turbines. As a result, the water absorbs the Facility's waste heat produced in the electrical generating process. This heats up the water and Schiller then discharges this thermal effluent to the Piscataqua River.

Under Sections 301(a) and 402(a) of the Federal Clean Water Act (CWA), Schiller Station may not discharge pollutants to, or withdraw water for cooling from, the Piscataqua River unless authorized to do so by a National Pollutant Discharge Elimination System (NPDES) permit. The Region 1 office of the U.S. Environmental Protection Agency (referred to hereinafter either as EPA, EPA-New England, Region 1, or the Region) is the governmental authority that issues NPDES permits to facilities in New Hampshire, such as Schiller Station. Still, the Region may not issue a permit to a New Hampshire facility unless the New Hampshire Department of Environmental Services (NHDES) either certifies that the conditions in the permit are stringent enough to assure, among other things, that the discharge will not cause the receiving water to violate the New Hampshire Surface Water Quality Regulations (NH-Standards) or waives its right to certify as set forth in 40 CFR §124.53.

Schiller Station's current NPDES permit authorizes the Facility to withdraw water for cooling purposes from, and to discharge pollutants to, the Piscataqua River. See Attachment A showing a map of the Facility including outfall locations. The Station is permitted to discharge non-contact cooling water, operational plant wastewater, process water, and runoff. The majority of stormwater runoff on the site is commingled with non-stormwater, so much of the runoff from the site is regulated under this individual permit. To address any directly discharged stormwater, PSNH has drafted a Stormwater Pollution Prevention Plan and the Station will file a Notice of Intent (NOI) to cover these outfalls under the Multi-Sector General Storm Water Permit.

Region 1 last issued the Station's NPDES permit (NH0001473) on September 11, 1990. This permit expired on September 10, 1995, but was administratively continued because the Station submitted a timely and complete application for permit reissuance. *See* 40 C.F.R. § 122.6(a). On September 13, 2010, the Region received an updated permit application from PSNH, as per the Region's request. The Station remains subject to the 1990 permit until EPA issues a new one.

EPA currently intends to reissue the Facility's NPDES permit. This draft permit proposes to continue to authorize the intake of cooling water and discharge of cooling and process water, subject to the conditions specified in the permit and discussed in this Fact Sheet.

2. Description of Discharge

Refer to Section 6.2 of this fact sheet for a description of the discharges associated with each outfall location. Attachment B further describes the discharge, based on the applicant's quantitative discharge data (from November 1990 to April 2014). Attachment C presents a schematic drawing depicting the flow of water at the Facility and its various discharges.

3. Receiving Water Description

Schiller Station withdraws water from and discharges to the lower Piscataqua River. The Piscataqua is an approximately 13-mile-long tidal river which empties into Portsmouth Harbor/ Atlantic Ocean. The tide in this river is semi-diurnal with an average period of 12.4 hours. The lower portion of the Piscataqua River has been characterized as a well-mixed estuary. Tidal flushing requires six to 12 tidal cycles (3 to 6 days) and tidal mixing forces cause the water column to be vertically well mixed. In the vicinity of Schiller Station (within a 0.5 mile radius), center river channel depths range from 42 ft to 75 ft below Mean Low Water (MLW) with a median depth (as defined by area) of 18 ft. Also within the lower Piscataqua River, the river has maximum sweeping flow velocities of approximately 4.9 feet per second (fps) during ebb tide and 4.4 fps during flood tide. The peak tidal flows are approximately 117,000 cubic feet per second (cfs).

The Piscataqua River is classified as a Class B water body pursuant to the State of New Hampshire's Surface Water Quality Regulations (N.H. Code of Administrative Rules, Env-Wq 1703.01) and N.H. RSA 485-A:8. Class B waters are "considered as being acceptable for fishing, swimming and other recreational purposes and, after adequate treatment, for use as water supplies." (RSA 485-A:8, II).

Section 303(d) of the CWA requires states to identify those water-bodies that are not expected to meet surface water quality standards after the implementation of technology-based controls and, as such, require the development of total maximum daily loads (TMDL). The section of the Piscataqua River that Schiller Station discharges into (Lower Piscataqua River – South) is on the 2012 CWA 303(d) list for polychlorinated biphenyls (PCB's), mercury, dioxin, and estuarine bioassessments.

4. Limitations and Conditions

The effluent limitations and all other requirements described herein may be found in the Draft Permit. The bases for the limits and other permit requirements are described below. The Discharge Monitoring Report (DMR) data for the period of November 1990 through April 2014 were reviewed as part of developing the Draft Permit. This time period is referred to in this Fact Sheet as the "monitoring period".

5. Permit Basis: Statutory and Regulatory Authority

5.1 General Requirements

The CWA prohibits the discharge of pollutants to waters of the United States without authorization from an NPDES permit, unless such the discharge is otherwise authorized by the statute. 33 U.S.C. §§ 1311(a), 1342(a)(1). In addition, the NPDES permit for a discharger must include appropriate requirements on withdrawals of water for cooling through a facility's cooling water intake structure. 33 U.S.C. § 1326(b). The NPDES permit is the mechanism used to implement technology and water quality-based effluent limitations and other requirements, including monitoring and reporting requirements, at the facility-specific level. *See* 33 U.S.C. § 1342(a). This draft NPDES permit was developed in accordance with various statutory and regulatory requirements established in or pursuant to the CWA and any applicable federal and state regulations. The regulations governing the EPA NPDES permit program are generally found at 40 C.F.R. Parts 122, 124, 125, and 136.

EPA bases NPDES permit limits on applicable technology-based and water quality-based requirements. 33 U.S.C. § 1342(a)(1). Permit limits must, at a minimum, satisfy federal technology standards, but also must satisfy any more stringent water quality-based requirements that may apply. *See* 33 U.S.C. §§ 1311(b), 1326(b), 1342(a)(1); 40 C.F.R. §§ 122.44, 125.3(a). Put differently, as between technology-based and water quality-based requirements, whichever is more stringent governs the permit. In some specific, limited circumstances, however, a permittee may seek a variance from technology-based and/or water quality-based requirements. For example, a permittee may seek alternative, variance-based thermal discharge limits under CWA § 316(a). 33 U.S.C. § 1326(a). In addition, when setting permit limits, EPA must consider the requirements in the existing permit in light of the CWA's "anti-backsliding" requirements, which generally bar new permits from relaxing limits as compared to the limits in an earlier permit, unless a specific anti-backsliding exception applies. *See* 33 U.S.C. § 1342(o); 40 C.F.R. § 122.44(l).

5.2 Technology-Based Requirements

Technology-based treatment requirements represent the minimum level of control that must be imposed under Sections 301(b) and 402 of the CWA *(see also* 40 C.F.R. §§ 122.44(a), 122.44(b)(3), 125.3(a). Technology-based limits are set to reflect the pollutant removal capability of particular treatment technologies that satisfy various narrative treatment technology standards set forth in the CWA. These standards, in essence, define different levels of treatment capability. Specifically, pollutant discharges must be limited to a degree that corresponds with the best practicable control technology currently available (BPT) for certain conventional pollutants, the best conventional control technology (BCT) for other conventional pollutants, and the best available technology economically achievable (BAT) for toxic and non-conventional pollutants. *See* 33 U.S.C. §§ 1311(b)(1)(A), (b)(2)(A), (E) and (F); 40 C.F.R. § 125.3(a). For "new sources" of pollutant discharges, *see* 40 C.F.R. §§ 122.2 (definition of "new source) and 122.29(a), discharges of pollutants must be limited to a degree corresponding to the "best available demonstrated control technology" (BADCT). *See* 33 U.S.C. §§ 1316(a) and (b). Moreover, CWA § 316(b), 33 U.S.C. § 1326(b), requires that the location, construction, design and capacity of cooling water intake structures reflect "the best technology available for minimizing adverse environmental impact" (BTA).

In general, the statute requires that facilities like Schiller Station comply with technology-based effluent limitations as expeditiously as practicable, but in no case later than March 31, 1989 (see 40 C.F.R. §125.3(a)(2)). Since the statutory deadline for meeting applicable technology-based effluent limits has already passed, NPDES permits must require immediate compliance with any such limits included in the permit. When appropriate, however, schedules by which a permittee will attain compliance with new permit limits may be developed and issued in an administrative compliance order under CWA § 309(a) or some other mechanism.

For CWISs, EPA has recently changed its interpretation of the applicable compliance deadline for meeting BTA requirements under CWA § 316(b). Because CWA § 316(b) cross-references CWA §§ 301 and 306, EPA formerly interpreted § 316(b) to incorporate the compliance deadlines from those provisions. *See, e.g., Cronin v. Browner,* 898 F. Supp. 1052 (S.D.N.Y. 1995); *EPA General Counsel's Opinion No. 41* (1976). EPA has changed this interpretation and now interprets the absence of a specific compliance date being specified in the text of § 316(b) to mean that EPA may re-interpret the statute not to impose a specific compliance deadline and, instead, to require that compliance with BTA requirements be achieved as soon as practicable. *See* 79 Fed. Reg. 48359. As a result, NPDES permits may contain appropriate compliance schedules for achieving compliance with BTA requirements. This is reflected in EPA's recently promulgated regulations applying CWA § 316(b)'s BTA standard to existing facilities. *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)). Compliance schedules are discussed in more detail in Section 10 of this document.

When EPA has promulgated national effluent limitation guidelines (ELGs) applying the statute's narrative technology standards (such as the BAT standard) to pollutant discharges from a particular industrial category, then those ELGs provide the basis for any technology-based effluent limits included in NPDES permits issued to individual facilities within that industrial category. 33 U.S.C. §§ 1342(a)(1)(A) and (b). *See also* 40 C.F.R. §§ 122.43(a) and (b), 122.44(a)(1) and 125.3(c)(1). In the absence of a categorical ELG, however, EPA develops technology-based effluent limits by applying the narrative technology standards on a case-by-case, Best Professional Judgment (BPJ) basis. *See* 33 U.S.C. § 1342(a)(1)(B); 40 C.F.R. §§ 122.43(a), 122.44(a)(1), 125.3(c)(2). When developing technology-based effluent limitations, EPA considers the terms of the particular technology standard in question, as specified in the statute and regulations, *id.*, along with the various factors enumerated in the statute and regulations for each specific technology standard. *See* 33 U.S.C. § 1314(b); 40 C.F.R. § 125.3(d). In developing ELGs, EPA's analysis is conducted for an entire industrial category or sub-category. In the absence of an ELG, EPA develops technology-based limits on a BPJ basis for a particular permit by conducting the analysis on a site-specific basis. One federal court has explained BPJ-based permitting as follows:

> [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.

NRDC v. EPA, 859 F.2d 156, 199 (D.C. Cir. 1988).

ELGs for the Steam Electric Power Generating Point Source Category

EPA promulgated ELGs for the Steam Electric Power Generating Point Source Category (the Steam Electric ELGs) in 1982. *See* 40 C.F.R. Part 423. The Steam Electric ELGs apply 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 (coal, oil, or gas) or nuclear fuel in conjunction with a thermal cycle employing the steam water system as the thermodynamic medium. 40 C.F.R. § 423.10. Schiller Station is a member of this industrial category and is covered by the Steam Electric ELGs. As noted above, after the last permit reissuance Unit 5 was converted to a dual fuel fluidized bed boiler that burns wood chips and/or other low grade wood products for its primary fuel. Hence, this generating unit does not fall within the Steam Electric Power Generating Point Source Category only because it relies on biomass for its fuel source rather than a fossil or nuclear fuel. Nevertheless, EPA concludes that it is reasonable and appropriate to consider the ELGs for the Steam Electric ELGs in developing BPJ-based BAT limits for the Schiller Station facility given that Units 4 and 6 are covered under this ELG and Unit 5 meets all other criteria for classification under this industrial category.

The Steam Electric ELGs, however, establish categorical effluent limitations under the various technology standards (*i.e.*, under BPT, BAT and BCT) for only *some* of the pollutants discharged by facilities in this industry. As noted above, where an applicable categorical effluent limitation has been developed, technology-based permit limits would be based on it. For example, the Steam Electric ELGs set BPT standards for certain pollutants contained in low volume wastes, fly ash and bottom ash transport water, metal cleaning wastes, cooling water, and cooling tower blowdown. In addition, the ELGs set BAT standards for certain pollutants in cooling water, cooling tower blowdown, and chemical metal cleaning wastes. When an applicable categorical standard has not been developed, however, technology-based limits would instead be developed on a BPJ, case-by-case basis. *See* 40 C.F.R. § 125.3(c)(2) and (3). Importantly, the Steam Electric ELGs do not include effluent limitations for discharges of heat. As a result, technology-based effluent limits for thermal discharges must be developed on a BPJ basis.

EPA has proposed regulations to update the Steam Electric ELGs, *see* 78 Fed. Reg. 34432 (June 7, 2013) (Proposed Rule), but they have not yet been finalized and are not in effect.[1] The proposed regulations do not govern the draft permit for Schiller. *See* 40 C.F.R. § 122.43(b). In addition, although the proposed revisions to the ELGs address a variety of pollutants, they do not propose to specify effluent limitations for discharges of heat.

EPA also recently promulgated final regulations setting categorical technology-based requirements under CWA § 316(b) for CWISs at existing facilities. 79 Fed. Reg. 48300-48439 (Aug. 14, 2014) (National Pollutant Discharge Elimination System—Final Regulations To Establish Requirements for Cooling Water Intake Structures at Existing Facilities and Amend Requirements at Phase I Facilities; Final Rule) ("New CWA § 316(b) Regulations"). These standards apply to Schiller Station. The New CWA § 316(b) Regulations specify certain technologies for certain purposes, but also call for continued site-specific decision-making for other purposes. *See, e.g.,* New CWA § 316(b) Regulations, 40 C.F.R. §§ 125.94(c) and (d). The requirements of the new regulations are discussed in more detail farther below.

5.3 Water Quality-Based Requirements

Water quality-based limits are required in NPDES permits when EPA and the State determine that effluent limits more stringent than technology-based limits are necessary to maintain or achieve state or federal water quality standards (WQS). *See* CWA § 301(b)(1)(C), 33 U.S.C. § 1311(b)(1)(C); 40 C.F.R. § 122.44(d). State WQS consist of three parts: (a) designated uses for a water body or a segment of a water body; (b) numeric and/or narrative water quality criteria sufficient to protect the assigned designated use(s); and (c) antidegradation requirements to ensure that once a use is attained it will not be degraded. *See* 40 C.F.R. §§ 131.10 - 131.12. The New Hampshire Surface Water Quality Standards (NHWQS) include these elements.

The NHWQS are collectively spelled out in Chapter 485-A of the New Hampshire statutes,

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[1] EPA cannot be entirely certain about when the updated Steam Electric ELGs will be finalized and what their provisions will be. This uncertainty is unavoidable because the terms of the final regulations may be changed from those of the proposed regulations after EPA completes its analysis, considers public comments and engages in intra-governmental review, such as with the White House Office of Management and Budget. Furthermore, in this case, the Proposed Steam Electric ELG Rule identified a variety of regulatory options that EPA was considering and the Final Rule could select any of these options, or an entirely different option. In addition, we cannot be certain of when the new ELGs will take effect. EPA presently expects to sign a new Final Rule by September 30, 2015, but such targets have had to be pushed back in the past for various reasons. Once signed, there will be some period of time before the regulations are published and then take effect. This length of this lag in effective date can vary from one set of regulations to another. Moreover, there is also always the possibility that litigation over a Final Rule could delay the new rule taking effect. If the Final Rule is in effect at the time that a new Final Permit is issued to Schiller Station, EPA will apply the Final Rule to the extent appropriate.

which governs water quality and the control of water pollution, and in Chapter Env-Wq 1700 of the State's regulations (namely, the "Surface Water Quality Regulations"). The NHWQS include requirements for the regulation and control of toxic constituents and require that EPA criteria, established pursuant to Section 304(a) of the CWA, shall be used unless a site-specific criterion is established.

The State's statutory and regulatory provisions do not specify *numeric* temperature criteria for the State's waters, but do specify *narrative* criteria for heat that are to be applied on a case-by-case basis in order to protect the existing and designated uses of each water body and restore and maintain the chemical, biological and physical integrity of the State's waters. Moreover, specific thermal discharge limits may be needed to ensure compliance with a number of biologically-oriented requirements of the NHWQS.

Chapter 485-A of New Hampshire's statutes governs water quality and the control of water pollution. N.H. Rev. Stat. Ann. § 485-A:1 states (in pertinent part) that:

> [t]he purpose of this chapter is . . . to prevent pollution in the surface and groundwaters of the State and to prevent nuisances and potential health hazards. In exercising any and all powers conferred upon the department of environmental services under this chapter, the department shall be governed solely by criteria relevant to the declaration of purpose set forth in this section.

Classification of the State's water bodies is addressed by N.H. Rev. Stat. Ann. § 485-A:8. The introductory language to this provision states that:

> [i]t shall be the overall goal that all surface waters attain and maintain specified standards of water quality to achieve the purposes of the legislative classification.

In addition, N.H. Code R. Env-Wq 1701.01 of New Hampshire's regulations provides that:

> [t]he purpose of these rules is to establish water quality standards for the State's surface water uses as set forth in RSA 485-A:8, I, II, III and V. These standards are intended to protect public health and welfare, enhance the quality of water and serve the purposes of the Clean Water Act and RSA 485-A. These standards provide for the protection and propagation of fish, shellfish, and wildlife, and provide for such uses as recreational activities in and on the surface waters, public water supplies, agricultural and industrial uses, and navigation in accord with RSA 485-A:8, I and II.

The purposes of the CWA, of course, similarly include restoring and maintaining the biological, chemical, and physical integrity of the Nation's waters, and, wherever attainable, ensuring water quality adequate for the protection and propagation of fish, shellfish, and wildlife, and for recreation, in and on such waters. *See* 33 U.S.C. §§ 1251(a) (introductory language) & (a)(2). Consistent with the stated goals and purposes of New Hampshire's water quality requirements, the NHWQS specify the uses of the state's water bodies that must be protected, and the numeric and narrative water quality criteria that must be satisfied, by any NPDES permit. *See* 33 U.S.C. §§ 1311(b)(1)(C), 1401(a)(1) & (d). These uses and criteria address a variety of issues, including the protection of aquatic organisms.

Thus, the NHWQS regulations mandate that "[a]ll surface waters shall provide, wherever attainable, for the protection and propagation of fish, shellfish and wildlife, and for recreation in and on the surface waters." N.H. Code R. Env-Wq 1703.01(c). *See also* 33 U.S.C. § 1251(a)(2). The regulations also dictate that:

> [a]ll surface waters shall be restored to meet the water quality criteria for their designated classification including existing and designated uses, and to maintain the chemical, physical, and biological integrity of surface waters.

N.H. Code R. Env-Wq 1703.01(b). "Biological integrity" is defined to mean:

> . . . the ability of an aquatic ecosystem to support and maintain a balanced, integrated, adaptive community of organisms having a species composition, diversity, and functional organization comparable to that of similar natural habitats of a region.

Id. 1702.7. In addition, the NHWQS regulations specify a water quality criterion for "Biological and Aquatic Community Integrity" that provides as follows:

> (a) The surface waters shall support and maintain a balanced, integrated, and adaptive community of organisms having a species composition, diversity, and functional organization comparable to that of similar natural habitats of a region.
>
> (b) Differences from naturally occurring conditions shall be limited to non-detrimental differences in community structure and function.

Id. 1703.19(a) & (b). *See also id.* 1703.04 (criteria in N.H. Code R. Env-Wq 1703.05 through 1703.32 apply to all of the state's surface waters).

Schiller Station discharges to the Piscataqua River, which is classified as a Class B water body under the NHWQS (N.H. Code of Administrative Rules, Env-Wq 1703.01; N.H. RSA 485-A:8(II)). The state requires that Class B waters be "acceptable for fishing, swimming and other recreational purposes and, after adequate treatment, for use as water supplies" (RSA 485-A:8, II). For Class B waters, the state statute also dictates that:

> [t]here shall be no disposal of sewage or waste into said waters . . . [where] such disposal of sewage or waste [would] be inimical to aquatic life or to the maintenance of aquatic life in said receiving waters.

N.H. Rev. Stat. Ann. § 485-A:8(II).[2] Thus, in sum, pollutant discharges to a Class B water body,

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[2] Under this provision, thermal effluent (*i.e.*, wastewater containing waste heat) constitutes a "waste." *See* N.H. Rev. Stat. Ann. § 485-A:2(VI) & (XVI); N.H. Code R. Env-Wq 1702.25 & 1702.51. In addition, *The American Heritage Dictionary* (2d College Ed.) (1982), defines "inimical" to mean, in pertinent part, "injurious or harmful in effect; adverse . . . ." *See also Merriam-Webster's Online Dictionary* (defining "inimical" as "1: being adverse often by reason of malevolence or hostility . . . 2 a: having the disposition of an enemy . . . 2 b: reflecting or indicating hostility . . . .), available at http://www.merriam-webster.com/dictionary/inimical (as of Jun. 29, 2009).

such as the Piscataqua River, may not harm aquatic life (*i.e.*, “be inimical to” or contribute to “detrimental differences” from naturally occurring conditions) or undermine a water body’s ability to support and maintain what would otherwise be the natural, balanced community of aquatic life in that water body.

In addition to these biologically-focused requirements, the NHWQS also address thermal discharges specifically. The state statute (N.H. Rev. Stat. Ann. § 485-A:8(II)) mandates, in pertinent part, that:

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

In other words, Schiller Station’s thermal discharges must not result in in-stream temperatures that “appreciably interfere” with fishing or other specified uses of the river. Furthermore, the State statute (N.H. Rev. Stat. Ann. § 485-A:8(VIII)) also provides that:

> [i]n prescribing minimum treatment provisions for thermal wastes discharged to interstate waters, the department shall adhere to the water quality requirements and recommendations of the New Hampshire Fish and Game Department, the New England Interstate Water Pollution Control Commission, or the United States Environmental Protection Agency, whichever requirements and recommendations provide the most effective level of thermal pollution control.

Given that Schiller Station discharges to an interstate water – namely, the Piscataqua River – this provision requires the NHDES to prescribe treatment requirements for thermal discharges that, at a minimum, adhere to the most effective of the water quality requirements and recommendations for thermal pollution control offered by EPA, NHFGD, and the New England Interstate Water Pollution Control Commission (“NEIWPCC”).[3] The NHWQS regulations incorporate these statutory requirements as water quality criteria for ambient temperature, dictating that “[t]emperature in class B waters shall be in accordance with N.H. Rev. Stat. Ann. § 485-A:8, II, and VIII” (N.H. Code R. Env-Wq 1703.13(b)).

From the State water quality requirements discussed above, EPA distilled the following criteria to guide its determination of water quality-based permit limits:

> (a) thermal discharges may not be “inimical to aquatic life”;
> (b) thermal discharges must provide, wherever attainable for the protection and propagation of fish, shellfish, and wildlife, and for recreation, in and on the receiving water;
> (c) thermal discharges may not contribute to the failure of an aquatic ecosystem to support and maintain a balanced, integrated, adaptive community of organisms having a

[3] (NEIWPCC does not presently review and make recommendations for thermal discharge limits to be included in individual NPDES permits and, thus, is not relevant here.)

> species composition, diversity, and functional organization comparable to, and with only non-detrimental differences in community structure and function from, that of similar natural habitats in the region; and
> (d) [a]ny stream temperature increase associated with thermal discharge must not appreciably interfere with fishing, swimming and other recreational purposes.

EPA has worked to determine thermal discharge limits that would be necessary to satisfy the NHWQS not only because of its obligations under CWA §§ 301(b)(1)(C) and 1341(a) and (d), but also in light of the above-discussed requirement in N.H. Rev. Stat. Ann. § 485-A:8(II) that NHDES must prescribe limits consistent with the water quality requirements and recommendations of EPA or NHFGD that yield the most effective thermal pollution control measures. In light of the latter requirement, EPA has coordinated with NHFGD and NHDES in considering water quality-based requirements and recommendations for thermal pollution control.

The State's water quality requirements also include requirements for the regulation and control of toxic constituents and require that EPA criteria, established pursuant to Section 304(a) of the CWA, shall be used unless a site-specific criterion is established. NPDES permit limits must be set to assure that these State WQS requirements will be satisfied in the waters receiving the permitted discharge. 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 (maximum daily limit), while chronic aquatic-life criteria are considered applicable to monthly time periods (average monthly limit). Chemical-specific limits may be set under 40 C.F.R. § 122.44(d)(1) and are implemented under 40 C.F.R. § 122.45(d).

A facility's design flow is used when deriving constituent limits for daily, monthly or weekly time periods, as appropriate. Also, the dilution provided by the receiving water is factored into this process where appropriate. Narrative criteria from the State's water quality standards may apply to require limits on the 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) the toxicity cannot be traced to a specific pollutant.

Water quality-based effluent limitations are established based on a calculated dilution factor derived from the available dilution in the particular receiving water at the point of discharge. New Hampshire SWQR require that the available effluent dilution be calculated based upon the receiving water lowest observed mean river flow for seven consecutive days, recorded over a 10-year recurrence interval, or 7-day, 10-year low flow (7Q10). Env-Wq 1705.02(d). For tidal waters, New Hampshire SWQR require that the low flow condition shall be equivalent to the conditions that result in a dilution that is exceeded 99% of the time. Env-Wq 1505.02(c). Use of the low flow allows for the calculation of the available dilution under critical flow (worst-case) conditions which, in turn, can be used in the derivation of conservative water quality-based effluent limitations.

As stated above, NPDES permits must contain effluent limits more stringent than technology-based limits when necessary to maintain or achieve State WQS. The permit 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 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 exceeds the applicable criterion or a narrative criterion or designated use is not satisfied. In determining reasonable potential, EPA considers a number of factors, including (a) existing controls on point and non-point sources of pollution; (b) pollutant concentration and variability in the effluent and receiving water as determined from the permit application, monthly DMRs, and State and Federal Water Quality Reports; (c) sensitivity of the species to toxicity testing; (d) known water quality impacts of processes on wastewater; and, where appropriate, (e) dilution of the effluent in the receiving water.

NHWQS also allow for "mixing zones." A mixing zone is an area in which a discharge may be allowed to cause exceedances of water quality standards, assuming a variety of specific criteria are satisfied, including that standards must be attained at the edge of the mixing zone. *See* Env-Wq 1702.27 and 1707.02).

Finally, the NHWQS also apply to NPDES permit requirements for CWISs that withdraw cooling water from the State's waters. This is discussed in greater detail below.

5.4 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") must, in general, satisfy both technology-based standards (specifically, the BAT standard) and any more stringent water quality-based requirements that may apply. As stated above, technology-based limits for thermal discharges must be developed on a BPJ basis. New Hampshire's water quality requirements pertaining to the control of thermal discharges are discussed above.

Beyond technology-based and water quality-based requirements, CWA § 316(a), 33 U.S.C. § 1326(a), authorizes the permitting authority to grant a variance under which 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.

To qualify for a variance under CWA § 316(a), a permit applicant must demonstrate to the permitting agency's satisfaction that thermal discharge limits based on technology and water quality standards would be more stringent than necessary to assure the protection and propagation of a balanced, indigenous population (BIP) of shellfish, fish and wildlife in and on the body of water into which the discharge is made. *See* 33 U.S.C. § 1326(a); 40 C.F.R. §§ 125.70, 125.73(a). The applicant must also show that its requested alternative thermal discharge limits will assure the protection and propagation of the BIP, considering the cumulative impact of its thermal discharge together with all other significant impacts on the species affected. 40 C.F.R. § 125.73(a). *See also* 33 U.S.C. § 1326(a); 40 C.F.R. §§ 125.73(c)(1)(i). If satisfied that the applicant has made such a demonstration, then the permitting authority may impose thermal discharge limits that, taking into account the interaction of the thermal discharge with other pollutants, will assure the protection and propagation of the BIP. *See* 33 U.S.C. § 1326(a); 40 C.F.R. §§ 125.70, 125.73(a) and (c)(1)(i).

While a new facility obviously must make a *prospective* demonstration that its desired future thermal discharges will assure the protection and propagation of the BIP, a facility with an existing thermal discharge can perform either a prospective or a retrospective demonstration in support of its request for a § 316(a) variance. If already operating under a CWA § 316(a) variance, "existing dischargers may base their demonstration upon the absence of prior appreciable harm in lieu of predictive studies." 40 C.F.R. § 125.73 (c)(1). Alternatively, even if there has been prior appreciable harm, the applicant may try to show that there will be no such harm going forward. 40 C.F.R. § 125.73 (c)(1)(ii).

As stated above, if the demonstration is satisfactory to the permitting authority, then it may issue a permit with alternative, variance-based thermal discharge limits. If the demonstration fails to support the requested variance-based thermal discharge limits, however, then the permitting authority shall deny the variance request. In that case, the permitting authority shall either impose limits based on the otherwise applicable technology-based and water quality-based requirements or, in its discretion, impose different variance-based thermal discharge limits that are justified by the permit record (*i.e.,* limits that satisfy the standards of CWA § 316(a)). *See In re Dominion Energy Brayton Point, LLC (Formerly USGen New England, Inc.) Brayton Point Station*, 12 E.A.D. 490, 500 n. 13, 534 n. 68, 552 n. 97 (EAB 2006). *See also* Section 6.5 below for further discussion of this matter.

In addition, it should be mentioned here that "mixing zones" may be used to set thermal discharge requirements pursuant to section § 316(a) of the Act. *See* EPA Decision of the General Counsel, In re Sierra Pacific Power Company, EPA GCO 31 (October 13, 1975). Although a "mixing zone" is a permitting concept or tool generally used in applying State water quality standards, *see* Section 5.3 above, the legislative history of CWA § 316(a) indicates that Congress felt mixing zones could also be used in designing permit limits based on a CWA § 316(a) variance from applicable technology standards. *Id*. This makes common sense in that limits could be designed in a particular case that allow a discharge to cause ambient temperatures or water quality criteria to be exceeded by a certain amount within a certain area on the grounds that the protection and propagation of the relevant BIP would nevertheless be assured. *See* 39 Fed. Reg. 36178 (October 8, 1974) (Preamble to EPA's earlier § 316(a) related regulations).

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

Schiller Station withdraws water from the Piscataqua River through two cooling water intake structures (CWISs). The Facility uses this water for cooling water in its process for producing electricity. Schiller Station's water withdrawals through its CWISs are subject to the requirements of CWA § 316(b). 33 U.S.C. § 1326(b). As discussed previously, CWA § 316(b) mandates that any standard set for a point source under CWA §§ 301 or 306 must "require that the location, design, construction, and capacity of cooling water intake structures reflect the best technology available for minimizing adverse environmental impact." This is referred to as the Best Technology Available (BTA) standard. The BTA standard is discussed in more detail in Section 7 below.

5.6 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 antibacksliding requirements of the CWA. *See* 33 U.S.C. § 1342(o); 40 C.F.R. § 122.44(l). These requirements prohibit new permit conditions from relaxing the requirements of earlier permit conditions, unless certain specified exceptions apply. Therefore, when developing new permit limits, EPA must determine whether the new limits under consideration would be less stringent than the corresponding limits in the prior permit and, if so, whether an exception to the antibacksliding requirements applies.

5.7 Antidegradation

Federal regulations related to state water quality standards, *see* 40 C.F.R. § 131.12, require states to develop and adopt a statewide antidegradation policy which maintains and protects existing instream water uses and the level of water quality necessary to protect them, and which generally maintains the quality of waters that have a quality exceeding the level necessary to support the propagation of fish, shellfish, and wildlife, and to support recreation in and on the water. The New Hampshire Antidegradation Regulations are found at Env-Wq 1708.

5.8 State Certification

Under Section 401(a)(1) of the CWA, 33 U.S.C. § 1341(a)(1), EPA is required to obtain certification from the state in which the discharge is located that the provisions of the new permit will comply with all state water quality standards and other applicable requirements of state law, in accordance with Section 301(b)(1)(C) of the CWA. 33 U.S.C. § 1311(b)(1)(C). *See also* 33 U.S.C. § 1341(d); 40 C.F.R. § 124.53. EPA permits are to include any conditions required in the state's certification as being necessary to ensure compliance with state water quality standards or other applicable requirements of state law. *See* 33 U.S.C. § 1341(d); 40 C.F.R. § 124.55(a)(2). Regulations governing state certification are set out at 40 C.F.R. §§ 124.53 and 124.55. EPA regulations pertaining to permit limits based upon water quality standards and state requirements are contained in 40 C.F.R. § 122.44(d).

6. Explanation of the Permit's Effluent Limitation(s)

6.1 Facility Information

Schiller Station is located on the southwestern bank of the Piscataqua River in Portsmouth, New Hampshire. *See* Attachment A for a map showing the geographical location of the facility and outfalls. The Station is a four-unit, 163 megawatt (MW) steam electric generating facility. The three main generators are designated as 4, 5, and 6; each rated at 48 MW. Units 4 and 6 are equipped with dual fuel boilers capable of firing both pulverized bituminous coal and #6 fuel oil. Unit 5 was converted in 2006 to a dual fuel fluidized bed boiler that is capable of burning both wood and coal, with wood being its primary fuel. The remaining unit, designated CT-1, is a 19-MW combustion turbine fired with #1 fuel oil that is typically operated during periods of highest seasonal peak demand.

The Facility withdraws water from the Piscataqua River via two separate CWISs located on the Piscataqua River to provide cooling water to Units 4, 5, and 6. The CWIS for Unit 4 draws water from an intake tunnel approximately 30 ft offshore from the north bulkhead (Screen House #1). The CWIS for Units 5 and 6 is located within the south bulkhead (Screen House #2). The two CWISs have a combined total maximum design intake flow of 150 million gallons per day (MGD).

Traveling water screens are automatically cleaned screening devices that are used to remove fish and/or floating or suspended debris from a channel of flowing water. In other words they are used to stop fish and other materials from being entrained by the CWIS (*i.e.*, drawn into the power plant through a CWIS along with the water being taken from the river for cooling). Of course, fish that are blocked by the screens are, by definition, impinged on the screens.

Schiller Station's traveling water screens consist of a continuous series of wire mesh panels bolted to frames and attached to two matched strands of roller chains. There is one traveling water screen for Unit 4 and four traveling water screens for Units 5 and 6. Each of the five traveling water screens is a REX (Chain Belt Company) screen. The fish and/or debris-laden mesh panels and shelves are lifted out of the flow and above the operating floor where a pressurized water spray is directed outward through the mesh to remove impinged fish and debris. The spray wash water and fish and/or debris are collected in a rectangular fish return trough which runs along the length of the CWIS and discharges all fish and debris into the Piscataqua River at an elevation of 4 ft above MSL.

River water is primarily used to cool the turbine exhaust steam in the condensers and provide cooling for the heat exchangers in the closed cooling service water systems. Both the condenser and the heat exchangers are non-contact systems. The cooling water bearing the Facility's waste heat is then discharged directly to the Piscataqua River via three outfalls (Outfalls 002, 003, 004).

All of Schiller Station's wastewater (excluding sanitary wastewater and non-contact cooling water) is collected in the Fireside Basin (FSB), which has a capacity of approximately 250,000 gallons and is divided into two equal sections connected by a partition and an overflow weir. The basin fills with wastewater which may contain any or all of the following: demineralized regeneration waste, effluent from the oil/water separator, ash handling runoffs and plant operation drains, dirty water sumps, boiler blowdowns, cooling water system drainage, and wood boiler drains. Wastewater treatment consists of the removal of oily residues and particulates and neutralization of wastewaters. The treated wastewater is discharged into the Piscataqua River through Outfalls 002, 003 and/or 004 along with the cooling water discharges from any operating unit or units.

A schematic drawing of the flow of water at the facility and the various discharges from the facility is presented in Attachment C.

6.2 Description of Permitted Outfalls

The table below lists and describes the facility's outfalls:

Table 6-A: Schiller Station's Outfall Locations

Outfall Number/Location	Description
001 - Weir discharge structure into Piscataqua River	Non-contact cooling water from one of the three operating unit intakes; small portion of roof and yard drains; rarely active
002 - Weir discharge structure into Piscataqua River	Non-contact cooling water discharges and occasional hotwell drains for Unit 4
003 - Weir discharge structure into Piscataqua River	Non-contact cooling water discharges and occasional hotwell drains for Unit 5
004 - Weir discharge structure into Piscataqua River	Non-contact cooling water discharges and occasional hotwell drains for Unit 6
006 - Discharges into Piscataqua River	Six pipes, two from each of the three units; used only for brief equipment overflows usually related to a unit upset; roof drains
011 – Discharges from tank farm into Piscataqua River	Combination of stormwater and heater condensate drains from the Schiller Station Tank Farm
013 - Internal outfall (discharges into 018)	Coal pile runoff basin; emergency overflow
015 - Weir discharge structure into Piscataqua River	Treated effluent from WWTP #1; only operated during essential maintenance of WWTP #2; rarely active
016 - Internal outfall (discharges into cooling water outfalls 002/003/004)	Treated effluent from WWTP #2
017- Internal outfall (discharges into cooling water outfalls 002/003/004)	Identical to 016; only active when metal cleaning wastes are being treated and discharged
018 - Discharges from tank farm into Piscataqua River	Stormwater runoff and heater condensate drips from Newington Station Tank Farm through valved oil/water separator; roof drains
020 - Intake screen spray wash	Initial screen wash to return marine life back to the river; serves Unit 4
021/022 - Intake screen spray wash	Initial screen wash to return marine life back to the river; serves Units 5 and 6 (combined into a single outfall referred to as Outfall 021, eliminating 022)
023 – Parking lot containing two chemical loading zones into the Piscataqua River	Occasional stormwater runoff from a parking lot used for chemical loading and/or unloading

Outfall 001

Effluent discharged from Outfall 001 consists predominantly of non-contact cooling water that is supplied from one of the three operating intakes. The piping for this outfall can also be valved to return the water to one of the operating cooling water systems (Outfall 002) if the facility encounters access issues to the Outfall 001 weir (e.g., winter conditions). The water cools miscellaneous plant equipment such as the influent to the oil/water separator and air compressors. A small portion of the station roof drains and a yard drain also tie into the discharge. While water may occasionally be treated with sodium hypochlorite, the concentrations are regulated by effluent limitations assigned to Units 4, 5, and 6. The maximum daily mass value reported for total residual chlorine (0.4 pounds) represents a maximum concentration of 0.2 mg/l for a two hour chlorination cycle. Ferrous sulfate is no longer used. The temperature rise is less than 5°F. Monitoring for all pollutants is performed at the discharge weir. When available, flow is calculated from a ruler measurement taken at the overflow of the weir outfall. PSNH requests that monitoring be reduced to quarterly oil and grease and flow sampling only.

Outfalls 002, 003, and 004

These outfalls represent the non-contact cooling water discharges and occasional hotwell drain discharges for Units 4, 5, and 6, respectively. Each unit is treated with sodium hypochlorite for a maximum of two hours each day of operation. The maximum daily mass value reported for total residual chlorine (6.0 pounds) represents a maximum concentration of 0.2 mg/l for a two-hour chlorination cycle. Inlet temperatures are measured at the legs feeding into the condenser and outlet temperatures are measured in the discharge legs or at the weir outfall. Flows are based upon pump run times. Ferrous sulfate is no longer used. PSNH has requested that the temperature limits be increased from 95°F/25°C to 100°F/30°C.

Outfall 006

This outfall actually consists of six pipes, two from each of the three units. With the exception of roof drains, the outfall is only used on the rare occasion when there is a brief equipment overflow, usually related to a unit upset. The effluent consists of boiler condensate that can be released from events such as steam blowdowns or a deaerator overflow during a unit startup or a boiler trip. Occasionally the outfall must be activated to perform essential maintenance to blowdown tanks or piping that transfer the water to waste treatment. Except for stormwater, the pipes will typically discharge only a few days per year for less than one hour per event. When the outfall is activated, the pH of the boiler condensate is reported and flow is estimated. PSNH requests no changes to the existing monitoring requirements and permit conditions.

Outfall 011

Effluent consists of a combination of stormwater and heater condensate drains from the Schiller Station Tank Farm. The Schiller Tank Farm consist of two tanks designated as SR #2 and SR #3. SR #2 has a capacity of 80,000 barrels (bbls) and SR #3 has a capacity of 125,000 bbls. Both contain #6 oil only. The #6 oil arrives by ship or barge and can be pumped directly into the Schiller tanks or can be pumped to the Newington tanks and then transferred to the

Schiller tanks. Samples for Outfall 011 can be collected from the end of one of three different pipes that discharge stormwater from the tank farm. Rainfall pH is also recorded to compare to effluent readings. Based upon historical compliance, PSNH requests the monitoring frequency be reduced to quarterly and the pH sampling be reduced to a single grab from any of the three pipes. Flows are estimated based upon drainage area, rainfall and steam used. Given the size of the drainage area, PSNH requests the flow limits be increased from 115,000/230,000 gpd to 300,000/600,000 gpd to accommodate a 10-year, 24-hour storm event of 4.6 inches.

Internal Outfall 013

Outfall 013 discharges emergency overflow (e.g., 10-year, 24-hour storm) from the coal pile runoff basin into Outfall 018. Schiller's normal non-emergency coal pile runoff can be transferred from the collection basin to either the fireside basin or directly to the wastewater treatment facility. This discharge was not regulated in the 1990 permit but flow was estimated and reported, when in use.

Outfall 015

Outfall 015 is treated effluent from WWTP #1 which is only operated during essential maintenance of WWTP #2. Samples are collected at the discharge from the neutralization tank. The outfall has not been necessary for the last several years. PSNH requests no changes to the existing monitoring requirements and permit conditions.

Internal Outfall 016

Outfall 016 is the WWTP #2 discharge during routine operations. It includes mostly all station wastewater which consists principally of demineralizer regenerations, boiler blowdown, coal pile runoff and equipment and floor drains. The treated effluent is pumped to any one of the three operating units and mixed and discharged with the non-contact cooling water (Outfalls 002, 003, or 004). Samples are collected weekly at the discharge from the neutralization tank while flow and pH are recorded continuously. Flow, total suspended solids, oil and grease, copper, iron, and pH are monitored and reported. Based on the historical compliance record, PSNH requests the monitoring frequency for oil and grease, total suspended solids, iron and copper for Outfall 016 be reduced to monthly.

Internal Outfall 017

Outfall 017 is identical to 016. It is only active, however, when boiler chemical cleaning wastes (water side metal cleanings) are being treated and discharged. This happens approximately once every 10 years for each boiler. Under worst case conditions, each boiler will be chemically cleaned once during the 5-year life of the NPDES permit. The same parameters are monitored as for Outfall 016, only on a daily basis. Only one discharge was recorded since 1990 due to the infrequency of chemical cleanings and the ability to evaporate the wastewater in the boilers.

Outfall 018

Effluent consists partially of stormwater and heater condensate drips from the Newington Tank

Farm that drain through a valved oil/water separator. The remainder of the discharge is stormwater runoff from the Schiller Station wood storage yard and other yard drainage areas. The Newington Tank Farm consists of two tanks designated as NT #1 and NT #2. Both NT #1 and NT #2 have a capacity of 278,800 bbls. Both contain #6 oil only. The #6 oil arrives by ship or barge and is pumped directly into the Newington tanks. Outfall 018 effluent samples are collected at the final catch basin before piping drops below ground. Roof drains from the Unit 5 wood boiler and WWTP #2 are piped in downstream from the monitoring location. Flows are estimated based upon the time of discharge from the oil/water separator, drainage area, rainfall and steam used. Rainfall pH is also recorded to compare to effluent readings. Based upon historical compliance, PSNH requests that the monitoring frequency be reduced to quarterly and the pH sampling be reduced to a single grab.

Outfalls 020, 021/022

These outfalls represent river water that is used to backwash the rotating screens in the cooling water intake structures (CWIS). The screens remove river debris and require regular cleaning to ensure unrestricted water passage. This is accomplished by spraying water through the screens and sluicing the leaves, branches, etc. back into the river. The regularity of washing is dependent upon river conditions. Worst case, the wash could occur six hours in a day with a pump rated at 300 gpm. Outfall 020 serves Unit 4, 021 serves Unit 5 and 022 discharges from Unit 6. Since Outfalls 021 and 022 actually discharge from the same location, PSNH requests they be combined into a single outfall. Flows are estimated based upon pump run times.

There are a few other inconsequential discharges associated with the operation of the CWIS. The discharges are relatively minor and present little or no additional loading to the river. Most of the water is discharged down into the screen wells and pumped back into the station condensers. The flows have never been quantified and no samples have been collected. PSNH requests the activities be cited in the permit to allow the operations to continue. This summary of the discharges is provided:

- Floor Sump in #2 CWIS: Includes routine water leakage from pump seals, river water, etc.
- Stormwater: Both CWIS discharge roof drains and the #2 Screenhouse receives a considerable amount of rainwater via a pipe trench that enters the building.
- Screenwell/Inlet Tunnel Drain: On rare occasions the screenwells and tunnels are dewatered to permit routine inspection and maintenance. This activity requires the inlet water to be drained and eventually pumped back into the river.
- Steam Drips: In cold weather station steam is used to heat the screenhouses and is sprayed on the screens to prevent them from freezing.
- Fire Pumps: Located in #2 CWIS, these pumps must be tested annually for approximately one hour and water is sprayed directly into the river. Each pump is rated at 3,000 gpm.

Outfalls 023

This is a new outfall consisting of occasional stormwater runoff from a parking lot used for chemical loading and/or unloading. Although this is a stormwater related discharge, PSNH requested that this outfall be regulated in the draft permit.

Refer to Attachment B for a quantitative summary of the discharge from outfalls 001 through 022 for the period November 1990 through April 2014.

6.3 Derivation of Effluent Limits under the CWA and/or State of New Hampshire Water Quality Standards

6.3.1 Outfall 001

PCB's

40 CFR § 423.12(b)(2) prohibits the discharge of polychlorinated biphenyl (PCB) compounds. Therefore, the draft permit prohibits discharges of PCBs.

Total Residual Oxidants

The National Effluent Limitation Guidelines for the Steam Electric Power Generating Point Source Category ("Steam Electric ELGs"), *see* 40 C.F.R. Part 423, state that for any plant with a total rated electric generating capacity of 25 or more megawatts ("MW"), the quantity of total residual oxidants (TRO) discharged in once-through cooling water from each discharge point may not exceed the quantity determined by multiplying the flow of once-through cooling water from each discharge point by a concentration of 0.2 mg/l (maximum) (*see* 40 C.F.R. § 423.13(b)(1)). This limit is expressed in the draft permit in terms of concentration (0.2 mg/l), pursuant to 40 C.F.R. § 423.13(g), and satisfies antibacksliding requirements in 40 CFR § 122.44(l).

40 C.F.R. § 423.13(b)(2) prohibits the discharge of TRO from any single generating unit for more than two hours per day unless the discharger demonstrates to the permitting authority that more than two hours of discharge is required for macroinvertebrate control. Simultaneous multi-unit chlorination is permitted.

Under the Steam Electric ELGs, the term "maximum concentration" means a limitation not to be exceeded at any time (*i.e.*, "instantaneous maximum"). The TRO limitations in the guidelines are specified as "maximum concentration" limits and not as "daily maximum" limits. After promulgation of the Steam Electric ELGs in 1982, *see* 40 C.F.R. Part 423, EPA was asked to clarify the correct interpretation of the term "maximum concentration". EPA studied this issue and, in 1992, issued guidance in the form of a memorandum to all the Regional Water Management Division Directors. The 1992 guidance explains that the term "maximum concentration", as it applies to TRO, is intended to mean "instantaneous maximum".

Furthermore, for the draft permit, chlorine may be used as a biocide. No other biocide shall be used without written approval from the Regional Administrator and the Director.

Ferrous Sulfate

Ferrous sulfate is no longer used in this waste stream. Hence, monitoring for ferrous sulfate at this outfall has been removed and its discharge is prohibited.

Flow

In the 1990 permit, the flow limit at this outfall was 40 MGD. This limit is carried forward in the draft permit. Based upon infrequent use of this outfall and the request of PSNH, monitoring is only required once per quarter, as specified in the draft permit.

Oil & Grease

This outfall discharges a co-mingled wastewater including non-contact cooling water for miscellaneous plant equipment such as the influent to the oil/water separator and air compressors, as well as occasional stormwater from roof and yard drains. In the 1990 permit, this waste stream was regulated for Oil & Grease (O&G) based on low volume waste requirements found at 40 C.F.R. § 423.12(b)(3). In the current draft permit, based on antibacksliding requirements found at 40 CFR § 122.44(l), O&G limits will remain the same. These limits are shown in the table below.

Pollutant	Maximum For Any 1 Day (mg/L)	Average of Daily Values For 30 Consecutive Days Shall Not Exceed (mg/L)
O&G	20.0	15.0

Temperature

The permit limits on thermal discharges from this and other outfalls are discussed below in Section 6.4 of this Fact Sheet.

6.3.2 Outfalls 002, 003 and 004

PCB's

As stated above, 40 C.F.R. § 423.12(b)(2) prohibits the discharge of polychlorinated biphenyl (PCB) compounds. Therefore, the draft permit prohibits the discharge of PCBs.

Total Residual Oxidants

The Steam Electric ELGs state that for any plant with a total rated electric generating capacity of 25 MW or more, the quantity of TRO discharged in once through cooling water from each discharge point shall not exceed the amount determined by multiplying the flow of once-through cooling water from each discharge point by a concentration of 0.2 mg/l (maximum). This limit is expressed in the draft permit in terms of concentration, pursuant to 40 C.F.R. § 423.13(g), and satisfies antibacksliding requirements found in 40 CFR §122.44(l).

In addition, 40 C.F.R. § 423.13(b)(2) prohibits the discharge of TRO from any single generating unit for more than two hours per day unless the discharger demonstrates to the permitting authority that discharge for more than two hours is required for macroinvertebrate control. Simultaneous multi-unit chlorination is permitted.

As stated above, TRO limits in the Steam Electric ELGs are specified as "maximum concentration" limits (not "daily maximum" limits). As also explained above, under the Steam Electric ELGs, the term "maximum concentration" means a limitation not to be exceeded at any time (*i.e.*, "instantaneous maximum").

Furthermore, for the draft permit, chlorine may be used as a biocide. No other biocide shall be used without written approval from the Regional Administrator and the Director.

Ferrous Sulfate

Ferrous sulfate is no longer used in this waste stream. Hence, monitoring for ferrous sulfate at this outfall has been removed and its discharge is prohibited.

Flow

In the 1990 permit, flow limits for Outfalls 002, 003 and 004 were as follows:

Outfall	Flow limits (MGD)	
	Monthly Average	Daily Max
002	43.5	52.2
003	50.2	50.2
004	50.2	50.2

These flow limits have been carried forward in the draft permit.

Temperature

The permit limits on thermal discharges from this and other outfalls are discussed below in Section 6.4 of this Fact Sheet.

6.3.3 Outfall 006

Flow

As in the 1990 permit, the permittee is required to report daily maximum flow from this outfall each month.

Total Suspended Solids and Oil & Grease

This outfall discharges effluent from roof drains and brief equipment overflows, usually related to a unit upset. More specifically, the effluent consists of boiler condensate that can be released from events such as steam blowdowns or de-aerator overflow during a unit startup or a boiler trip. Occasionally the outfall must be activated to perform essential maintenance on blowdown tanks or piping that transfers water to waste treatment. EPA has determined that this discharge contains "low volume waste" (boiler blowdown), as defined in 40 CFR § 423.11(b). Hence, Oil and Grease (O&G) and Total Suspended Solids (TSS) limits are being established in the draft permit based on the limits set in the Steam Electric ELGs for low volume wastes ((*see* 40 C.F.R. § Part 423.12(b)(3)). These limits from the Steam Electric ELGs are based on "the best practicable control technology currently available" ("BPT") standard; and benchmark values for stormwater (*see* 65 Fed. Reg. 64767).

The ELGs specified in 40 C.F.R. § 423.12(b)(3) limit the maximum and average concentration of TSS and O&G discharged in low volume waste as shown below. The quantity of pollutant (mass limit) is determined by multiplying the flow of the low volume waste source by the concentration listed in the table. The limits in the draft permit are expressed as concentration-based limits pursuant to Section 423.12(b)(11). Effluent subject to these limits must be monitored prior to mixing with effluent from any other outfall.

Pollutant	**Maximum For Any 1 Day (mg/L)**	**Average of Daily Values For 30 Consecutive Days Shall Not Exceed (mg/L)**
TSS	100.0	30.0
O&G	20.0	15.0

pH

The limit for pH is based upon State Certification Requirements and RSA 485-A:8, which states that "The pH range for said (Class B) waters shall be 6.5 to 8.0 except when due to natural causes." These water quality-based limits are more stringent than the limits of 6.0 to 9.0 standard units ("S.U.") provided in the Steam Electric ELGs (*see* 40 C.F.R. § 423.12(b)(1)).

The draft permit includes a provision allowing a relaxation of the pH limits if the permittee performs an in-stream dilution study that demonstrates that the in-stream standards for pH would be protected. If the State approves results from a pH demonstration study, this permit's pH limit range may be relaxed. The notification of the relaxation must be made by certified letter to the permittee from EPA-New England. The pH limit range cannot be less restrictive than 6.0 - 9.0 S.U., however, which are the limitations in the Steam Electric ELGs.

Historic discharges from this outfall, although rare, have not consistently been in compliance with the upper pH limit of 8.0 S.U. Since the 1990 permit issuance, there have been 18 exceedances out of 23 pH measurements. PSNH must take necessary action to prevent future discharges from Outfall 006 exceeding the pH limits. One option may be to route this wastewater to the on-site WWTP for pH neutralization prior to discharge. Subsequent discharge would then be monitored through Outfall 016.

Nitrogen

Great Bay and many of the rivers that feed it are approaching, or have reached, their assimilative capacity for nitrogen and are suffering from the adverse water quality impacts of nutrient overenrichment. The impacts of excessive nutrients are evident throughout the Great Bay Estuary, including the Piscataqua River. A portion of Schiller Station's discharge is transported upstream on the incoming tide into the nitrogen-impaired waters of the Lower Piscataqua and Upper Piscataqua River, Little Bay, and even into Great Bay proper. Therefore, the assessment of the impact of the Facility's discharge on water quality includes all of these waters.

Section 303(d) of the Clean Water Act (CWA) requires states to identify those waterbodies that are not expected to meet surface water quality standards after implementation of technology-based controls. As a result of the documented water quality impairments, portions of the Great Bay Estuary, including its tributaries, have been included on the State of New Hampshire's Section 303(d) list. As mentioned previously, New Hampshire's 2012 Section 303(d) list includes the Lower Piscataqua River - South (Assessment Unit ID: NHEST600031001-02-02). This assessment unit is listed as not supporting aquatic life as a result of estuarine bioassessments. These regulatory findings are consistent with a growing body of technical and scientific literature pointing toward an estuary in environmental decline as a result of nutrient overloading.

Given the nutrient overenrichment throughout the Great Bay estuary, it is clear that significant point source and non-point source reductions are necessary in order to achieve water quality standards. Section 301 of the CWA and its implementation regulations obligate EPA to establish water quality based effluent limits for outfalls that may cause or contribute to a violation of water quality standards. EPA and NHDES's shared preference is to address all sources of nutrient pollution to the Great Bay estuary—both point source loading and the far greater component of non-point source loading—in a coordinated and comprehensive fashion, to the extent possible.

The September 2010 permit reapplication submitted by PSNH indicated that various outfalls contained low concentrations of nitrogen in various species. For example, the discharge sampled from Outfall 006 contained 0.9 mg/l of ammonia nitrogen, Outfall 011 contained 0.33 mg/l of nitrate/nitrite nitrogen, Outfall 016 contained 0.32 mg/l nitrate/nitrite nitrogen and 1.2 mg/l total organic nitrogen and Outfall 018 contained 0.32 mg/l of nitrate/nitrite nitrogen. In this case, EPA has determined that the Best Management Practices (BMPs) required in the Stormwater Pollution Prevention Plan (SWPPP) included in the draft permit are expected to reduce total nitrogen levels to a degree necessary to ensure that Schiller Station does not cause or contribute to a water quality standard violation. In developing these BMPs specifically for this permit, EPA has been informed by the BMPs designed to reduce nitrogen in stormwater discharges found in the 2015 draft New Hampshire small MS4 permit. Additionally, a quarterly monitoring requirement for total nitrogen has been established for this outfall in the draft permit in order to track the effectiveness of the BMPs.

6.3.4 Outfall 011

Flow

In the 1990 permit, the flow limits at this outfall were 115,000 gpd (monthly average) and 230,000 gpd (daily max). Based on the size of the drainage area contributing to this outfall, PSNH requests the flow limits be increased to 300,000/600,000 gpd to accommodate a 10-year, 24-hour storm event of 4.6 inches.

EPA calculated an average discharge flow of 360,000 gpd based on an estimated drainage area of 125,000 square feet and a 4.6 inch rain event. Based upon this calculation, EPA agrees that the flow increase is justified. It was also determined that the increase in flow would neither affect the designated uses of the river nor violate the State's anti-degradation policy. Flow in the Piscataqua River is dominated by tidal exchange. The tidal prism of the Piscataqua River Estuary has been estimated to total approximately 25,000 MGD (see Newington Power Facility NPDES Permit Application, July 1998, p 5-5). A discharge flow of 600,000 gpd represents a fraction (0.0024 %) of the tidal prism volume. Based upon this, EPA has granted the flow increase, as reflected in the draft permit.

Total Suspended Solids and Oil & Grease

This outfall consists of co-mingled discharge of heater condensate drains from the Schiller Station Tank Farm as well as occasional stormwater runoff. Based upon the 1990 permit, this waste stream was regulated for Oil & Grease (O&G). In the draft permit, Total Suspended Solids (TSS) limits are being established based on the BPT limits for low volume waste source(s) established in the Steam Electric ELGs (*see* 40 CFR § 423.12(b)(3)); and benchmark values for stormwater (*see* 65 Fed. Reg. 64767).

The Steam Electric ELGs (*see Section* 423.12(b)(3)) limit the maximum and average concentration of TSS and O&G discharged from low volume waste source(s) as shown below. The quantity of pollutant (mass limit) is determined by multiplying the flow of low volume waste sources times the concentration listed in the table. The limits in the 1990 permit and draft permit are expressed as concentration-based limits pursuant to Section 423.12(b)(11). The permit reflects these limits which must be measured prior to mixing with any other outfall.

Pollutant	Maximum For Any 1 Day (mg/L)	Average of Daily Values For 30 Consecutive Days Shall Not Exceed (mg/L)
TSS	100.0	30.0
O&G	20.0	15.0

pH

The limit for pH is based upon State Certification Requirements and RSA 485-A:8, which states that "[t]he pH range for said (Class B) waters shall be 6.5 to 8.0 except when due to natural causes."

The draft permit includes a provision allowing a relaxation of the pH limits if the permittee performs an in-stream dilution study that demonstrates that the in-stream standards for pH would be protected. If the State approves results from a pH demonstration study, this permit's pH limit range may be relaxed. The notification of the relaxation must be made by certified letter to the permittee from EPA-Region 1. The pH limit range cannot be less restrictive than 6.0 - 9.0 S.U., which are the technology-based limitations included in the applicable Steam Electric ELGs for the facility.

PSNH requested that the pH sampling be reduced to a single grab from any of the three pipes. EPA has granted this request, as reflected in the draft permit.

Rain pH

Rainfall pH must continue to be monitored and reported in order to compare to effluent pH readings.

Based upon historical compliance, PSNH requests the monitoring frequency at this outfall be reduced to quarterly. EPA has granted this request, as reflected in the draft permit.

Polynuclear Aromatic Hydrocarbons (PAHs)

PAHs are a group of organic compounds that form through the incomplete combustion of hydrocarbons. PAHs are also present in crude oil and some heavier petroleum derivatives and residuals such as No. 6 fuel oil. Discharge of these products can introduce PAHs into the environment where they strongly adsorb to suspended particulates and biota. PAHs can also bio-accumulate in fish and shellfish. The ultimate fate of those PAHs which accumulate in the environment is believed to be biodegradation and biotransformation by benthic organisms. Several PAHs are well known animal carcinogens, while others are not carcinogenic alone but can enhance the response of the carcinogenic PAHs.

There are 16 PAH compounds identified as priority pollutants under the CWA (*see* Appendix A to 40 C.F.R. Part 423). In view of evidence of PAH-induced animal carcinogenicity and the type of petroleum products stored at the facility, the draft permit establishes monitoring requirements, without limits, for these Group I and II PAHs, as listed below.

Group 1 PAHs comprise seven known animal carcinogens:

- Benzo(a)anthracene
- Benzo(a)pyrene
- Benzo(b)fluoranthene
- Benzo(k)fluoranthene
- Chrysene
- Dibenzo(a,h)anthracene
- Indeno(1,2,3-cd)pyrene

Quarterly monitoring of the above Group I PAHs, without limits, is required.

Group II PAHs comprise nine priority pollutants which are not considered carcinogenic alone, but which can enhance or inhibit the response of the carcinogenic PAHs:

- Acenaphthene
- Acenaphthylene
- Anthracene
- Benzo(g,h,i)perylene
- Fluoranthene
- Fluorene
- Napthalene
- Phenanthrene
- Pyrene

Quarterly monitoring of the above Group II PAHs, without limits, is required. Of these, naphthalene is considered an important limiting pollutant parameter based upon its prevalence in petroleum products and its toxicity (i.e., naphthalene has been identified as a possible human carcinogen).

For the maximum protection of human health from the potential carcinogenic effects of exposure to PAHs through ingestion of contaminated water and contaminated aquatic organisms, EPA established human health “organism only” *National Recommended Water Quality Criteria* for individual PAH compounds based on the increase of cancer risk over the lifetime and consumption of contaminated fish. The human health criteria for Group I PAHs were established in ng/L, which is many orders of magnitude below the current Practical Quantitation Limits (PQLs) for determining PAH concentrations in aqueous solutions.

The draft permit also requires that the quantitative methodology used for PAH analysis must achieve a minimum level for analysis (“ML”) using approved analytical methods in 40 C.F.R. Part 136. The ML is not the minimum level of detection, but rather the lowest level at which the test equipment produces a recognizable signal and acceptable calibration point for an analyte, representative of the lowest concentration at which an analyte can be measured with a known level of confidence. The ML for each Group I PAH compound must be <0.1 µg/L. The ML for each Group II PAH compound must be <1 µg/L. These MLs are based on those listed in Appendix VI of EPA’s Remediation General Permit. Sample results for an individual compound that is at or below the ML should be reported according to the latest EPA Region 1 *NPDES Permit Program Instructions for the Discharge Monitoring Report Forms (DMRs)*. These values may be reduced by modification pursuant to 40 CFR §122.62 as more sensitive tests become available or are approved by EPA and the State.

EPA believes these requirements are necessary for the protection of human health, to maintain the water quality standards established under Section 303 of the CWA, and to meet New Hampshire’s water quality criteria. Should monitoring data indicate the presence of PAHs in concentrations that may cause or contribute to an excursion above water quality criteria, the permit may be modified, reissued or revoked pursuant to 40 CFR §122.62. Should monitoring indicate PAHs are not detected (using the proper MLs described above) over the first two years of the permit cycle, the permittee may request a reduction in monitoring frequency.

Nitrogen

As described in section 6.3.3 above, many segments of the Great Bay estuary, including the Piscataqua River, are approaching, or have reached, their assimilative capacity for nitrogen and are suffering from the adverse water quality impacts of nutrient overenrichment. Hence, it is clear that significant point source and non-point source reductions are necessary in order to achieve water quality standards.

The September 2010 permit reapplication submitted by PSNH indicated that Outfall 011 contained low concentrations of nitrate/nitrite nitrogen (0.33 mg/l). In this case, EPA has determined that the Best Management Practices (BMPs) required in the Stormwater Pollution Prevention Plan (SWPPP) included in the draft permit are expected to reduce total nitrogen levels to a degree necessary to ensure that Schiller Station does not cause or contribute to a water quality standard violation. In developing these BMPs specifically for this permit, EPA has been informed by the BMPs designed to reduce nitrogen in stormwater discharges found in the 2015 draft New Hampshire small MS4 permit. Additionally, a quarterly monitoring requirement for total nitrogen has been established for this outfall in the draft permit in order to track the effectiveness of the BMPs.

6.3.5 Internal Outfall 013

TSS

As previously stated, Internal Outfall 013 discharges emergency overflow from the coal pile runoff basin into Outfall 018. According to 40 CFR § 423.12(b)(9), any point source discharges of coal pile runoff shall be subject to the BPT effluent limitation for TSS of 50 mg/l as a maximum concentration. However, according to 40 CFR § 423.12(b)(10), any untreated overflow from facilities designed, constructed, and operated to treat the volume of coal pile runoff which is associated with a 10-year, 24-hour rainfall event shall not be subject to the limitations in paragraph (b)(9) of this section. Hence, no TSS limit is included in the draft permit.

Flow, pH and Rainfall pH

Additionally, the permittee is required to annually estimate the flow and monitor both effluent pH and rainfall pH each month. These requirements were included in the 1990 permit.

6.3.6 Outfall 015

Flow

In the 1990 permit, the flow limits at this outfall were 61,800 gpd (monthly average) and 85,300 gpd (daily max). These limits are carried forward in the draft permit.

Total Suspended Solids and Oil & Grease

Discharges from this outfall consist of treated effluent from WWTF #1 which treats various low volume waste streams. This WWTF is rarely operated. Based upon the 1990 permit, this waste stream was regulated for Oil & Grease (O&G). In the draft permit, Total Suspended Solids (TSS) limits are also being established based on BPT limits established in the Steam Electric ELGs (*see* 40 CFR § 423.12(b)(3)) for low volume waste source(s).

The Steam Electric ELGs (*see* 40 C.F.R. § 423.12(b)(3)) limit the maximum and average concentration of TSS and O&G discharged from low volume waste source(s) as shown below. The quantity of pollutant (mass limit) is determined by multiplying the flow of the low volume waste source(s) times the concentration listed in the table. The limits in the 1990 permit and the draft permit are expressed as concentration-based limits pursuant to 40 C.F.R. § Section 423.12(b)(11). The permit reflects these limits and the discharge must be monitored for compliance prior to mixing with the discharge from any other outfall.

Pollutant	Maximum for Any 1 Day (mg/l)	Average of Daily Values for 30 Consecutive Days Shall Not Exceed (mg/l)
TSS	100.0	30.0
O&G	20.0	15.0

pH

The limit for pH is based upon State Certification Requirements and RSA 485-A:8, which states that “The pH range for said (Class B) waters shall be 6.5 to 8.0 except when due to natural causes.”

The draft permit includes a provision allowing a relaxation of the pH limits if the permittee performs an in-stream dilution study that demonstrates that the in-stream standards for pH would be protected. If the State approves results from a pH demonstration study, this permit's pH limit range may be relaxed. The notification of the relaxation must be made by certified letter to the permittee from EPA-Region 1. The pH limit range cannot, however, be made less restrictive than the 6.0 - 9.0 S.U. limitations included in the applicable Steam Electric ELGs for the facility.

6.3.7 Internal Outfall 016

Flow

In the 1990 permit, the flow limits at this outfall were 216,000 gpd (monthly average) and 360,000 gpd (daily max). These limits are carried forward in the draft permit.

Segregation of Non-Chemical Metal Cleaning Wastewater Stream

This outfall no longer allows discharge of non-chemical metal cleaning waste. Hence, Outfall 016 no longer contains limits for copper or iron which were only required as technology-based requirements for discharges containing metal cleaning waste. Refer to section 6.3.8 below for a description of internal outfall 017 which now applies to the discharge of all treated chemical and non-chemical metal cleaning waste.

Total Suspended Solids and Oil & Grease

The draft permit limits for Total Suspended Solids (TSS) and Oil and Grease (O&G) are based on the 1990 permit in accordance with the antibacksliding requirements of 40 C.F.R. § 122.44. These limits were originally established based on BPT limits in the Steam Electric ELGs (see 40 C.F.R. § 423.12(b)(3)) for low volume waste source(s).

The Steam Electric ELGs (*see* 40 C.F.R. § 423.12(b)(3)) limit the maximum and average concentration of TSS and O&G discharged by low volume waste source(s) as shown below. The quantity of pollutant (mass limit) is determined by multiplying the flow from low volume waste sources times the concentration listed in the table. The limits in the 1990 permit and draft permit are expressed as concentration-based limits pursuant to 40 C.F.R. § 423.12(b)(11)). The permit reflects these limits which must be measured prior to mixing with any other outfall.

Pollutant	Maximum For Any 1 Day (mg/L)	Average of Daily Values For 30 Consecutive Days Shall Not Exceed (mg/L)
TSS	100.0	30.0
O&G	20.0	15.0

Based upon the historical compliance record and the request of PSNH, monitoring for these pollutants is required monthly.

pH

The limit for pH is 6.0 - 9.0 S.U., which are the limitations included in the applicable Steam Electric ELGs for the facility.

Nitrogen

As described in section 6.3.3 above, many segments of the Great Bay estuary, including the Piscataqua River, are approaching, or have reached, their assimilative capacity for nitrogen and are suffering from the adverse water quality impacts of nutrient overenrichment. Hence, it is clear that significant point source and non-point source reductions are necessary in order to achieve water quality standards.

The September 2010 permit reapplication submitted by PSNH indicated that Outfall 016 contained low concentrations of nitrate/nitrite nitrogen (0.32 mg/l) as well as total organic nitrogen (1.2 mg/l). In this case, EPA has determined that the Best Management Practices (BMPs) required in the Stormwater Pollution Prevention Plan (SWPPP) included in the draft permit are expected to reduce total nitrogen levels to a degree necessary to ensure that Schiller Station does not cause or contribute to a water quality standard violation. In developing these

BMPs specifically for this permit, EPA has been informed by the BMPs designed to reduce nitrogen in stormwater discharges found in the 2015 draft New Hampshire small MS4 permit. Additionally, a quarterly monitoring requirement for total nitrogen has been established for this outfall in the draft permit in order to track the effectiveness of the BMPs.

6.3.8 Internal Outfall 017

Flow

In the 1990 permit, the flow limit at this outfall was 360,000 gpd (daily max). This limit is carried forward in the draft permit.

Additionally, a reporting requirement for monthly average flow has been added since Outfall 017 now includes the discharge of non-chemical metal cleaning waste (see below). Since there is no historical flow data to categorize the average monthly flow of non-chemical metal cleaning waste, EPA has decided that the draft permit should require the monthly average flow to be reported. For the next permit cycle, when sufficient data has been gathered, EPA will determine if a monthly average flow limit is warranted. EPA considers this approach appropriate since, among other reasons, Outfall 017's limits are technology-based and not water quality-based. (The derivation of water quality-based limits would depend on the discharge's flow rate.)

TSS, O&G, Copper and Iron

The draft permit limits for TSS, O&G, copper and iron are based on the 1990 permit in accordance with the antibacksliding requirements of 40 C.F.R. § 122.44. These limits were originally based on BPT limitations established in the Steam Electric ELGs (*see* 40 C.F.R. § 423.12(b)(5) for metal cleaning wastes). Since the discharge at Outfall 017 was specified as "chemical" metal cleaning waste, the same limits for copper and iron were also confirmed by BAT limits established in the Steam Electric ELGs (*see* 40 C.F.R. § 423.13(e)) for chemical metal cleaning wastes. Now that chemical and non-chemical metal cleaning waste are permitted to be discharged from this outfall, the same limits are carried forward as BPJ limits in this permit reissuance. This is because the BPJ limits for non-chemical metal cleaning waste in this case are identical to the BAT limits established for chemical metal cleaning waste. See below for a more thorough discussion.

In the Steam Electric ELGs, 40 C.F.R. §§ 423.12(b)(5) & 423.13(e) limits the maximum and average concentration of TSS, O&G, copper and iron as shown below. The limits in the 1990 permit and draft permit are expressed as concentration-based limits pursuant to Section 423.12(b)(11). The draft permit reflects these limits which must be measured prior to mixing with the discharge from any other outfall.

Pollutant	Maximum For Any 1 Day (mg/L)	Average of Daily Values For 30 Consecutive Days Shall Not Exceed (mg/L)
TSS	100.0	30.0
O&G	20.0	15.0

Pollutant	Maximum For Any 1 Day (mg/L)	Average of Daily Values For 30 Consecutive Days Shall Not Exceed (mg/L)
Copper	1.0	1.0
Iron	1.0	1.0

pH

The limit for pH is 6.0 - 9.0 S.U., which are the limitations included in the applicable Steam Electric ELGs for the facility.

Nitrogen

As described in section 6.3.3 above, many segments of the Great Bay estuary, including the Piscataqua River, are approaching, or have reached, their assimilative capacity for nitrogen and are suffering from the adverse water quality impacts of nutrient overenrichment. Hence, it is clear that significant point source and non-point source reductions are necessary in order to achieve water quality standards.

The September 2010 permit reapplication submitted by PSNH indicated that Outfall 017 contained low concentrations of nitrate/nitrite nitrogen (0.32 mg/l) as well as total organic nitrogen (1.2 mg/l). In this case, EPA has determined that the Best Management Practices (BMPs) required in the Stormwater Pollution Prevention Plan (SWPPP) included in the draft permit are expected to reduce total nitrogen levels to a degree necessary to ensure that Schiller Station does not cause or contribute to a water quality standard violation. In developing these BMPs specifically for this permit, EPA has been informed by the BMPs designed to reduce nitrogen in stormwater discharges found in the 2015 draft New Hampshire small MS4 permit. Additionally, a quarterly monitoring requirement for total nitrogen has been established for this outfall in the draft permit in order to track the effectiveness of the BMPs.

Segregation of Non-Chemical Metal Cleaning Wastewater Stream

According to PSNH, Schiller Station's waste treatment plant #2 treats most station wastewater which consists principally of demineralizer regenerations, boiler blowdown, coal pile runoff and equipment and floor drains. All these different waste streams are comingled and treated prior to being discharged through external outfall 002, 003 or 004. Under the 1990 permit, effluent limits for TSS, O&G, Iron and Copper are applied to the comingled waste stream (Outfall 016) after treatment but prior to being comingled with non-contact cooling water in one of the external outfalls. As described above, the wastewater discharged through internal Outfall 016 is comprised of a variety of dissimilar wastewater streams that have been commingled. Thus, the metals limits applied at Outfall 016 are currently being applied to the commingled waste streams being discharged from the treatment process. EPA has concluded that this approach is inappropriate and must be corrected.

The National Effluent Limit Guidelines (NELGs) for Steam Electric Power Plants, See 40 C.F.R. Part 423, require that when separately regulated waste streams (i.e., "waste streams from different sources") are combined for treatment or discharge, each waste stream must independently satisfy the effluent limitations applicable to it.[4] 40 C.F.R. §§ 423.12(b)(12), 423.13(h). See also 40 C.F.R. § 125.3(f) (technology-based treatment requirements may not be satisfied with "'non-treatment'" techniques such as flow augmentation). Thus, it is not acceptable to determine compliance for different wastewater streams after they have been mixed (or diluted) with each other, unless the effluent limits applicable to them are the same. See 40 C.F.R. § 122.45(h) (internal waste streams).

Hence, the draft permit now requires segregation of these waste streams to be regulated as two internal outfall: Outfall 016 and Outfall 017. At Outfall 016, the applicable effluent limits for all comingled wastes excluding all metal cleaning waste are applied. These various low volume, runoff and drainage waste streams may be comingled prior to treatment and sampling for compliance because the effluent limitations for these waste streams are the same. At Outfall 017, technology-based limits for copper and iron in the chemical and non-chemical metal cleaning wastes are applied based on the NELGs.[5] All metal cleaning waste may not be combined with the low volume, runoff and drainage waste streams prior to compliance monitoring because the metal cleaning wastes are subject to additional effluent limitations for copper and iron. Applying the copper and iron limit of 1.0 mg/l to a comingled waste stream would potentially allow the permittee to (1) comply by diluting the non-chemical metal cleaning waste stream rather than treating it, and (2) discharge total copper and total iron in excess of that authorized by the NELGs. In addition, if non-chemical metal cleaning wastes are greatly diluted, removal of the pollutant metals in the metal cleaning wastes becomes more difficult and less efficient.

Given that the existing permit applies technology-based limits for both copper and iron to the comingled, non-similar waste streams at outfall 016, EPA has concluded that these limitations were incorrectly applied in the current permit. EPA proposes to correct the error in the draft permit.[6] Either the non-chemical metal cleaning wastewater must be separately monitored for compliance with copper and iron limitations (as Outfall 017), or a combined waste stream formula must be developed for the commingled waste stream. EPA does not, however, currently have sufficient information to derive limits based on combined waste stream calculations.[7] Therefore, the draft permit proposes, in effect, to segregate the non-chemical metal cleaning wastewater from the other wastewater streams by applying limits for the metal cleaning wastes at a separate compliance point (Outfall 017) located before mixing with other wastewater flows. The permittee may comply with the requirement by either (1) eliminating or diverting all other waste streams[8] at the time when non-chemical metal cleaning waste is being treated and

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[4] The BPT NELGs set copper and iron limits for both chemical and nonchemical metal cleaning wastes, while the BAT NELGs set limits only for the chemical metal cleaning wastes. As discussed in detail farther below, this leaves EPA to determine BAT limits for the nonchemical metal cleaning wastes on a BPJ basis.

[5] Since Outfall 017 already regulates chemical cleaning waste in the 1990 permit, this discussion focuses on the additional segregation of non-chemical cleaning waste from Outfall 016 to Outfall 017.

[6] The law is clear that when an administrative agency recognizes that it has made an error, it should correct that error. See Southwestern Penn. Growth Alliance v. Browner, 121 F.3d 106, 115 (3d Cir. 1997); Davila-Bardales v. I.N.S., 27 F.3d 1, 5 (1st Cir. 1994); Puerto Rico Cement Co. v. EPA, 889 F.2d 292, 299 (1st Cir. 1989).

[7] In order for EPA to derive iron and copper limits based on combined waste stream calculations, PSNH must supply EPA with a comprehensive list of all non-chemical metal cleaning, low volume and stormwater waste streams that currently comingle at WWTP #2. This list must include the total volume, frequency and concentrations of iron and copper for each wastewater stream.

[8] With the exception of chemical metal cleaning waste. Chemical and non-chemical metal cleaning waste may be comingled prior to treatment and monitoring because they are subject to the same technology-based requirements.

discharged through waste treatment plant #2 (perhaps through schedule changes) and then monitoring compliance of the treated non-chemical metal cleaning waste prior to mixing with any other internal discharge or (2) diverting any non-chemical metal cleaning waste through an alternate treatment process to comply with the technology-based iron and copper limits and monitor compliance at an alternate location before being comingled with any other waste stream.

In other words, EPA's draft permit proposes to require (a) that the non-chemical metal cleaning waste be discharged from Outfall 017 subject to the 1.0 mg/L limits for total copper and total iron, and (b) that compliance monitoring for this type of metal cleaning waste occur after treatment but before discharge being comingled with any other waste streams. Furthermore, the draft permit allows low volume, runoff and drainage waste streams to be combined and discharged through Outfall 016 subject to the relevant effluent limits other than the technology-based copper and iron limits. Copper and iron limits will no longer be in Outfall 016 but will be in Outfall 017.

Development of BAT Effluent Limit for Non-chemical Metal Cleaning Wastes Based On BPJ

As discussed above, Schiller Station discharges many different types of waste streams, including "non-chemical metal cleaning wastes," "chemical metal cleaning wastes," "low volume wastes," and heated cooling water (which carries waste heat).[9] Non-chemical metal cleaning wastes may include wastewater from a variety of sources such as the following non-chemical metal process equipment washing operations: air pre-heater wash, SCR catalyst wash, boiler wash, furnace wash, stack and breeching wash, fan wash, precipitator wash, and combustion air heater wash. As discussed above, the non-chemical metal cleaning wastes are currently combined with several of the Station's low volume wastes prior to being discharged.

EPA has promulgated NELGs for the "Steam Electric Power Generating Point Source Category," the point source category which applies to Schiller Station. See 40 C.F.R. Part 423. These NELGs define "metal cleaning wastes" as:

> any wastewater resulting from cleaning [with or without chemical cleaning compounds] any metal process equipment including, but not limited to, boiler tube cleaning, boiler fireside cleaning, and air preheater cleaning.

40 C.F.R. § 423.11(d). Thus, this regulation defines metal cleaning waste to include any wastewater generated from either the chemical or non-chemical cleaning of metal process equipment. In addition, the regulations define "chemical metal cleaning waste" as "any wastewater resulting from cleaning of any metal process equipment with chemical compounds, including, but not limited to, boiler tube cleaning." EPA also uses, but does not expressly define; the term "non-chemical metal cleaning waste" in the regulations when it states that it has "reserved" the development of BAT NELGs for such wastes. 40 C.F.R. § 423.13(f). While the regulations provide no definition of "non-chemical metal cleaning waste," the definitions of

[9] Cf. 42 Fed. Reg. 15690, 15693 (Mar. 23, 1977) (Interim Regulations, Pretreatment Standards for Existing Sources, Steam Electric Generating Point Source Category) (listing the different types of wastewaters discharged by power plants as follows: metal cleaning wastes (without distinguishing between chemical and nonchemical metal cleaning wastes); cooling system wastes; boiler blowdown; ash transport water; and low volume waste)

metal cleaning waste and chemical metal cleaning waste make clear that non-chemical metal cleaning waste is any wastewater resulting from the cleaning of metal process equipment without using chemical cleaning compounds.

Finally, the regulations define "low volume waste" as follows:

> . . . 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.

40 C.F.R. § 423.11(b). The waste sources listed as examples of low volume wastes include various process and treatment system wastewaters and do not include wastewater generated from washing metal process equipment. Therefore, low volume wastes are distinct from metal cleaning wastes.

The NELGs establish BPT daily maximum and 30-day average limits of 1.0 mg/l for both total copper and total iron in discharges of "metal cleaning waste." On the face of the regulations, these limits apply to both chemical and non-chemical metal cleaning wastes because, as stated above, both are included within the definition of "metal cleaning waste." 40 C.F.R. § 423.12(b)(5), 423.11(d). Thus, the facility's non-chemical metal cleaning wastes are, at a minimum, subject to NELGs' BPT limits of 1.0 mg/l (maximum and 30-day average limits) for both total copper and total iron. The NELGs also set BAT daily maximum and 30-day average limits of 1.0 mg/L for both total copper and total iron in discharges of chemical metal cleaning waste, 40 C.F.R. § 423.13(e), while indicating that EPA has "reserved" specification of BAT NELGs for non-chemical metal cleaning waste. 40 C.F.R. § 423.13(f). While the regulations do not set categorical BAT limitations for nonchemical metal cleaning waste, by expressly reserving the development of BAT limitations, EPA's regulations confirm that the BAT standard applies to nonchemical metal cleaning wastes. EPA explained in the preamble to the Steam Electric Power Plant NELGs, promulgated in 1982, that it was "reserving" the specification of BAT standards for nonchemical metal cleaning wastes because it felt that it had insufficient information regarding (a) the potential for differences between the inorganic pollutant concentrations found in the non-chemical metal cleaning wastes of oil-burning and coal-burning power plants, and (b) the cost and economic impact that would result from requiring the entire industrial category to ensure that non-chemical metal cleaning wastes satisfy the same limits that had been set for chemical metal cleaning wastes. See 47 Fed. Reg. 52297 (Nov. 19, 1982).

When EPA has promulgated NELGs applying the statute's narrative technology standards to a particular industrial category's pollutant discharges, then those NELGs provide the basis for the discharge limits included in the NPDES permits issued to individual facilities within that industrial category. 33 U.S.C. §§ 1342(a)(1)(A) and (b). See also 40 C.F.R. §§ 122.43(a) and (b), 122.44(a)(1) and 125.3. In the absence of a categorical NELG, however, EPA develops NPDES permit limits by applying the statute's narrative technology standards (such as the BAT standard) on a case-by-case, BPJ basis. See 33 U.S.C. § 1342(a)(1)(B) and (b)(1)(A); 40 C.F.R. §§

122.43(a), 122.44(a)(1), 125.3 and 122.1(b)(1).[10] According to 40 C.F.R. § 125.3(c)(2), in determining BAT requirements, EPA 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."[11]

CWA § 301(b) sets forth in narrative form the technology standards that pollutant discharges must satisfy and the deadlines by which compliance with them must be achieved. Effluent limitations based on application of the BAT standard were to be achieved no later than March 31, 1989. 33 U.S.C. § 301(b)(2). See also 40 C.F.R. §§ 125.3(a). According to the CWA's legislative history, "best available" technology refers to the "single best performing plant in an industrial field." See 45 Fed. Reg. 68333.[12] EPA also considers the following specific factors in determining the BAT: (i) age of the equipment and facilities involved; (ii) process employed; (iii) engineering aspects of the application of various types of control techniques; (iv) process changes; (v) the cost of achieving such effluent reductions; and (vi) non-water quality environmental impacts (including energy requirements). See CWA § 304(b)(2) and 40 C.F.R. § 125.3(d)(3).

EPA has determined that the BAT-based effluent limits for non-chemical metal cleaning waste discharges at Schiller Station should be at least as stringent as the applicable BPT limitations for such non-chemical metal cleaning wastes. Therefore, for this draft permit, EPA has determined, based on its Best Professional Judgment (BPJ), which non-chemical metal cleaning wastes at Schiller Station should be subject to concentration-based effluent limits of 1.0 mg/L for total copper and total iron. EPA's consideration of the above-listed factors is discussed below.

(i) Age of the equipment and facilities involved

In determining BAT for Schiller Station, EPA accounted for the age of equipment and the facilities involved. Schiller Station began generating electricity in 1952. Schiller Station is equipped to perform treatment of chemical metal cleaning wastes consisting of boiler chemical cleaning wastewater (Outfall 017 in existing permit). There is nothing about the age of the equipment and facilities involved that would preclude the use of the same or similar technology to treat non-chemical metal cleaning wastes at the facility. Schiller Station may, however, need to reroute some existing piping, at some expense, to comply with the new requirements regarding not comingling the non-chemical metal cleaning waste before treatment and monitoring. Based on our knowledge of the flow volumes involved and the nature of the site, EPA would expect

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[10] See Texas Oil & Gas Ass'n v. EPA, 161 F.3d 923, 928-29 (5th Cir. 1998) ("In situations where the EPA has not yet promulgated any [effluent limitation guidelines] for the point source category or subcategory, NPDES permits must incorporate 'such conditions as the Administrator determines are necessary to carry out the provisions of the Act.' 33 U.S.C. 1342(a)(1). …. In practice, this means that the EPA must determine on a case-by-case basis what effluent limitations represent the BAT level, using its 'best professional judgment.' 40 C.F.R. § 125.3(c)-(d). Individual judgments thus take the place of uniform national guidelines, but the technology-based standard remains the same."); Trustees for Alaska v. EPA, 749 F.2d 549, 553 (9th Cir. 1984) (same for BCT).

[11] EPA is not aware, and PSNH has not identified, any unique factors applicable to the facility that would impact the selection of the BAT in this case. EPA has taken into account site-specific factors in the course of discussing the six BAT considerations below.

[12] See also Texas Oil & Gas Ass'n, 161 F.3d at 928 (quoting CMA v. EPA, 870 F.2d at 226); CMA v. EPA, 870 F.2d at 239; Kennecott v. EPA, 780 F.2d 445, 448 (4th Cir. 1985); Ass'n of Pacific Fisheries, 615 F.2d at 816-17; American Meat Inst. v. EPA, 526 F.2d 442, 463 (7th Cir. 1975).

any re-piping expenses to be modest.

(ii) Process employed

In determining the BAT for Schiller Station, EPA considered the process employed at the facility. Schiller Station steam-electric power plant is rated to generate 48 MW of electrical energy in each of its three generating units (two coal-burning and one wood-burning). Treating non-chemical metal cleaning wastes to the same level as chemical metal cleaning wastes will not prevent the permittee from maintaining its primary production processes. The facility already treats chemical metal cleaning waste generated as a result of operations at the facility. Chemical metal cleaning wastewater (specifically boiler cleaning) is treated prior to discharge using neutralization tanks for pH adjustment and settling basins for solids removal. This treatment process can also be applied to non-chemical metal cleaning wastes.

(iii) Engineering aspects of the application of various types of control techniques

Technologies to treat metal cleaning wastes for copper and iron are in wide use at large steam electric power plants around the country. Typically, this treatment process entails pH adjustment, metal coagulation and solids removal. This is fairly straightforward, standard technology applied to treat many types of wastewaters containing metals.[13] The NPDES permit for the Mystic Station power plant in Everett, Massachusetts, for instance, requires non-chemical metal cleaning wastes to receive the same level of treatment as chemical metal cleaning wastes and both must meet mass-based limits equivalent to concentration-based limits of 1.0 mg/L for total copper and total iron. See Mystic Station NPDES Permit No. MA0004740. As mentioned above, technology to treat chemical metal cleaning wastewater already exists at Schiller Station. Specifically, this wastewater is treated prior to discharge using pH adjustment and solids removal within neutralization and waste tanks/basins. The Station can utilize the same treatment technologies at the facility to meet the proposed BAT standards for copper and iron for non-chemical metal cleaning wastewater. In order to employ this existing treatment capability, some wastewater streams may need to be redirected before and during metal cleaning treatment. Because this effluent stream is currently comingled with low volume wastes, it must be segregated before treatment or a combined waste stream formula could potentially be applied. From an engineering standpoint, the waste segregation proposed for the draft permit could be accomplished with scheduling changes and the facility's existing treatment technology. In other words, Schiller Station could change the timing of non-chemical cleaning operations to coincide with either chemical cleaning operations or outages.

(iv) Process changes

EPA has also evaluated the process changes associated with treatment of non-chemical metal cleaning wastes. As discussed, non-chemical metal cleaning wastes can be treated using existing technology currently in use at the plant. Since metal cleaning wastewater treatment is a separate process from power generation, the treatment of non-chemical metal cleaning wastewater does not impact power generating operations at the Station.

[13] See pages 441-455 of the Final Development Document for Effluent Limitations Guidelines and Standards and Pretreatment Standards for the Steam Electric Point Source Category, November, 1982, for treatment technologies for metal cleaning wastes.

(v) Cost of achieving effluent reductions

EPA acknowledges that waste stream segregation and additional treatment of the non-chemical metal cleaning wastes could be accomplished, but that it may require some engineering modifications and associated expenditures. However, EPA believes that these costs would be modest. In addition, should PSNH choose to pursue either the “scheduling changes” or the “combined waste stream formula” options, the costs required to comply with the permit limits could be still less. EPA recognizes that more substantial costs may result from steps needed to comply with the new CWA § 316(b) requirements, and the cost to segregate non-chemical metal cleaning waste should be relatively insignificant.

(vi) Non-water quality environmental impacts (including energy requirements)

Finally, EPA considers the non-water quality environmental impacts associated with the treatment of non-chemical metal cleaning wastes, including energy consumption, air emission, noise, and visual impacts at Schiller Station. In particular, EPA believes that the permittee should be able to treat the non-chemical metal cleaning wastes with a similar amount of energy usage, air emissions and noise as presently occurs at the facility. As previously stated, the metal cleaning waste segregation proposed for the draft permit could be accomplished with scheduling changes and the facility’s existing treatment technology. In addition, EPA does not expect any change in the visual impacts of the plant from the redirection of waste streams. EPA has determined that the non-water environmental impacts from the steps needed to comply with the BAT effluent limits would be negligible.

As previously discussed in this section, the low volume, runoff and drainage waste streams may be combined prior to sampling for compliance because the O&G and TSS effluent limitations for these waste streams are the same. The non-chemical metal cleaning waste may not, however, be combined with these other waste streams prior to compliance monitoring because the metal cleaning wastes are subject to additional effluent limitations for copper and iron. All metal cleaning wastewater must be treated prior to mixing with any other waste streams. Dilution of metal cleaning wastes is prohibited prior to treatment. All chemical and non-chemical metal cleaning wastes must be sampled prior to mixing with any other waste stream and are subject to effluent limitations for TSS, O&G, copper and iron shown in the table below.

Pollutant	**Maximum For Any 1 Day (mg/L)**	**Average of Daily Values For 30 Consecutive Days Shall Not Exceed (mg/L)**
TSS	100.0	30.0
O&G	20.0	15.0
Copper	1.0	1.0
Iron	1.0	1.0

6.3.9 Outfall 018

Flow

In the 1990 permit, the flow limit at this outfall was 300,000 gpd (monthly average) and 600,000 gpd (daily max). These limits are carried forward in the draft permit.

Total Suspended Solids and Oil & Grease

This outfall consists of a co-mingled discharge of heater condensate drips from the Newington Tank Farm that drain through a valved oil/water separator, as well as occasional stormwater runoff from the Schiller Station wood storage yard and other drainage areas. In the 1990 permit, this waste stream was regulated for Oil & Grease (O&G). Using best professional judgment (BPJ), EPA has made the determination that this co-mingled discharge which passes through a valved oil/water separator is similar to a low volume waste and has similar treatment technology (oil/water separator). Therefore, EPA will apply the same limitations as for a low volume waste source. Hence, the draft permit contains Total Suspended Solids (TSS) and O&G limitations based on the Best Conventional Treatment standard established in the Steam Electric ELGs (*see* 40 C.F.R. § 423.12(b)(3)) for low volume waste source(s).

The maximum and average concentration of TSS and O&G discharged in low volume waste source(s) are limited in 40 C.F.R. § 423.12(b)(3) as shown below. The limits in the 1990 permit and draft permit are expressed as concentration-based limits pursuant to 40 C.F.R. §423.12(b)(11). The permit reflects these limits which must be measured prior to mixing with any other outfall.

Pollutant	Maximum For Any 1 Day (mg/L)	Average of Daily Values For 30 Consecutive Days Shall Not Exceed (mg/L)
TSS	100.0	30.0
O&G	20.0	15.0

Since the O&G limits are the same as those in the 1990 permit, they comply with antibacksliding regulations in 40 C.F.R. § 122.44.

pH

The limit for pH is based upon State Certification Requirements and RSA 485-A:8, which states that "[t]he pH range for said (Class B) waters shall be 6.5 to 8.0 except when due to natural causes."

The draft permit includes a provision allowing a relaxation of the pH limits if the permittee performs an in-stream dilution study that demonstrates that the in-stream standards for pH would be protected. If the State approves results from a pH demonstration study, this permit's pH limit range may be relaxed. The notification of the relaxation must be made by certified letter to the permittee from EPA-New England. The pH limit range cannot be less restrictive than 6.0 - 9.0

S.U., which are the limitations included in the applicable Steam Electric ELGs for the facility (*see* 40 C.F.R. § 423.12(b)(1).

PSNH requested that the pH sampling be reduced to a single grab from any of the three pipes. EPA has granted this request, as reflected in the draft permit.

Rain pH

Rainfall pH must continue to be monitored and reported in order to compare to effluent pH readings.

Based upon historical compliance, PSNH requests the monitoring frequency at this outfall be reduced to quarterly. EPA has granted this request, as reflected in the draft permit.

Polynuclear Aromatic Hydrocarbons (PAHs)

PAHs are a group of organic compounds that form through the incomplete combustion of hydrocarbons. PAHs are also present in crude oil and some heavier petroleum derivatives and residuals such as No. 6 fuel oil. Discharge of these products can introduce PAHs into the environment where they strongly adsorb to suspended particulates and biota. PAHs can also bio-accumulate in fish and shellfish. The ultimate fate of those PAHs which accumulate in the environment is believed to be biodegradation and biotransformation by benthic organisms. Several PAHs are well known animal carcinogens, while others are not carcinogenic alone but can enhance the response of the carcinogenic PAHs.

There are 16 PAH compounds identified as priority pollutants under the CWA (*see* Appendix A to 40 C.F.R. Part 423). In view of evidence of PAH-induced animal carcinogenicity and the type of petroleum products stored at the facility, the draft permit establishes monitoring requirements, without limits, for these Group I and II PAHs, as listed below.

Group 1 PAHs comprise seven known animal carcinogens:

- Benzo(a)anthracene
- Benzo(a)pyrene
- Benzo(b)fluoranthene
- Benzo(k)fluoranthene
- Chrysene
- Dibenzo(a,h)anthracene
- Indeno(1,2,3-cd)pyrene

Quarterly monitoring of the above Group I PAHs, without limits, is required.

Group II PAHs comprise nine priority pollutants which are not considered carcinogenic alone, but which can enhance or inhibit the response of the carcinogenic PAHs:

- Acenaphthene
- Acenaphthylene

- Anthracene
- Benzo(g,h,i)perylene
- Fluoranthene
- Fluorene
- Napthalene
- Phenanthrene
- Pyrene

Quarterly monitoring of the above Group II PAHs, without limits, is required. Of these, naphthalene is considered an important limiting pollutant parameter based upon its prevalence in petroleum products and its toxicity (i.e., naphthalene has been identified as a possible human carcinogen).

For the maximum protection of human health from the potential carcinogenic effects of exposure to PAHs through ingestion of contaminated water and contaminated aquatic organisms, EPA established human health "organism only" *National Recommended Water Quality Criteria* for individual PAH compounds based on the increase of cancer risk over the lifetime and consumption of contaminated fish. The human health criteria for Group I PAHs were established in ng/L, which is many orders of magnitude below the current Practical Quantitation Limits (PQLs) for determining PAH concentrations in aqueous solutions.

The draft permit also requires that the quantitative methodology used for PAH analysis must achieve a minimum level for analysis ("ML") using approved analytical methods in 40 C.F.R. Part 136. The ML is not the minimum level of detection, but rather the lowest level at which the test equipment produces a recognizable signal and acceptable calibration point for an analyte, representative of the lowest concentration at which an analyte can be measured with a known level of confidence. The ML for each Group I PAH compound must be <0.1 µg/L. The ML for each Group II PAH compound must be <1 µg/L. These MLs are based on those listed in Appendix VI of EPA's Remediation General Permit. Sample results for an individual compound that is at or below the ML should be reported according to the latest EPA Region 1 *NPDES Permit Program Instructions for the Discharge Monitoring Report Forms (DMRs)*. These values may be reduced by modification pursuant to 40 CFR §122.62 as more sensitive tests become available or are approved by EPA and the State.

EPA believes these requirements are necessary for the protection of human health, to maintain the water quality standards established under Section 303 of the CWA, and to meet New Hampshire's water quality criteria. Should monitoring data indicate the presence of PAHs in concentrations that may cause or contribute to an excursion above water quality criteria, the permit may be modified, reissued or revoked pursuant to 40 CFR §122.62. Should monitoring indicate PAHs are not detected (using the proper MLs described above) over the first two years of the permit cycle, the permittee may request a reduction in monitoring frequency.

Nitrogen

As described in section 6.3.3 above, many segments of the Great Bay estuary, including the Piscataqua River, are approaching, or have reached, their assimilative capacity for nitrogen and are suffering from the adverse water quality impacts of nutrient overenrichment. Hence, it is clear that significant point source and non-point source reductions are necessary in order to achieve water quality standards.

The September 2010 permit reapplication submitted by PSNH indicated that Outfall 018 contained low concentrations of nitrate/nitrite nitrogen (0.32 mg/l). In this case, EPA has determined that the Best Management Practices (BMPs) required in the Stormwater Pollution Prevention Plan (SWPPP) included in the draft permit are expected to reduce total nitrogen levels to a degree necessary to ensure that Schiller Station does not cause or contribute to a water quality standard violation. In developing these BMPs specifically for this permit, EPA has been informed by the BMPs designed to reduce nitrogen in stormwater discharges found in the 2015 draft New Hampshire small MS4 permit. Additionally, a quarterly monitoring requirement for total nitrogen has been established for this outfall in the draft permit in order to track the effectiveness of the BMPs.

6.3.10 Outfalls 020 and 021/022

Based upon the request of PSNH, Outfalls 021 and 022 have been combined into a single outfall since they discharge from the same location. The combined Outfall 021/022 will henceforth be referred to as Outfall 021, as in the draft permit.

Flow

The total flow must be estimated each month and may not exceed 108,000 gpd as a daily maximum.

Temperature

The temperature of the discharge shall at no time exceed the temperature of the intake water used for this discharge.

6.3.11 New Outfall 023

This outfall consists of occasional stormwater runoff from a parking lot used for chemical loading and/or unloading. The Multi-Sector General Permit Part 8 Subpart O addresses requirements for industrial activities at Steam Electric Generating Facilities. Based on Section 8.O.4.4, which discusses Chemical Loading and Unloading, the following requirements apply to this site:

> *Minimize contamination of precipitation or surface runoff from chemical loading and unloading areas. Consider using containment curbs at chemical loading and unloading areas to contain spills, 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 loading and unloading in covered areas and storing chemicals indoors.*

Flow

The permittee must estimate and report flow from this outfall on a monthly basis as described in the draft permit.

pH

The pH shall not be less than 6.0 standard units (S.U.) nor greater than 9.0 S.U., unless due to naturally occurring conditions. The pH shall be within 0.5 S.U. of the rainfall pH when the rainfall pH is outside of the above range.

Rain pH

Rainfall pH shall be monitored and reported during the month in which the discharge occurs in order to compare to effluent pH readings.

6.4 NPDES Permitting Requirements for Thermal Discharges

6.4.1 Existing Permit Thermal Limits

Schiller Station's existing NPDES permit, issued in 1990, includes a number of limits and conditions on the Facility's thermal discharges from Outfalls 001, 002, 003 and 004 (which service Schiller Station generating Units 4, 5 and 6, respectively). Specifically, the existing permit imposes the following restrictions on thermal discharges from these outfalls:

- A daily maximum discharge temperature limit (Max-T) of 95ºF;
- A daily maximum temperature differential between the intake and discharge temperatures (Delta-T) of 25ºF (this limit is increased to 30ºF for a two-hour period during condenser maintenance); and
- A prohibition of discharges that cause the receiving water to exceed a maximum temperature of 84°F at any point beyond a distance of 200 feet in any direction from the point of discharge.

See Parts I.A.3, I.A.5, I.A.6 and I.A.7 of the 1990 permit (note (*) and note (b)). The permit also, in effect, limits the maximum waste heat load discharged by the Facility per day. This effective, though not expressly stated, limit follows from the permit's limits on Delta-T and the maximum volume of non-contact cooling water permitted to be discharged from Outfalls 002, 003 and 004 (servicing generating units 4, 5 and 6, respectively). The permit sets a flow limit of approximately 150 million gallons per day (MGD) on the combined discharges from the three outfalls. *See id.* (EPA has not included the 40 MGD volumetric limit on cooling water discharges from Outfall 001 in this calculation because Unit 3 currently operates on a very limited basis.) With a delta T (ΔT) of 25ºF and a maximum flow of 150 MGD, the resulting heat load is calculated as follows:

$$Q = C_p m(\Delta T)/24 \text{ hours}$$

Where:

C_p = Heat capacity (specific heat) of water = 1.0 BTU/pound °F
m = mass of water = cooling water flow rate (MGD) x 8.34 pounds/gallon =150 x 8.34 = 1251 lb
ΔT = discharge temperature – intake temperature (°F) = 25°F and
Q = Heat load, million British Thermal Units (mBTU)/hour = 1,303 mBTU/hour

However, for a maximum of two hours each day, as stated above, the ΔT may be 30ºF, which results in the following heat load 1,564 mBTU/hour (150 MGD x 30ºF x 8.34/24 hours). Therefore, the maximum allowable waste heat load discharged each day is 31,796 mBTU/day (1,303 mBTU x 22 hours + 1,564 mBTU x 2 hours).

Furthermore, the 1990 permit includes narrative requirements that effectively limit thermal discharges, among other things. Part I.A.1.b of the 1990 permit states, "[t]he discharges shall not jeopardize any Class B use of the Piscataqua River and shall not violate applicable water quality standards …." Moreover, Part I.A.1.h of the 1990 permit provides that:

> [t]he combined thermal plumes for the station shall (a) not block zone of fish passage, (b) not change the balanced indigenous population of the receiving water, and (c) have minimal contact with the surrounding shorelines.

As per the discussion in the Fact Sheet for the 1990 permit, *see* pp. 5 - 7, EPA applied the permit's thermal discharge limits pursuant to a variance under CWA § 316(a).

In addition, in a letter dated August 17, 1990, NHDES certified that these requirements also satisfied the NHWQS. The permit's prohibition against discharges causing in-stream temperatures above 84°F at any point beyond a distance of 200 feet in any direction from the point of discharge is consistent in concept with the identification of a mixing zone (*see* Section 5.3 above). Yet, as discussed above in Section 5.4, a mixing zone that satisfies State water quality standards could also be used to determine thermal discharge limits that satisfy CWA § 316(a).

6.4.2 Collection of Thermal Data

In order to characterize the thermal discharge under the present design and operational profile of Schiller Station, EPA requested that the permittee collect additional thermal information (EPA Letter from Stephen S. Perkins, Director, Office of Ecosystem Protection, EPA, to William H. Smagula, P.E., Director, PSNH Generation, dated May 4, 2010). This thermal data, along with field data collected by EPA, allowed EPA to perform an updated analysis of the potential impact of the Facility's thermal discharges on the Piscataqua River.

Thermal Plume Mapping

Field measurements were collected by EPA on August 31, 2010, to delineate the horizontal, vertical, and downstream extent of the thermal plume discharged from Schiller Station, as well as its temperature and relative increase above ambient temperature. This one-day monitoring effort was designed to be a "snap shot" of thermal plume conditions over a brief time period. Late

August was selected for the monitoring effort to capture seasonally high ambient river temperatures along with expected high electric generation by the facility, which would result in near maximum permitted discharge flows and temperatures. This would constitute approximate "worst-case" conditions for the receiving water.

An EPA field crew recorded river temperatures by conducting multiple transects through the Station's plume while towing a boat mounted temperature sonde. A pressure transducer on the temperature sonde recorded its exact depth as it recorded the temperature measurements. Temperature, depth and GPS positioning data were recorded and stored every 10 seconds during a transect run. Multiple bank-to-bank transects, perpendicular to the flow of the river, as well as down river and up river, were conducted within and outside of the Station's thermal plume.

Fixed Thermistor Data Collection

In addition to the one day "snap shot" of summer thermal plume conditions in the river, continuous, long-term temperature data was collected. EPA sent PSNH a CWA § 308 Information Request Letter, dated May 4, 2010 (clarified and amended by a follow-up letter from EPA, dated June 1, 2010). As part of the request, PSNH was directed to characterize Schiller Station's thermal plume. From August 15, 2010, through November 14, 2010, the permittee was required to collect continuous temperature data using a series of thermistors placed in eleven locations in the Piscataqua River, in the vicinity of the Station's discharge.

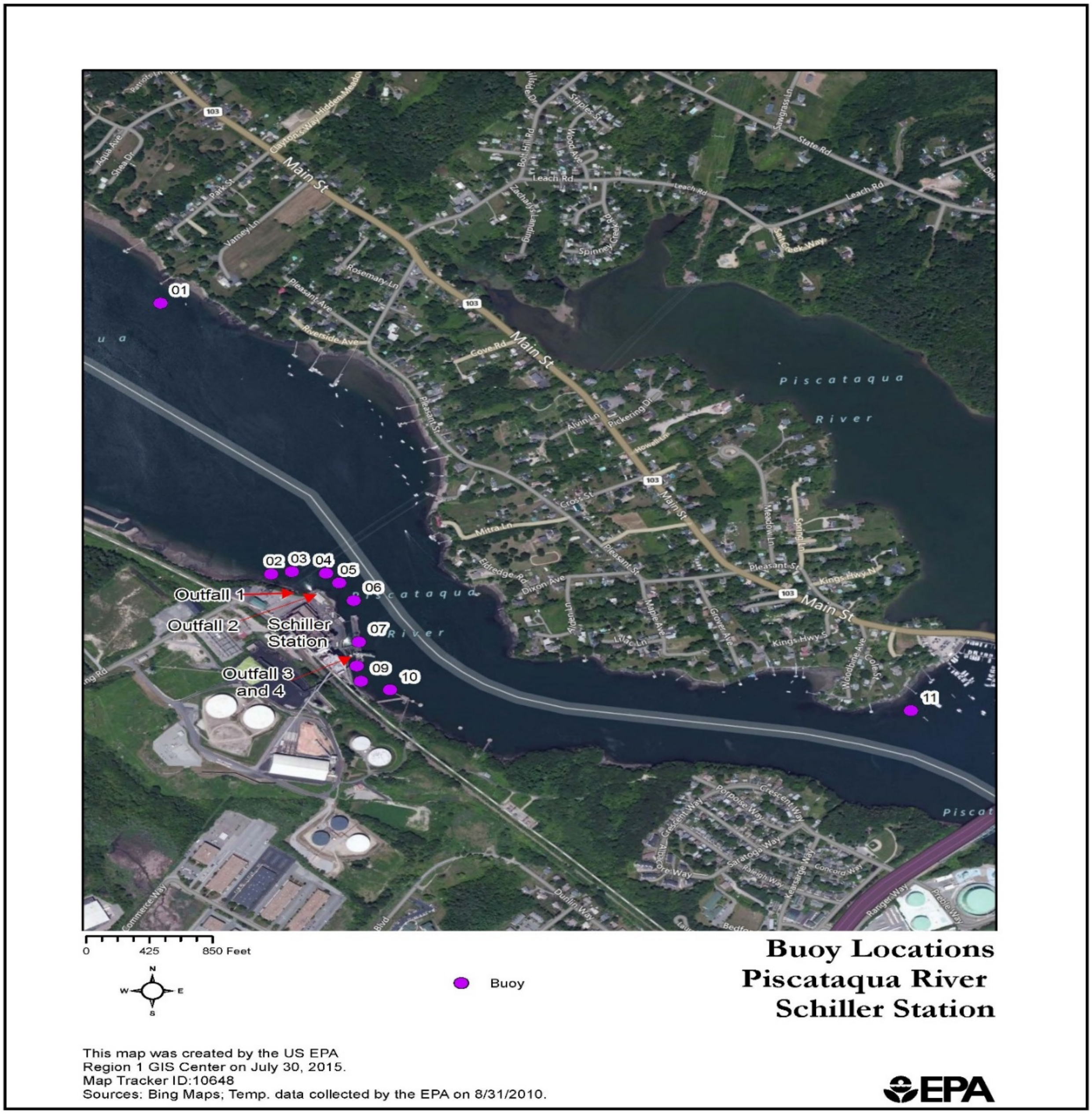
Thermistors were deployed at approximate locations designated by EPA. The thermistors were given number designations and their positions are depicted in Figure 6-1. Thermistor Station 1 (upstream) and Thermistor Station 11 (downstream) were deployed in locations to collect temperatures representative of ambient conditions in the Piscataqua River (*i.e.*, unaffected by the Facility's thermal discharges). The ambient monitoring locations were outside of the effects of the thermal plume(s) and were used to determine background river temperature at locations upstream and downstream of Schiller's discharge. The other thermistor stations were arranged in locations that had the potential to encounter the thermal plume.

For water depths greater than 20 feet, three thermistors per station were used (one approximately six inches below the water surface, one approximately one foot above the river floor, and one approximately midway between the other two thermistors). For water depths less than 20 feet, two thermistors per station were used (one approximately six inches below the water surface, and one approximately one foot above the river floor).

The thermistors collected continuous temperature data, with a minimum of 12 temperature measurements recorded each hour. For each thermistor, the hourly average, hourly maximum, and hourly minimum temperatures were recorded for each hour (clocktime). The average, maximum, and minimum hourly values were calculated from a minimum of 12 temperature measurements recorded during that hour. Facility operating conditions during the thermistor deployment were also recorded.

In addition, three monthly data reports were provided to EPA by PSNH, beginning on September 24, 2010, and continuing monthly thereafter until November 29, 2010. The reports summarized the river temperature data collected from August 15 through November 14, 2010, along with corresponding facility operation data (Reports dated September 20 and 24, 2010 [AR-21, AR-23]; October 22 and 25, 2010 [AR-38 and AR-39]; and November 24 and 29, 2010 [AR-42 and AR-43]).

Figure 6-1 The location of a series of thermistors placed in eleven locations in the Piscataqua River. The thermistors were used to collect continuous temperature data in the vicinity of the Schiller Station thermal discharges (August 15, 2010, through November 14, 2010).



6.4.3 Analysis of Thermal Data

Analysis of Thermal Plume Mapping Data

The colored temperature contours generated from the field data collected on August 31, 2010, are depicted in Figure 6-2. This thermal plume map was generated by EPA by plotting the temperature and position data collected during the multiple transect boat mounted temperature sonde runs. An initial inspection of the figure shows a concentrated thermal discharge not associated with the Schiller Station outfalls. This is a permitted thermal discharge from Eversource Energy's Newington Station.

According to facility intake temperature data provided by Schiller Station, the ambient river temperatures recorded on August 31, 2010, were among the highest from the time period of August 15 through September 14 (approximately 23°C; 73.4°F). Units 4, 5 and 6 were all operating during the transect runs, with an average capacity generation of approximately 80% for the day. Both EPA and NHDES were satisfied that the data collected on August 31, 2010, and depicted in Figure 6-2, represent reasonable worst-case conditions.

An examination of the temperature representation in Figure 6-2 shows a maximum surface temperature of approximately 28.0°C (82.4°F) at a small point within the 200-foot boundary of the mixing zone. This point likely represents the station outfall where the thermal discharge first enters the receiving water, just as it mixes with the Piscataqua River. The majority of the 200 foot boundary area maintained a surface temperature of 24.0°C (75.2°F) to 25.0°C (77.0°F) or below. EPA temperature monitoring information on August 31, 2010, conducted under reasonable worst-case conditions, confirmed that the receiving water did not exceed a maximum temperature of 84°F at a distance of 200 feet or greater in any direction from the points of thermal discharge. Indeed, water temperatures did not reach 84°F even within 200 feet of the point of discharge. These values are within the thermal limit requirements included in the 1990 permit.

Analysis of Fixed Thermistor Data

Facility operating conditions during the thermistor deployment were recorded and included with the data reports submitted to EPA by PSNH. The rate of non-contact cooling water, the daily facility generation and the water temperature of both the intake and discharge for Generation Units 4, 5 and 6 were submitted for the time period of August 15 through November 14, 2010. During this three-month period, the maximum difference in temperature between the intake and the discharge (delta T) was 23.0°F, recorded at Unit 5 on November 10, 2010. The absolute maximum discharge temperature recorded for the entire three month period was 92.7°F, recorded on September 4, 2010, at Unit 5. These values are within the thermal limit requirements included in the 1990 permit.

As observed on Figure 6-2, the thermal discharge from Eversource Energy's Newington Station is discharged just upstream of Schiller Station. Based on the monitoring conducted on August 31, 2010, the thermal contours suggest the possibility that under certain river and facility operating conditions, a well-mixed remnant of the thermal plume from Newington Station could have been recorded by the Schiller Station surface thermistors at monitoring Stations 2, 3, and 4 during their deployment (August 15 - November 14, 2010). A review of the surface thermistors, as well as the operational data for Newington Station for that time period revealed that the thermal discharge from Newington Station likely was not recorded at Surface Stations 2, 3 and 4.

As discussed previously, both Station 1 (upstream of the facility) and Station 11 (downstream of the facility) were located in areas that represent ambient river temperature conditions. A review of the Schiller Station thermal plume data confirmed that the thermal discharge from the Station was not recorded at either background station. These stations are approximately 1.3 miles apart, and while they did represent ambient thermal conditions in the river, natural tidal impacts related to their distance from each other caused the two background stations to record temperatures that sometimes differed from one another by over 1.5°C (2.7°F), especially in early September 2010. Rather than average the temperature data from these two background stations, EPA selected Station 1, upstream from the facility, as the background station that best represented ambient river conditions in the Piscataqua River. Station 11 was not used in the data analysis.

Summary statistics for the August 15 through the November 14, 2010, fixed position continuous temperature monitors for Stations 1 through 10 are presented in Table 6-B. An examination of the continuous three months of thermal data from the Stations 2 through 10 thermistors indicates that the thermistor located approximately six inches below the surface at Station 7 consistently recorded the highest temperatures [ARs 21, 23, 38, 39, 42 and 43]. Station 7 was located approximately 95 feet from shore, and approximately 200 feet from thermal discharge Outfalls 003 and 004 (Figure 6-1). Figure 6-3 depicts temperature data from August 15 through November 14, 2010, from the Station 7 continuous recording thermistor. The figure includes graphs showing the Station 7 near surface (A7) temperatures, the depth of the thermistor and the difference between the temperature of the near surface Station 7 readings and the ambient temperature of the Piscataqua River as recorded at Station 1. Also included in Figure 6-3 are graphs showing the Station 7 near bottom (C7) temperatures, the depth of the thermistor and the difference between the temperature of the near bottom Station 7 readings and the ambient temperature of the Piscataqua River. The relatively higher temperatures recorded at the near surface thermistor shows that the thermal plume from Schiller Station is primarily a surface feature. The absolute maximum instantaneous temperatures from all thermistors at Stations 2 through 10 were recorded as follows. The near surface maximum temperature was 26.0°C (78.8°F), recorded at Station 7. The mid-depth maximum temperature was 23.6°C (74.4°F), recorded at Station 3. The near-bottom maximum temperature was 23.5°C (74.3°F), recorded at Station 2. Temperatures recorded at monitoring Stations 2 through 10, which approximated a 200 foot distance from the thermal discharge outfalls, were observed to be well below the 84°F limit included in the 1990 permit.

Figure 6-2. Colored temperature contours depicted by plotting the temperature and position data collected during multiple transect runs on August 31, 2010.

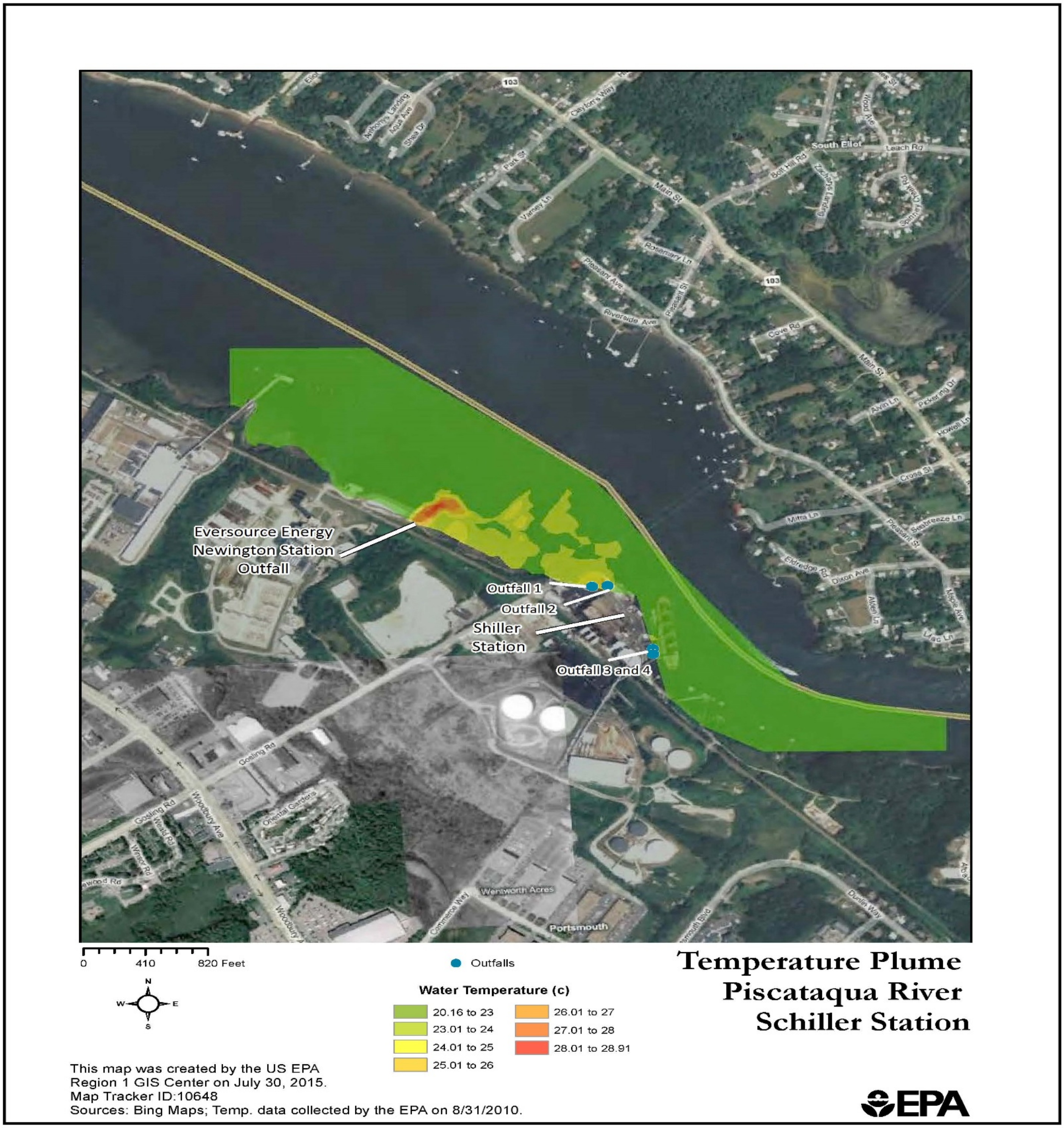


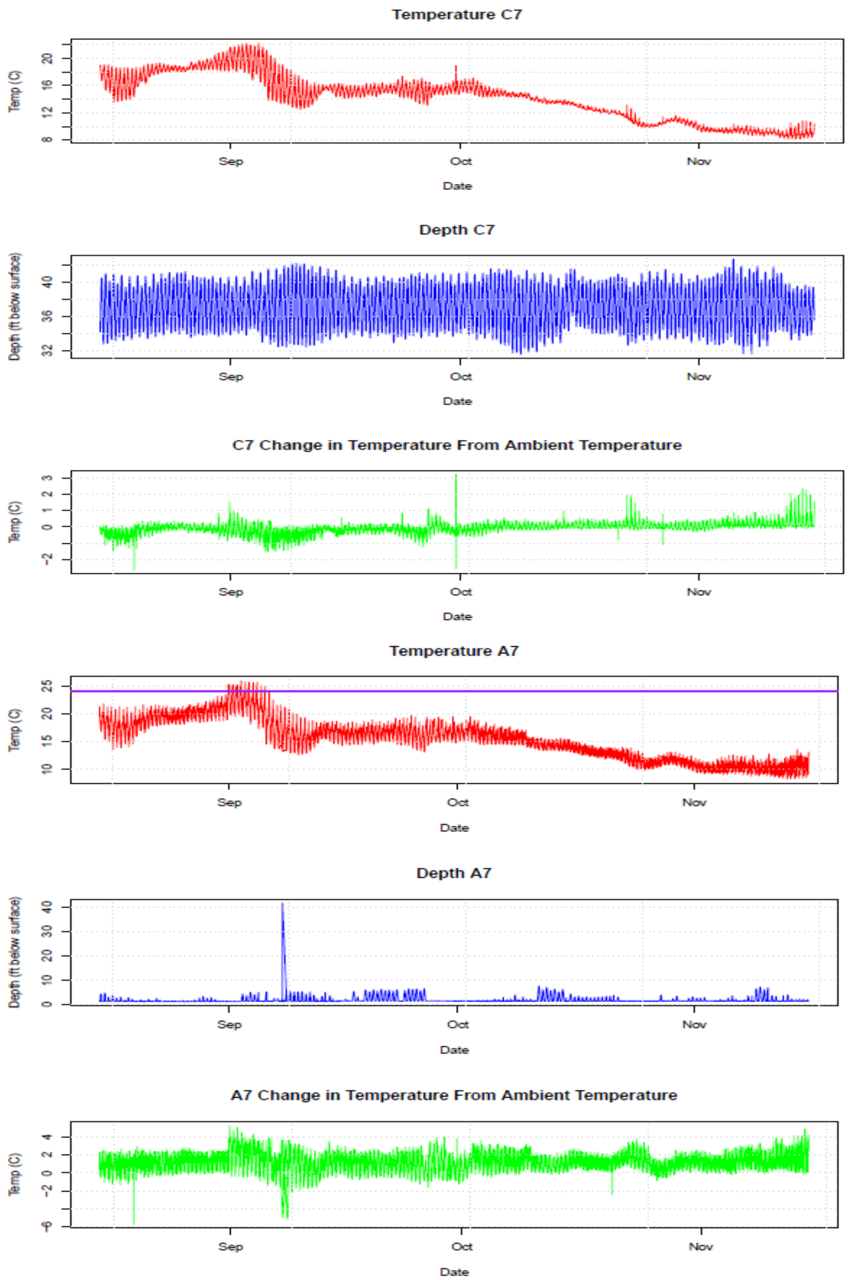
Table 6-B Summary Statistics for the Three Month Temperature Data Set for Stations 1 through 10

Station 2 had no mid-depth temperature sensor so no data is presented for that station location. The raw temperature data was recorded every five minutes at all stations and at all depths (PSNH, August 15- November 14, 2010).

Water Temperature at Data Logger Stations 1- 10
PSNH Schiller Station Thermal Study August 15 –November 14, 2010

Sensor Depth	Parameter	Station Number 1	2	3	4	5	6	7	8	9	10
Surface	Average Temp (Deg C)	14.3	14.8	15.0	14.8	14.3	14.4	15.4	14.7	14.7.	14.4
	Average Temp Deg F	57.8	58.6	58.9	58.6	57.7	58.0	59.7	58.5	58.5	57.9
	Max Temp (Deg C)	22.2	24.5	24.9	24.1	23.3	23.3	26.0	25.8	25.9	24.6
	Max Temp (Deg F)	72.0	76.0	76.9	75.3	73.9	73.9	78.8	78.5	78.6	76.2
	Standard Deviation (Deg C)	3.6	3.7	3.8	3.7	3.6	3.5	3.7	3.5	3.4	3.5
	Standard Deviation (Deg F)	6.4	6.6	6.9	6.6	6.4	6.3	6.7	6.3	6.2	6.2
Mid	Average Temp (Deg C)	14.3	NA	14.6	14.5	14.1	14.2	14.4	14.3	14.5	14.2
	Average Temp Deg F	57.8	NA	58.2	58.1	57.4	57.6	58.0	57.7	58.1	57.6
	Max Temp (Deg C)	22.2	NA	23.6	22.9	22.4	22.8	22.7	22.5	22.3	22.1
	Max Temp (Deg F)	72.0	NA	74.4	73.2	72.4	73.1	72.9	72.6	72.2	71.9
	Standard Deviation (Deg C)	3.6	NA	3.6	3.5	3.6	3.4	3.4	3.4	3.3	3.4
	Standard Deviation (Deg F)	6.4	NA	6.5	6.4	6.4	6.2	6.1	6.1	5.9	6.2
Deep	Average Temp (Deg C)	14.3	14.6	14.6	14.4	14.2	14.2	14.2	14.2	14.5	14.2
	Average Temp Deg F	57.8	58.3	58.2	58.0	57.5	57.5	57.6	57.6	58.1	57.6
	Max Temp (Deg C)	22.2	23.5	23.0	22.6	22.4	22.5	22.2	22.1	22.2	22.1
	Max Temp (Deg F)	72.0	74.3	73.4	72.7	72.4	72.6	72.0	71.9	72.0	71.7
	Standard Deviation (Deg C)	3.6	3.6	3.6	3.5	3.6	3.4	3.4	3.4	3.3	3.4
	Standard Deviation (Deg F)	6.4	6.4	6.4	6.3	6.4	6.1	6.1	6.1	6.0	6.1

Figure 6-3. Temperature data from the Station 7 continuous recording thermistor near Schiller Station (August 15 through November 14, 2010).



6.4.4 Thermal Discharge Requirements under CWA § 316(a)

As explained in Section 5.4, above, CWA § 316(a), 33 U.S.C. § 1326(a), authorizes the permitting authority to set thermal discharge limits less stringent than technology-based and/or water quality-based requirements based on a "variance" if CWA § 316(a)'s biological criteria are satisfied. A permit applicant may qualify for a variance under CWA § 316(a) if it can demonstrate to the permitting agency's satisfaction that thermal discharge limits based on technology and water quality standards would be more stringent than necessary to assure the protection and propagation of a balanced, indigenous population of shellfish, fish and wildlife in and on the body of water into which the discharge is made (BIP). *See* 33 U.S.C. § 1326(a); 40 C.F.R. §§ 125.70, 125.73(a). The applicant must also demonstrate that any alternative, variance-based thermal discharge limits that it requests will assure the protection and propagation of the BIP, considering the cumulative impact of its thermal discharge together with all other significant impacts on the species affected. *See* 33 U.S.C. § 1326(a); 40 C.F.R. § 125.73(a). If satisfied that the applicant has made such a demonstration, then the permitting authority may impose thermal discharge limits that, taking into account the interaction of the thermal discharge with other pollutants, will assure the protection and propagation of the BIP. *See* 33 U.S.C. § 1326(a); 40 C.F.R. §§ 125.70, 125.73(a) and (c)(1)(i).

As also explained above, dischargers operating under an existing CWA § 316(a) variance "may base their [renewal] demonstration upon the absence of prior appreciable harm in lieu of predictive studies." 40 C.F.R. § 125.73 (c)(1). The existing discharger must demonstrate the absence of prior appreciable harm "taking into account the interaction of such thermal component [of the discharge] with other pollutants and the additive effect of other thermal sources to a [BIP]..." 40 C.F.R. § 125.73(c)(1).

As discussed above, Schiller Station's existing permit's thermal discharge requirements are based on a CWA § 316(a) variance. *See* Fact Sheet for the 1990 Permit, pp. 5-7. The Facility initially requested that its new permit retain the same thermal discharge limits based on a renewal of its CWA § 316(a) variance. *See* September 13, 2010, Letter from John M. MacDonald, PSNH, to Shelley Puleo, EPA, Attachment 3, p. 1 (response to EPA request for information to supplement NPDES permit application). PSNH's request maintains, in essence, that the Facility's existing thermal discharge has not caused appreciable harm to the BIP and, indeed, could not have caused such harm given how small it is relative to the large volume and cold temperatures of the waters of the Piscataqua River estuary. PSNH subsequently requested that the new permit increase the maximum discharge temperature limit from 95ºF to 100ºF.

After considering PSNH's request in light of the available information, and after consulting with the NH-DES, EPA is proposing to (a) grant PSNH's request for renewal of its CWA § 316(a) variance with the permit's current thermal discharge restrictions, and (b) reject its request to increase the maximum discharge temperature limit to 100ºF. EPA's analyses underlying these proposed decisions are presented below.

As discussed previously, instream and discharge thermal data indicate that Schiller Station has been able to comply with the existing permit's limits, although the discharge has reached the permitted delta T and maximum discharge temperature limits during a number of summer months (DMR Data 1991 – 2013). Under CWA § 316(a), however, the key question is not whether the permittee has complied with the existing permit limits. The key questions are whether the record demonstrates that the Facility's thermal discharges have not caused prior appreciable harm to the BIP, and whether the record provides reasonable assurance of the protection and propagation of the BIP going forward with the proposed thermal discharge limits.

EPA's regulations define the term "balanced indigenous population" (or BIP) as follows:

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

40 C.F.R. § 125.71(c). EPA has determined that it would be unreasonable to try to evaluate the potential thermal impacts to *every* marine, riverine and diadromous species that may potentially be present at one time or another in the Piscataqua River in the vicinity of Schiller Station's discharge. In such cases, EPA regulations, *see* 40 C.F.R. §§ 125.71(b) and 125.72(b), and guidance (1977) direct the permitting agency to focus analysis on a subset of the potentially affected species. The species in this subset are referred to as "Representative Important Species" (RIS). EPA regulations define RIS as follows:

> *Representative important species* means species which are representative, in terms of their biological needs, of a balanced, indigenous community of shellfish, fish and wildlife in the body of water into which a discharge of heat is made.

40 C.F.R. §§ 125.71(b). The RIS may include, without limitation, species commonly associated with power plant impacts, economically important species, particularly thermally sensitive or vulnerable species, and federally listed threatened or endangered species.

EPA assembled a list of RIS for the area of the Piscataqua River into which Schiller Station discharges its waste heat. The list is included in Table 6-C. More detailed information regarding Schiller Station impingement and entrainment impacts on the RIS species discussed below is found in Section 8.2.3 of this Fact Sheet.

Table 6-C. Representative Important Species in the Piscataqua River near Schiller Station

Species	Common Name
Tautogolabrus adspersus	cunner
Osmerus mordax	rainbow smelt
Scomber scombrus	Atlantic mackerel*
Clupea harengus	Atlantic herring *
Pleuronectes americanus	winter flounder *
Alosa pseudoharengus	alewife
Alosa aestivalis	blueback herring
Morone saxatilis	striped bass
Lepomis macrochirus	bluegill
Gadus morhua	Atlantic cod *
Homarus americanus	American lobster
Acipenser oxyrinchus	Atlantic sturgeon**

*Essential Fish Habitat species designation (Department of Commerce, 1999)

** On January 31, 2012, NOAA's Fisheries Service listed five distinct population segments (DPSs) of Atlantic sturgeon under the Endangered Species Act. The Chesapeake Bay, New York Bight, Carolina, and South Atlantic populations of Atlantic sturgeon are listed as endangered, while the Gulf of Maine population is listed as threatened.

Cunner

This species, a close relative of the tautog, lives near the coastline and is usually found inhabiting eelgrass beds and other benthic structures. They are observed swimming near piers, docks, and among rocks. Cunner are not a sought after commercial fish or popular recreational fish. One noteworthy characteristic of cunner is that they do not migrate long distances. Therefore, the reduced presence of this species within an area of its expected range may be an indicator of local stress to the biological community in that specific area (US Fish and Wildlife Service). Cunner have been documented in the Piscataqua River and in the vicinity of Schiller Station. This species makes up a large relative percentage of the annual entrained ichthyoplankton and annual impingement numbers recorded at Schiller Station.

Rainbow Smelt

This small anadromous fish is found in estuaries, harbors, and offshore waters during summer, autumn and winter. Smelt migrate into rivers and streams to spawn, beginning in late winter (Massachusetts) to late spring (eastern Maine). It is an important prey species as well as a sought after recreational fish. Rainbow smelt populations are in decline. Spawning runs that once teamed with smelt are greatly diminished. Since 2004, rainbow smelt have been designated as a federal Species of Concern under the Endangered Species Act (ESA) (National Oceanic and Atmospheric Administration – National Marine Fisheries Service; NOAA Fisheries). Rainbow smelt ichthyoplankton have been entrained at Schiller Station. Rainbow smelt make up a large relative proportion of fish impinged at the station as well

Atlantic Mackerel

In the western Atlantic, mackerel are found from Labrador to North Carolina. Atlantic mackerel are common in cold and temperate waters over the continental shelf. They swim in schools near the surface, and travel to and from spawning and summering grounds. Depending on their size, females can hatch between 285,000 and almost 2 million eggs. Eggs generally float in the surface water and hatch in 4 to 7½ days, depending on water temperature. An important part of the food web, Atlantic mackerel feed heavily on crustaceans such as copepods, krill, and shrimp, while they serve as prey items for several species of fish and marine mammals. Atlantic mackerel are sensitive to changes in water temperature and migrate long distances on a seasonal basis to feed and spawn. An important commercial fish, overfishing eventually depleted the Atlantic mackerel stock in the 1970's. Fishery managers have implemented annual catch quotas to limit harvests and rebuild the stock (NOAA Fisheries). Atlantic mackerel are designated as Essential Fish Habitat species (Department of Commerce). Atlantic mackerel ichthyoplankton were recorded in entrainment samples collected from October 2006 to September 2007 at Schiller Station. However, adult mackerel were not found in impingement records from the same time period. While impingement and entrainment monitoring data from a power plant may not be a representative indicator of the presence or abundance of a fish species in the associated waterbody, the absence of adult mackerel in impingement sampling may be an indication that this important representative species spawns in near-by coastal waters adjacent to the Piscataqua River, but juvenile and adult life stages of the species are not routinely found in large numbers in the river itself.

Atlantic Herring

A small schooling fish, herring are found in coastal and continental shelf waters from Labrador to Cape Hatteras, North Carolina. When herring spawn, they deposit their eggs on the rock, gravel, or sand bottoms. Schools of herring can produce so many eggs that they can cover an area of ocean bottom in a dense carpet of eggs several centimeters thick. A variety of bottom-dwelling species including winter flounder, cod, haddock, and red hake feed on herring eggs. Juvenile herring are heavily preyed upon due to their abundance and small size (NOAA Fisheries). An important commercial fish, like Atlantic mackerel, the stock was greatly depleted in the 1970's. Atlantic herring has recovered substantially from those very low levels and is now harvested sustainably. This fish has been designated as an Essential Fish Habitat species (Department of Commerce, 1999). Early life stages as well as juvenile and adult herring are present in the Piscataqua River, as reflected in entrainment and impingement records at Schiller Station.

Winter Flounder

This species is found in estuaries and on the continental shelf of the Northwest Atlantic, from the Gulf of St. Lawrence, Canada, to North Carolina. In the winter, adults migrate from offshore areas where they feed to inshore bays and estuaries where they spawn. Females usually produce between 500,000 and 1.5 million eggs. They deposit their eggs on sandy bottoms and algal mats at night, usually about 40 times every spawning season. They are benthic feeders. Fish (mainly striped bass, bluefish, toadfish, and summer flounder), birds, invertebrates, winter skate, and marine mammals prey on larval and juvenile winter flounder. Atlantic cod, spiny dogfish, and monkfish prey on adults (NOAA Fisheries). Winter flounder are an important commercial and recreational fish throughout New England and the Mid-Atlantic, although current harvests are a fraction of their historic levels. Heavy fishing pressure, habitat destruction and other stressors caused winter flounder stocks to drastically decline. Strict fishing regulations are now in place. Winter flounder life stages are present in the Piscataqua River. They made up approximately ten percent of the fish impinged from October 2006 to September of 2007 at Schiller Station. Early life stages of this species were also identified in entrainment samples at Schiller Station.

Alewife and Blueback Herring

These species, together known as "river herring" are important anadromous fish in the Piscataqua River. When in the marine environment, they form large schools. Alewife are more sensitive to temperature and they ordinarily spawn in early spring at temperatures of about 55° to 60°. Herring begin spawning at slightly higher temperatures. River herring eggs are about 0.05 inches in diameter and stick to brush, stones, or anything else they may settle upon. Incubation occupies about 6 days at 60°. Young alewives are about 5 mm long when hatched, grow to 15 mm long when a month old, and soon after begin to work their way downstream. They have been seen descending as early as June 15 in more southerly Gulf of Maine streams. Successive companies of fry may move out of the spawning area and down with the current throughout the summer; and by autumn the young alewives have all found their way down to salt water when 2 to 4 inches long. River herring are chiefly plankton feeders; copepods, amphipods and shrimp are common prey items (Bigelow and Schroeder, 1953). Numbers have declined and the range of the two species has been restricted from overfishing, pollution, and restricted fish passage. River herring are harvested for food and bait. In New Hampshire, these species are managed by the NH Fish and Game Department. Relatively small numbers of river herring have been impinged at Schiller Station. River herring larvae have not been identified in the entrainment samples.

Striped Bass

The striped bass is a highly migratory fish that moves north from the mid-Atlantic during the spring and autumn, spending May through October feeding on Great Bay's river herring, pollock, and silversides. It is a relatively large fish, a rapid swimmer and a carnivorous feeder that grows rapidly. The striped bass can move from fresh water to salt water and return with ease. It produces a great many eggs and larvae, of which only a few per female survive to maturity. Females produce eggs in direct proportion to their weight. A three-pound female produces 14,000 eggs and a 50-pound female produces about five million eggs. Larvae feed on zooplankton and the young-of-year feed on small fish and worms. When they are about six inches long, they begin to feed on small schooling forage fish, soft-shelled clams, peeler crabs, and clamworms. Adults feed on menhaden, river herring, anchovies, white perch, blue crabs, and other invertebrates. (NOAA Fisheries). The population of striped bass is robust and it is the most sought after coastal sportfish in New Hampshire. (NH Fish and Game). Striped bass are an important predator species in the Piscataqua River. The species early life stages were not identified in entrainment samples at Schiller Station, but a relatively small number of these fish were collected during impingement sampling.

Bluegill

The bluegill is a species of freshwater sunfish introduced into most New Hampshire water bodies. Its original range included the St. Lawrence and Mississippi River basins and Atlantic slope drainages as far north as Virginia. Bluegills thrive among thick aquatic vegetation, feeding on invertebrates and small fish. Females lay eggs in shallow circular depressions along the shoreline, excavated by males who aggressively defend their nests. Females may lay up to 27,000 eggs and remain reproductively active as long as water temperatures are suitable; in some years this may extend into late fall. They can survive in very warm water temperatures and are considered tolerant of pollution and habitat alteration. There are no specific conservation or management targets for bluegill in New Hampshire (NH Fish and Game). Since bluegill are nest builders and spawn in a low energy, fresh water environment, it is not surprising that no early life stages were present in Schiller Station entrainment samples. Adult bluegill, along with pumpkinseeds, a related sunfish family member (centrarchids), were collected in small numbers as part of Schiller Station impingement sampling.

Atlantic Cod

Atlantic cod are distributed throughout the North Atlantic, with well-known stocks in the Grand Banks and Georges Banks. Smaller stocks exist closer to shore in Southern New England and in the Gulf of Maine. In coastal New Hampshire, codfish of various ages are near the Isles of Shoals and both juveniles and adults are caught along Jeffrey's Ledge. They can occur from surface waters to depths of 1,200 feet, depending on life stage and season. Adapted for bottom feeding, they inhabit rocky bottoms but may occasional feel on herring in the water column. Codfish in the Gulf of Maine spawn during February or March and all females are mature by the time they are 23 inches long (NH Fish and Game). They feed on copepods, amphipods, and barnacle larvae as juveniles. Adults feed on shrimp, small lobsters, spider and hermit crabs, and fish such as capelin, herring, and sand lance. They are prey to larger fish, marine mammals and humans. Adult cod form spawning aggregations from late winter to spring and the fertilized eggs drift with the currents as they develop into larvae. Several stocks of Atlantic Cod went through a population crash in the 1990's and have failed to recover. The primary threat the species face is from overfishing (NOAA Fisheries). It is also under a fishery management plan by the New England Fishery Management Council, which is designed to reduce fishing mortality and promote rebuilding of the stocks. At Schiller, early life stages of Atlantic cod were recorded in entrainment samples and juvenile cod were noted in impingement samples, both in relatively small numbers.

American Lobster

The American lobster is found only on the eastern coast of North American where its range includes 1,300 miles of coastline no more than 30 to 50 miles wide, then widening at Cape Cod, Massachusetts to nearly 200 miles on Georges Bank. They live on rocky bottoms and are scavengers rather than hunters, feeding on carrion, clams, snails, mussels, worms, sea urchins, and even other lobsters (NH Fish and Game). To grow, they must molt, which occurs primarily during June to October, although this varies in different locales. After a complicated mating process a female can carry sperm for as long as a year before fertilizing her eggs. The number of eggs produced by a female depends on her size: a 1 ½-pound lobster can produce about 10,000 eggs, while a 20-pound lobster can produce nearly 100,000. She carries the eggs for 9 to 12 months. When hatched, larvae spend four to five weeks near the surface of the ocean, transported by wind and currents as they pass through four distinct growth phases. The lobster is more abundant in the northern part of its range included Maine, New Hampshire, and parts of Canada. (NOAA Fisheries). Lobsters are a finite resource, and they are carefully managed so that the population can sustain itself at a healthy and harvestable level. Techniques include size restrictions for harvested lobsters, V-notching fertile females and returning them to the water, as well as limiting numbers of traps (NH Fish and Game). Schiller Station has impinged adults and juvenile lobsters and has entrained a relatively small number of their larvae.

Atlantic Sturgeon

The Atlantic sturgeon is a long-lived, estuarine dependent, anadromous fish. Atlantic sturgeon can grow to approximately 14 feet long and can weigh up to 800 pounds. The more southern populations mature chronologically earlier than the northern. Spawning adults migrate upriver in spring, as early as February in more southern areas and as late as June the farthest north. Spawning occurs in flowing water between the salt front and fall line of large rivers. Atlantic sturgeon spawning intervals range from 1 to 5 years for males and 2 to 5 years for females. Females produce eggs based on their age and body size, ranging from 400,000 to 8 million eggs. Sturgeon eggs are highly adhesive and are deposited on bottom substrate, usually on hard surfaces (e.g., cobble). It is likely that cold, clean water is important for proper larval development. Atlantic sturgeon are benthic feeders and typically forage on benthic invertebrates such as crustaceans, worms, and mollusks.

On February 6, 2012, NOAA's National Marine Fisheries Service (NMFS) listed five distinct population segments of Atlantic sturgeon under the Endangered Species Act. The Chesapeake Bay, New York Bight, Carolina, and South Atlantic populations of Atlantic sturgeon were listed as endangered, while the Gulf of Maine population was listed as threatened. The decision became effective on April 6, 2012. Atlantic sturgeon found in the Piscataqua River are part of the Gulf of Maine population and therefore listed as threatened. As part of ongoing communication with NMFS for other federal actions in the Piscataqua River, NMFS reported that Atlantic sturgeon use the portion of the Piscataqua River in the vicinity of Schiller Station (E-mail from C. Vaccaro, NMFS to D. Arsenault, EPA, September 12, 2011).

Based on this information and the expected distribution of the species, EPA has initiated an Endangered Species Act informal Section 7 consultation with NMFS Protected Resources Division as part of this permit action (see Section 13 and Attachment E of this document). No Atlantic sturgeon were collected in impingement and entrainment sampling from October 2006 to September of 2007 at Schiller Station.

Summary

The RIS described in Table 6-C, represent a fish assemblage that includes all expected levels of a stable biological community for this type of environment. These levels include forage species (blueback herring and alewife), higher trophic level predator species (cod and striped bass), pelagic feeders (Atlantic mackerel), benthic feeders (winter flounder, American lobster), anadromous species (rainbow smelt, striped bass, river herring), and riverine freshwater species (bluegill and other sunfish).

A central challenge of this particular CWA § 316(a) variance analysis is the lack of a strong, long-term data set on the health of the species that make up or represent the BIP in the area of Schiller Station. Long-term data on the overall abundance of fish, or on the abundance of particular species of fish, in the area of the discharge does not exist as far as EPA knows. Moreover, there is no "before-and-after" fish abundance data that might be able to indicate whether or not the onset, or any increase, of thermal discharges by the Facility might appear to correlate with any declines of local fish populations.

Nevertheless, EPA reviewed the best available information to support its CWA § 316(a) analysis. This assessment utilized a variety of information, including the thermal monitoring data discussed above and the scientific literature concerning thermal effects on aquatic organisms. EPA also considered impingement and entrainment monitoring data from Schiller Station, while recognizing that there are important limitations on using this data in the CWA § 316(a) context, as this data was not generated from a sampling program scientifically designed to monitor fish abundance in the river. EPA also considered information from the records for the Newington Station NPDES permit renewal and the Dover Wastewater Treatment Facility NPDES permit renewal. Both of these facilities are located along the Piscataqua River in the vicinity of Schiller Station.

Scope of Schiller Station's Current Thermal Discharge Plume

For the purposes of this discussion, the Schiller Station "mixing zone" is identified as a subset of the overall area affected by the facility's thermal discharge plume and it constitutes the area that extends in the water in any direction 200 feet from the thermal discharge outfalls. The highest surface temperatures have been documented in the mixing zone. The mixing zone is part of the larger area affected by the facility's thermal plume. As discussed earlier, temperatures at the edge of this mixing zone may not exceed 84°F, according to the existing permit, but instream temperatures were shown to be much lower, with a representative high surface temperature of 24.0°C (75.2°F) to 25.0°C (77.0°F) or below (Figure 6-2). Recorded on a reasonably "worst case day" of thermal contribution by the facility (August 31, 2010), this represents a maximum delta T of from 1°C (1.8°F) to 2°C (3.6°F) above the ambient temperature.

Because of the configuration of the discharge, the high energy currents in the Piscataqua River, and the assumption that more mixing takes place as the thermal discharge moves into the receiving water from the outfall, the thermal influence of the discharge is expected to dissipate past the 200-foot mixing zone boundary. This is confirmed in Figure 6-2. Although elevated temperatures above ambient may still be detected greater than 200 feet away from the discharge, the extent of the temperature increases is expected to be much less. Since temperatures within the mixing zone are not expected to adversely affect the biological community, the more diluted areas of this extended area affected by the thermal plume is also not expected to adversely affect the biological community.

EPA assessed the scope of Schiller Station's thermal plume based on the thermal monitoring data discussed above. The scope of the plume refers to the area and depth of the river which experiences temperature changes as a result of the Facility's discharges, as well as the intensity of those temperature changes. As explained above, the thermal monitoring data was collected during the summer and fall. The one day "snap-shot" characterization of the thermal plume, conducted on August 31, 2010, is representative of reasonably worst case conditions.

This thermal monitoring data reveals that Schiller Station's thermal discharge plume is relatively modest in scope, even under worst case summer conditions (Figure 6-2). This is not surprising in light of the volume, velocity and cold temperature of Piscataqua River flows in the area of Schiller Station relative to the moderate nature of the Facility's thermal discharge. Schiller Station's DMR data shows a maximum discharge temperature of 95ºF and a maximum reported discharge flow rate of approximately 120 MGD for Outfalls 002, 003 and 004 combined. Furthermore, outside of the peak summer operations represented in the monitoring data, Schiller Station in recent years has typically operated at a much lower capacity factor and, accordingly, would commonly produce a far lesser thermal plume. As indicated in the Zone of Passage discussion to follow, along with Figure 6-2 and the discussion of thermal data, the thermal plume neither reaches very far, nor is very hot, and it does not penetrate deeply into the water column.

Zone of Passage with the Current Thermal Discharge

From reviewing the available information, EPA concludes that under the existing permit conditions, Schiller Station's thermal discharge plume will not create a significant impediment to fish or other organisms migrating, or otherwise seeking to swim, past the Facility. This is because the thermal plume extends neither far nor deep enough into the river at high enough temperatures to significantly interfere with fish passage.

The total bank-to-bank width of the Piscataqua River, measured at the narrowest point of the river, perpendicular to the flow in the vicinity of the Schiller Station outfalls, is approximately 850 feet. Water temperature data shows, however, that the highest temperature "hot spot" recorded within the 200-foot mixing zone designated by the existing permit is only 82.4ºF, and this peak temperature occurs at a small point within the mixing zone. The area outside this mixing zone, while required to meet a temperature limit below 84ºF, is only minimally affected by the thermal discharge and maintains ambient river temperatures for the majority of the remaining width of the river. An examination of Figure 6-2 indicates that a rise in surface temperature of up to a degree Celsius, from 23.1ºC to 24ºC (approximately a 1.7ºF rise; 73.6ºF to 75.2ºF) over ambient river temperature is evident in a localized area upstream from the discharge. This is a minimal, localized surface temperature increase, likely of short duration. The high energy tidal flow of the Piscataqua River is moving water past the discharge, fostering vigorous mixing. A transitory temperature increase of this magnitude is expected to have an insignificant impact on fish passage in the river and the aquatic community in the vicinity of the discharge. A more detailed discussion of the potential impacts of various absolute water temperature as well as delta T's will be included later in this section.

It must be noted that the requirements of the mixing zone specified by the existing permit do not stipulate that ambient temperatures must be achieved at the edge of the mixing zone, but rather a maximum temperature of 84ºF must not be exceeded. Under the reasonably worst case conditions observed on August 31, 2010, the maximum mixing zone temperature allowed would have resulted in a delta T of approximately 10.6ºF at the edge of the mixing zone. An inspection of the thermal map confirms that the majority of the surface area associated with the New Hampshire side of the river, in addition to all of the Maine side of the river (it is reasonable to assume), maintained ambient river temperatures.

In addition, as detailed above, the thermal plume is discharged from surface outfalls and is buoyant. As a result, the plume's effect on water temperature decreases with greater depth in the river. Indeed, the thermal plume is primarily a near-surface feature expected to occupy only a small portion of the water column and not to contact sediment or benthic species. This is confirmed by a three-month data set of temperatures collected from temperature monitors placed near the surface, at mid-depth and near the bottom of the river. Monitors at mid-depth and near bottom recorded cooler temperatures than the surface monitors (Table 6-B).

The width and depth of the river unaffected by the Facility's thermal plume allows sufficient zone of passage for both swimming and drifting organisms. Swimming organisms have a large section of the river available in the event an avoidance response is triggered by the thermal plume. Such avoidance behavior due to elevated temperatures would only occur, if at all, in a very small area within the mixing zone. In EPA's judgment, the thermal discharge represents little or no impediment to fish migration up or down the Piscataqua River. Moreover, EPA concludes that the thermal plume will not degrade fishing opportunities in the vicinity of Schiller Station.

With regard to drifting organisms, the majority of early life stages of fish in the Piscataqua River will pass by Schiller Station without coming in contact with the plume. Although a percentage of drifting organisms moving along the southern bank (New Hampshire side) of the river at the surface may encounter the thermal discharge, the high energy tidal currents of the Piscataqua move water quickly past the Schiller outfalls under most tidal conditions. For example, assuming the entire 200-foot wide mixing zone contained a delta T of 2°C (3.6°F) above ambient conditions (projected worst case conditions). At the maximum tidally induced river current of 4.9 feet per second, a drifting organism would move through the mixing zone in 41 seconds. Over 80% of the tidal cycle is expected to move a drifting organism through the mixing zone in from under one minute to 13 minutes. The maximum expected exposure of a drifting organism to the mixing zone is projected to be approximately 33 minutes, during slack tides. This quick transport past the mixing zone, under most conditions within a matter of minutes, will limit the exposure time of the organisms to any elevated water temperatures.

In broad terms, sudden changes in temperature are believed to be deleterious to fish life, with abrupt changes of 5°C (9°F) or greater likely to be harmful (Snyder 2011). Tolerance of fish to changes in temperature is species specific, based on acclimation temperature, the life stage, the condition of the individual fish and the time of exposure to the elevated temperature, among other factors. As discussed above, a delta T of 2°C (3.6°F), was the highest delta T observed under reasonably worst case conditions on August 31, 2010.

While specific temperature tolerance information was not assembled for every RIS species, a general review of the literature supports EPA's judgment that drifting organisms that encounter the thermal plume will not experience an adverse effect.

For example, winter flounder larvae were exposed for 13 minutes to a delta T from 8°C (14.4°F) to 14°C (25.2°F) and the larvae were then observed for 96 hours. Only larvae exposed to the delta T of 14°C yielded mortality different from the control organisms (Valenti, 1974).

In another experiment, three species of flounder larvae were exposed to a delta T of 12°C (21.6°F) under a range of exposure times and did not show significant decreased survival (Hoss et al. 1973).

Two week old striped bass larvae were exposed to a delta T of 7°C (12.6° F) for 30 minutes (acclimation temperature of 22°C; 71.6°F) without mortality. However, delta T's of 9°C (16.2°F) and 11°C (19.8°F) caused approximately 50% mortality with an exposure of 5 to 6 minutes (Coutant and Kedl, 1975).

Blueback herring eggs were exposed to a delta T of 10°C (18°F) for exposure times of 5, 30 and 180 minutes (Koo and Johnson, 1978) without mortality of the hatched larvae.

The literature did indicate that at least for some species, an absolute temperature above 30°C (86°F) was likely to result in mortality, even under limited exposure times. For example, an exposure of striped bass larvae to temperatures of 31C° (87.8°F) and 31.9°C (89.4°F) for as little as 5 to 6 minutes resulted in increased mortality.

This general review reinforces the expectation that drifting organisms in the Piscataqua River exposed to an increase in temperature for several minutes will experience no detrimental effects.

Furthermore, comparing the peak temperatures within the mixing zone of the thermal plume to the critical temperatures indicated in the literature for the RIS, EPA concludes that the thermal plume is unlikely to have caused appreciable harm to the BIP in the past and is unlikely to do so in the future. When comparing thermal plume temperatures with the temperature sensitivity of species found in the area of the facility, two important factors must be considered.

First, the modest size of the mixing zone and thermal plume as a whole, along with the high energy currents of the river, only allows exposure of organisms to elevated temperatures for a short period of time (see the drifting organism discussion above). Controlled experiments published in the scientific literature to obtain thermal tolerance information for specific species of fish are generally based on a 24-hour, 48-hour or 96-hour exposure of the organism to the elevated temperature, with no opportunity for avoidance of the temperature. As discussed above, this is not directly applicable to the brief thermal exposure (possibly a few minutes) an organism is likely to experience in the mixing zone or overall thermal plume of Schiller Station. Therefore, the thermal tolerance data obtained from the literature may be of limited value.

Second, once again, the modest size of the mixing zone and thermal plume as a whole compared with the unaffected area of the Piscataqua River is a factor. For many fish species, avoidance temperatures are triggered well before the fish is exposed to potentially lethal temperature values. Because the Piscataqua River in the area of the station retains a large portion of the river that is unaffected by the thermal plume, adult and juvenile fish species have the opportunity to easily avoid the elevated water temperature long before potential lethality is a consideration, if at all. This avoidance behavior is not judged to adversely affect the fish species.

A general review of thermal tolerance information for the Schiller Station RIS life stages expected to be present in the Piscataqua River in late summer noted that young-of-year alewife acclimated to 75.2°F showed a no effects level (100% survival) at a test temperature of 84.2°F

(Otto, 1976). Cunner showed an upper sublethal temperature in the range of 78.8°F to as high as 89.6°F (Auster, 1989). Adult striped bass and adult bluegill acclimated to 73.4°F demonstrated a loss of equilibrium at approximately 97°F. Adult striped bass have been found to tolerate temperatures as high as 84ºF without visible signs of stress.

To evaluate potential impacts to adult species or early life stages of fish expected to be present in the vicinity of Schiller Station outside of the summer months, EPA used the in-stream delta T ranges documented for the summer season (2°F to 4°F delta T in most of the mixing zone, with a localized hot spot as high as 9°F above ambient) combined with documented ambient river temperatures for the months where the appropriate species or life stages are expected to be present. It would have been inappropriate to use the maximum summer mixing zone temperatures observed in August to assess cooler ambient water temperature conditions.

EPA has taken a conservative approach to the thermal evaluation during other seasons. It is likely the facility will not run at high summer capacity and will therefore experience a lower delta T across the condensers in the fall, winter and spring, when the once through cooling is more efficient. However, EPA is using the summer season delta T and facility operation for this discussion. Although Figure 6-2 represents summer conditions, EPA assumes that when the facility is operating at a high capacity during other times of the year, the general pattern and delta T configuration of the temperature contours of the mixing zone will be generally similar. Therefore, Figure 6-2 is a reasonable reference point as to the delta T contours likely to be seen in the mixing zone during other times of the year.

For example, adult rainbow smelt inhabit the lower Piscataqua River in the spring. Smelt have been tested at temperatures as high as 68°F without mortality. (Woytanowski and Coughlin, 2013), but under an acclimation temperature of 52°F, the upper incipient lethal temperature is reported to be 64°F (Evans and Loftus 1987). The acclimation temperature of 52°F generally corresponds to Piscataqua River ambient temperatures during the month of April. (Schiller Station DMR data, 2000 - 2012). Assuming the thermal mixing zone would contain delta T ranges similar to levels documented for the summer season (2°F to 4°F delta T in most of the mixing zone, with a localized hot spot as high as 9°F above ambient), mixing zone temperatures would range from 54°F to as high as 61°F during the month of April. These temperatures are still below the smelt upper incipient lethal temperature of 64°F.

EPA also reviewed potential impacts, if any, to Atlantic sturgeon, a federally protected species that may be in the action area of the facility. Although sturgeon are a benthic species and will not likely come in contact with a surface thermal plume, this review is designed to provide a discussion of temperatures expected in the overall action area of the facility. The preferred temperature ranges and upper and lower lethal temperatures for Atlantic sturgeon are not well established. Atlantic sturgeon juveniles in the Hudson River have been documented to move downstream as the river warms in the spring, seeking temperatures of approximately 75°F to 76°F. Once again, assuming the thermal mixing zone during any season would contain delta T ranges similar to levels documented for the summer season (2°F to 4°F delta T in most of the mixing zone, with a localized hot spot as high as 9°F above ambient), mixing zone temperatures would likely be from 60°F to as high as 67°F during the month of May. This is based on an average Piscataqua River ambient temperature in May of approximately 58°F (Schiller Station DMR data, 2000 - 2012). Thus, elevated near-surface water temperatures are unlikely to thermally stress Atlantic sturgeon found in the vicinity of Schiller Station.

As discussed below, EPA also considered the potential impact of the thermal mixing zone on early life stages of organisms that may drift into the thermal plume. The presence of eggs and larvae in the Piscataqua River peaks in the month of June, according to entrainment sampling at Schiller Station. Using the Facility's DMR data from 2000 to 2012, the monthly average ambient river temperature in the Piscataqua River in June ranged from 63°F to 69°F, with an overall average for the thirteen years of approximately 66°F. A representative ambient temperature of 66°F was selected for June for the purposes of this discussion. Also, as discussed previously, EPA conservatively assumed the thermal mixing zone would contain delta T ranges similar to levels documented for the summer season (2°F to 4°F delta T in most of the mixing zone, with a localized point as high as 9°F above ambient). This approach results in projected near surface mixing zone temperatures in the range of 68°F to 70°F for most of the mixing zone, with a localized point of 75°F during the month of June. A general literature review of temperature sensitivity of the early life stages of relevant fish species noted a 50% habitat suitability of blueback eggs and larvae at approximately 78ºF. (Pardue *et al*., 1983). For tautog, a close relative of the cunner, Olla and Samet (1978) reported that eggs incubated above 68°F resulted in embryos with anatomical deformities. Atlantic mackerel larvae have been collected at temperatures only as high as approximately 72°F (NOAA September 1999). These temperature thresholds do not exceed the range of near surface temperatures expected in the majority of the mixing zone. As discussed previously, the experiments conducted in the case of tautog eggs use an incubation time of over 24 hours. Any exposure of the small number of tautog eggs to the hottest point of the mixing zone will likely last minutes and result in a minimal chance of an adverse impact. For the same reasons of limited opportunity of exposure and the short duration exposure, no adverse impacts to mackerel species are expected to occur as well.

There does also seem to be an absolute temperature range, in addition to a delta T range, beyond which even a minimal time exposure can cause harm to fish species. For example, an exposure of striped bass larvae to temperatures of 31C° (87.8°F) and 31.9°C (89.4°F) for as little as 5 to 6 minutes resulted in increased mortality. As a general guideline to maintain survival in temperate areas, one approach to consider is to manage thermal discharges so that large areas are not heated above 30°C (86°F) for long periods (Cairns, 1956).

Phytoplankton similar to the tiny, free floating plant life found in the lower Piscataqua River have been shown to be influenced by an increase in water temperature. Ilus and Keskitalo (2008) observed that phytoplankton exposed to water with a temperature elevated by approximately 3.6°F for an extended period demonstrated increased primary productivity and overall biomass. A shift in the relative abundance of the phytoplankton community was also noted. Research on short duration exposure of phytoplankton to elevated temperatures was not available. In the case of phytoplankton, EPA has judged that the anticipated brief exposures to the range of delta T's in the mixing zone (2°F to 9°F) will not result in detectable mortality or otherwise meaningful levels of mortality. In addition, since the thermal plume is a surface feature and does not directly contact the benthic habitat that might contain anchored plant life, no mortality is anticipated in this area. At the same time, EPA also does not regard Schiller Station's thermal discharge to the Piscataqua River to pose a threat to the BIP as a result of fueling phytoplankton growth because of the limited scope of the thermal plume.

It must be noted, however, that there is a degree of unavoidable uncertainty over the extent to which the thermal sensitivity temperatures referenced in this section will reliably predict potential thermal effects on the various life stages of fish in the Schiller Station mixing zone. These temperatures are primarily derived from laboratory experiments designed to evaluate the biological impacts of elevated water temperatures on various life stages of fish by maintaining the subject organisms in the warmer test water for hours, or even days, in order to determine a stress response. Free floating eggs and larvae in the vicinity of Schiller Station, however, would likely only be exposed to elevated near-surface temperatures in the mixing zone for a matter of minutes at most because of the active tidal currents of the Piscataqua River. Furthermore, under actual river conditions, motile organisms can swim away from any encounter with a small area of disfavored water temperatures. Therefore, the effects of the Schiller Station thermal discharge would be expected to be less than would be predicted by the literature.

Other Potential Effects on the BIP from the Current Thermal Discharge

The reach of the lower Piscataqua River receiving Schiller Station's thermal discharge is not considered a high value spawning or nursery area. The industrialized shoreline and high energy tidal currents in the area of Schiller Station do not provide high quality spawning or nursery habitat for indigenous aquatic species. Anadromous nursery areas are usually found in low flow aquatic habitats with structure sufficient to afford shelter for young-of-year and juvenile fish species. This segment of the Piscataqua River does not have these features. Furthermore, to the extent that any benthic (at a depth of approximately 30 feet) nursery habitat did exist in the vicinity of Schiller Station's discharge, the buoyant thermal plume would be unlikely to affect the benthic habitat. While EPA expects that some spawning likely takes place in the area of the Schiller Station discharges – for example, based on entrainment data presented in Table 8-A, cunner may spawn in these waters – the relatively limited scope of the thermal plume is likely to have limited, if any, effect on such spawning. In addition, early life stages (ELS; eggs and larvae) of many species are represented in entrainment sampling at Schiller Station and monitoring data from the EP Newington Energy facility, indicating successful spawning in the larger habitat of the Piscataqua River and Great Bay.

EPA is not aware of evidence suggesting that Schiller Station's existing thermal discharge has undermined the protection and propagation of the BIP, either in terms of the overall community of organisms or the populations of specific species that are part of the BIP. EPA is also not aware of any data suggesting that the local community of aquatic organisms, or populations of individual indigenous species, is less healthy in the relevant area of the Piscataqua River than in other similar waters in the region. Moreover, as discussed above, the temperatures in the Schiller Station thermal plume are not high enough – relative to the delta T, short exposure time information and critical temperatures for the RIS – to cause adverse impacts to species in the receiving water.

EPA is also unaware of any evidence suggesting that Schiller Station's thermal discharge has resulted in the dominance of nuisance species in the receiving water. Such an effect is not expected given the relatively small scope of the Facility's thermal discharge plume. Impingement and entrainment records from Schiller Station and monitoring data from the EP Newington Energy facility indicate that marine, riverine and anadromous RIS, at all life stages, are present in the river, and the fish assemblage is not dominated by nuisance species. Taking all of this into account, EPA finds that Schiller Station's thermal discharge has not harmed the BIP in the relevant area of the Piscataqua River and would not be expected to do so in the future.

EPA has reached this conclusion taking into account the length of time that Schiller Station has maintained its thermal discharges and the nature of those discharges, as discussed above. *See* 40 C.F.R. § 125.73(c)(2). Furthermore, EPA also has taken into account whether appreciable harm might have been caused by the Facility's thermal discharge interacting with other types of pollutant discharges or other thermal discharges. With regard to the former, EPA does not see any pollutants being discharged by Schiller Station or other dischargers that would combine with the Facility's thermal discharge in a way that would have appreciably harmed the BIP or that would undermine assurance of the protection and propagation of the BIP going forward. With regard to the latter, EPA considered the thermal discharges from PNSH's Newington Station power plant and the EP Newington Energy, LLC, power plant, both of which lie along the Piscataqua River upstream of Schiller Station. Neither of these discharges, however, presents a significant adverse cumulative thermal effect in conjunction with Schiller Station's discharge. Newington Station currently operates only infrequently and, therefore, contributes little heat to the river (*see* Newington Station Capacity Factor Information (AR-253)). The EP Newington Energy facility operates with a closed-cycle cooling system using wet cooling towers and has only a relatively small thermal discharge (specifically 4.0 MGD of cooling tower blow down, *see* NPDES Permit No. NH0023361 (available on EPA's website at http://www.epa.gov/region1/npdes/permits/2012/finalnh0023361permit.pdf)

PSNH Request to Increase Effluent Temperature Limit to 100ºF

PSNH has requested that EPA raise the permit's temperature limit to 100ºF for its cooling water discharges. EPA proposes to reject this request as part of the draft permit. The primary reason for this rejection is that PSNH has not made an adequate demonstration, or really any demonstration at all, that the protection and propagation of the BIP will be assured with discharges at that level. All the data and analysis regarding conditions under the existing permit involve discharges of 95ºF or less and do not establish that the BIP will be adequately protected with discharges up to 100ºF. Raising the discharge temperature would increase the amount of heat discharged to the river and would change the scope of the thermal discharge plume to some unknown extent. As a result, Schiller Station has not carried its burden to demonstrate to EPA that the protection and propagation of the BIP would be assured with a temperature limit of 100ºF applied pursuant to a CWA § 316(a) variance. Furthermore, EPA would expect to see higher temperatures within a larger area than exists with the current temperature limit of 95ºF. As a result, there would be a greater chance of adverse effects to any swimming or drifting organisms that contact unfavorable temperatures from the thermal discharge plume.

The permittee has also requested that temperature limits be removed at outfall 001. EPA proposes to reject this request because detailed supporting information and a justification was not included with the request.

Conclusion

Based on the above analysis, EPA concludes that Schiller Station's existing thermal discharge has not caused appreciable harm to the BIP. Moreover, EPA concludes that the record provides reasonable assurance that with the same thermal discharge limits in place, the Facility's thermal discharge will not cause such harm to the BIP in the future – in other words, will allow for the protection and propagation of the BIP. Indeed, the Facility's declining capacity factors indicate that, if anything, Schiller Station's thermal discharges will decrease overall in the future, though EPA cannot be sure of whether or when such reductions may occur.

Thus, EPA's new draft permit for Schiller Station proposes to retain the thermal discharge limits from the existing permit. Consistent with the Facility's request, EPA is proposing to issue these permit limits pursuant to a variance under CWA § 316(a).

EPA could lawfully end its analysis in support of the permit's thermal discharge limits here based on granting Schiller Station's request for a renewal of its CWA § 316(a) variance. These variance-based limits would supplant any more stringent technology-based and/or water quality-based limits that would otherwise be prescribed under CWA § 301. EPA decided, however, to present an assessment of technology-based and water quality-based requirements in this Fact Sheet because of public interest in this permit. Not only does PSNH obviously have strong interest in this permit but wider public interest has been evidenced by the Sierra Club's law suit against EPA filed in 2011 seeking to accelerate the Agency's development and issuance of this permit. EPA anticipates that if it only addresses thermal discharge requirements under CWA § 316(a), then comments and questions might be raised about what the technology-based and water quality-based permit requirements would have been in the absence of a CWA § 316(a) variance. Therefore, EPA decided to anticipate such questions by providing this additional analysis in the Fact Sheet.

6.4.5 Technology-Based Thermal Discharge Limits

Turning to technology standards, the statute classifies heat as a "nonconventional" pollutant subject to Best Available Technology economically achievable (BAT) standards. *See* 33 U.S.C. §§ 1311(b)(2)(A) and (F). *See also* 33 U.S.C. §§ 1311(g)(4), 1314(a)(4) and 1362(6). As noted previously in this Fact Sheet, the ELGs for the Steam Electric Power Generating Point Source Category, which are found at 40 C.F.R. Part 423, apply to Schiller Station because this facility meets the ELG's definition of a steam electric power plant. This definition covers facilities that, among other things, burn a fossil fuel (coal, oil, gas) as its fuel source. Since the Steam Electric ELGs do not include categorical standards for thermal discharge, 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.

With regard to technologies for reducing thermal discharges, EPA is aware that closed-cycle cooling towers, if available for use at the site, would substantially reduce (*i.e.*, by approximately 95%) thermal discharges from a facility like Schiller Station. While the Temperature and Temperature Rise limits might remain the same (or close to the same), closed-cycle cooling would allow for an approximately 95% reduction in the volume of the thermal discharge, which, in turn, would result in an approximately 95% reduction in the amount of heat (in BTUs) discharge to the river. Therefore, thermal discharge limits based on this technology would be substantially more stringent than the current limits, which are compatible with Schiller Station's existing open-cycle cooling system. EPA's evaluation of the closed-cycle cooling option is set forth below.

In setting BAT effluent limits 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; and (6) non-water quality environmental impacts (including energy requirements). Finally, based upon all available information, EPA also considers the appropriate technology for the category or class of point sources of which the applicant is a member and 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 this BPJ determination of the BAT for controlling thermal discharges at Schiller Station.

For the same power plant, an "open-cycle" (or "once-through") cooling system would produce much higher levels of thermal discharge (and water withdrawal) than a closed-cycle or partially closed-cycle cooling system. Schiller Station currently operates with an open-cycle cooling system. As a result, essentially the entire volume of the facility's cooling water (and thus the entire amount of waste heat) is discharged to the receiving water. "Closed-cycle" cooling systems reduce thermal discharges (and cooling water withdrawals) by using cooling water to condense the steam but then, instead of discharging the heated water directly to a receiving water body, they have a cooling system that removes most of the waste heat from the cooling water so that it can be reused for additional cooling.[14] Typically, the waste heat is dissipated to the atmosphere through a cooling tower or cooling pond of some type.

Given that Schiller Station is an existing facility that would require retrofitting to achieve technologically-driven improvements, EPA has investigated 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 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.[15] 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.

Consistent with the retrofit application of closed-cycle cooling at these other facilities, EPA has

[14] Cooling towers can also be used in a "helper tower" configuration, which involves using cooling towers to "chill" the heated water prior to discharge, but does not involve reusing the cooling water. Therefore, this approach does not reduce cooling water withdrawals.

[15] For example, retrofitting all four generating units at Brayton Point Station in Massachusetts reduced the heat load to Mount Hope Bay (the receiving water) by approximately 96%.

determined that converting Schiller Station's cooling system to a closed-cycle system using wet, mechanical draft cooling towers would be the BAT for the reduction of thermal discharges at the Facility. As part of its determination of the BTA for Schiller Station'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* Section 9.5.4 below). EPA relies upon and incorporates by reference that technological analysis here.[16] With a wet cooling tower system, Schiller Station's remaining and much reduced thermal discharge (consisting of cooling tower blowdown) would be discharged to the Piscataqua River, subject to specific effluent limits consistent with the technology. With this new cooling technology, Schiller Station's highest volume of thermal discharge would be approximately 1.5 MGD in the summer months, at a temperature of 98°F, assuming an intake temperature of 82°F. This would represent a greater than 97% reduction in flow volume and 95% reduction in heat load from the current two pump operation at a delta T of 20°F.[17]

Although EPA has found that thermal discharge limits based on retrofitting closed-cycle cooling would satisfy the BAT standard at Schiller Station, the draft permit's limits are not based on this technology. This is because, as discussed above, EPA has also concluded that a less stringent set of limits –namely, the thermal discharge limits in the existing permit—would satisfy CWA § 316(a) and support renewal of Schiller Station's existing § 316(a) variance. In other words, technology-based temperature limits based on the installation and operation of a closed-cycle cooling system at Schiller Station would be more stringent than necessary to assure the protection and propagation of the BIP, and the alternative thermal discharge limits will satisfy CWA § 316(a)'s standard for the protection of aquatic life. The thermal discharge limits proposed in the draft permit under CWA § 316(a) are not technology-based, but, as it turns out, they would allow Schiller Station to continue to use its open-cycle cooling system. PSNH would be free, however, to convert to closed-cycle cooling as a method of meeting its permit limits if it wanted to.

6.4.6 Water Quality-Based Thermal Discharge Limits

As explained above, a CWA § 316(a) variance can authorize alternative thermal discharge limits less stringent than what otherwise would be required based on federal technology standards and state water quality standards under CWA § 301. Because EPA is proposing the draft permit's thermal discharge requirements based upon renewal of an existing CWA § 316(a) variance, determining technology-based and water quality-based requirements is not strictly necessary for this draft permit. Nevertheless, as with the technology-based requirements discussed above, EPA decided to determine the water quality-based requirements that would apply to Schiller Station's thermal discharges in the absence of a variance in order to enable the Agency to consider the requirements that the state's water quality standards would call for and to address

[16] *See also* BAT determinations by Region 1 for Brayton Point Station (discussed in *In re Dominion Brayton* Point, 12 E.A.D. at 538-548); for Merrimack Station (Fact Sheet, Attachment D, Section 7.5, http://www.epa.gov/region1/npdes/merrimackstation/pdfs/MerrimackStationAttachD.pdf); General Electric Aviation (Lynn, MA) (Fact Sheet, Section V.C.8.a, http://www.epa.gov/region1/npdes/permits/draft/2011/draftma0003905fs.pdf); and Mt. Tom Station (Fact Sheet, Section 7.1, http://www.epa.gov/region1/npdes/permits/draft/2014/draftma0005339permit.pdf).

[17] Ultimately, the waste heat load discharged by the Facility in BTUs is a function of the volume of thermal effluent discharge and the Delta-T.

possible public interest in the application of state water quality standards.

6.4.6.1 *Determination by NHDES*

EPA generally defers to a state's application of its own water quality standards as reflected in a state certification under CWA § 401(a)(1). *See In the Matter of General Electric Company, Hookset, New Hampshire*, 4 E.A.D. 468, 470 (1993) ("Challenges to permit limitations and conditions attributable to State certification will not be considered by the Agency . . . [and instead] must be made through applicable State procedures."); *In the matter of Lone Star Steel Company,* 3 E.A.D. 713, 715 (1991). Yet, although EPA generally does not "look behind" State certification conditions, if EPA believes that a State has committed "clear error" by failing to include more stringent conditions required by the State's own standards, then EPA *must* include the more stringent conditions in order to comply with CWA § 301(b)(1)(C). *In re Ina Road Water Pollution Control Facility, Pima County, Arizona*, NPDES Appeal 84-12 (Nov. 6, 1985), at 3. *See also In re American Cyanamid Col., Santa Rosa Plant*, NPDES Appeal No. 92-18 (EAB Sept. 27, 1993), at 14; *In re City of Jacksonville, District II Wastewater Treatment Plant*, NPDES Appeal No. 91-19 (EAB Aug. 4, 1992) at 16.

In a letter dated August 7, 2013, EPA asked NHDES whether a renewal of the existing permit's thermal discharge requirements would satisfy the state's water quality standards. More specifically, EPA wrote:

> EPA is seeking concurrence from NHDES and NHFGD that these 1990 thermal limits attain New Hampshire Surface Water Quality Standards and that the decision to use these thermal limits is supported by New Hampshire state policy and is protective of the existing uses of the receiving water.

In response, NHDES reviewed both the "snap-shot" data collected by EPA and the continuous temperature data collected by Schiller Station's in-stream thermistors and then sent EPA a letter dated September 4, 2013, stating that:

> [w]e have reviewed the thermal study, which appears to have been conducted under reasonable worst-case conditions, and have considered changes at the facility since the 1990 permit was issued, including the decommissioning of Unit 3. Based on that review, as well as discussions with the NH Department of Fish and Game, we agree that the thermal limits contained in the 1990 permit can be continued in the reissued permit.

Based on EPA's analysis of the application of the NHWQS, as detailed below, EPA sees no reason to question the state's conclusion that renewing the existing permit limits will satisfy the State's standards. At this point in this permit proceeding, NHDES has yet to provide a CWA § 401 certification for the proposed NPDES permit for Schiller Station, but based on the State's conclusion in the letter quoted above, and EPA's analysis below, EPA expects that the State will certify the permit at the appropriate time.

6.4.6.2 *Relevant Provisions of New Hampshire's Water Quality Standards*

Aspects of New Hampshire's surface water quality standards (NHWQS) relevant for thermal discharges are discussed in detail above in Section 5.3 of this document. As this discussion explains, the NHWQS require that:

> [a]ll surface waters shall be restored to meet the water quality criteria for their designated classification including existing and designated uses, and to maintain the chemical, physical, and biological integrity of surface waters.

N.H. Code R. Env-Wq 1703.01(b). "Biological integrity" is defined to mean:

> . . . the ability of an aquatic ecosystem to support and maintain a balanced, integrated, adaptive community of organisms having a species composition, diversity, and functional organization comparable to that of similar natural habitats of a region.

Env-Wq 1702.07. Consistent with these provisions, the NHWQS also mandate that all the State's waters meet a water quality criterion for "Biological and Aquatic Community Integrity," which requires that:

> (a) The surface waters shall support and maintain a balanced, integrated, and adaptive community of organisms having a species composition, diversity, and functional organization comparable to that of similar natural habitats of a region.
> (b) Differences from naturally occurring conditions shall be limited to non-detrimental differences in community structure and function.

Id. 1703.19(a) & (b). The definition of biological integrity in the NHWQS is generally consistent with EPA's definition of the terms "balanced, indigenous population" and "balanced, indigenous community" in its regulations promulgated under CWA § 316(a). *See* 40 C.F.R. § 125.71(c).

Furthermore, with specific regard to thermal discharges, New Hampshire's environmental statutes and WQS regulations combine to dictate that for Class B waters:

> [a]ny stream temperature increase associated with the discharge of … cooling water … shall not be such as to appreciably interfere with the uses assigned to this class. The waters of this classification shall be considered as being acceptable for fishing, swimming and other recreational purposes and, after adequate treatment, for use as water supplies.

RSA 485-A:8, II. S*ee also* Env-Wq 1703.13(b). The statute also provides that:

> [t]here shall be no disposal of … waste into said waters except those which have received adequate treatment to prevent the lowering of the biological, physical, chemical or bacteriological characteristics below those given above [for dissolved oxygen, bacteria and the absence of objectionable physical characteristics], nor shall such disposal of … waste be inimical to aquatic life or to the maintenance of

> aquatic life in said receiving waters.

RSA 485-A:8, II. In addition, the NHWQS also provide that:

> [i]n prescribing minimum treatment provisions for thermal wastes discharged to interstate waters, the department shall adhere to the water quality requirements and recommendations of the New Hampshire fish and game department, the New England Interstate Water Pollution Control Commission, or the United States Environmental Protection Agency, whichever requirements and recommendations provide the most effective level of thermal pollution control.

N.H. Rev. Stat. Ann. § 485-A:8(VIII). *See also* Env-Wq 1703.13(b). This provision applies to Schiller Station because the Piscataqua River is an interstate waterway.

As also explained in Section 5.3 above, the NHWQS allow water quality-based NPDES permit limits to be set based on site-specific "mixing zones," if the state's mixing zone criteria would be satisfied. *See* 40 C.F.R. § 131.13; Env-Wq 1707.02. The NHWQS define "mixing zones" as follows:

> Env-Wq 1702.27 "Mixing zone" means a defined area or volume of the surface water surrounding or adjacent to a wastewater discharge where the surface water, as a result of the discharge, might not meet all applicable water quality standards.

Env-Wq 1702.27. Thus, with a mixing zone, discharges are allowed to cause exceedances of applicable state water quality criteria within the delineated zone as long as all water quality criteria will be met at the boundary of the mixing zone and certain specific criteria are satisfied within the zone. Env-Wq 1702.27 and 1707.02. New Hampshire's WQS regulations state that:

> … [f]or Class B waters, the department shall designate a limited area or volume of the surface water as a mixing zone if the applicant provides sufficient scientifically valid documentation to allow the department to independently determine that all criteria in Env-Wq 1707.02 have been met.

Env-Wq 1707.01(b). The state regulations further specify the following mixing zone criteria:

> Env-Wq 1707.02 Minimum Criteria. Mixing zones shall be subject to site specific criteria that, as a minimum:
>
> (a) Meet the criteria in Env-Wq 1703.03(c)(1);[18]
> (b) Do not interfere with biological communities or populations of indigenous species;
> (c) Do not result in the accumulation of pollutants in the sediments or biota;
> (d) Allow a zone of passage for swimming and drifting organisms;
> (e) Do not interfere with existing and designated uses of the surface water;
> (f) Do not impinge upon spawning grounds and/or nursery areas of any

18 Env-WQ 1703.03(c)(1)(d) prohibit the discharge of substances that would result in the dominance of nuisance species.

indigenous aquatic species;
(g) Do not result in the mortality of any plants, animals, humans, or aquatic life within the mixing zone;
(h) Do not exceed the chronic toxicity value of 1.0 TUc* at the mixing zone boundary
*Env-Wq 1702.50 "Toxic unit chronic (TUc)" means the reciprocal of the effluent dilution that causes no unacceptable effect to the test organisms by the end of the chronic exposure period. The TUc can be calculated by dividing 100 by the chronic NOEC value.
;and
(i) Do not result in an overlap with another mixing zone.

Env-Wq 1707.02.

EPA has considered the NHWQS, including the state's mixing zone criteria, as well as pertinent thermal data, thermal model projections and biological information concerning the health of the relevant community of aquatic organisms and the manner in which they may be affected by changes in in-stream water temperatures and other cumulative stressors. From this evaluation, as discussed below, the agencies conclude that it would be appropriate to retain the existing permit's thermal discharge limits under the NHWQS. Of course, as explained farther above, EPA is proposing to base the permit's thermal discharge limits on a variance under CWA § 316(a).

6.4.6.3 *The Proposed Thermal Discharge Limits Will Satisfy NHWQS Even Without Formally Delineating a Mixing Zone*

EPA is proposing to retain the existing permit's thermal discharge limits pursuant to the renewal of the Facility's existing CWA § 316(a) variance, but these limits will also satisfy NHWQS. The NHWQS do not specify an in-stream numeric temperature criterion for Class B waters, such as the segment of the Piscataqua River receiving Schiller Station's discharge, but they do provide that:

> [i]n prescribing minimum treatment provisions for thermal wastes discharged to interstate waters, the department shall adhere to the water quality requirements and recommendations of the New Hampshire fish and game department, the New England Interstate Water Pollution Control Commission, or the United States Environmental Protection Agency, whichever requirements and recommendations provide the most effective level of thermal pollution control.

N.H. Rev. Stat. Ann. § 485-A:8(VIII). This provision applies to Schiller Station's thermal discharges because the Pisquataqua River is an interstate waterway. The most effective limits for thermal discharge control recommended by any of the listed agencies are the CWA § 316(a) variance-based limits proposed by EPA. Therefore, these limits satisfy this provision of the NHWQS. Moreover, as quoted above, NHDES sent EPA a September 4, 2013, letter indicating that it had consulted with NH Fish & Game and that the two State agencies agreed that the existing thermal discharge limits could also be retained under the State's water quality standards.

In addition, EPA has determined under CWA § 316(a) that the proposed thermal discharge limits will be adequate to assure the protection and propagation of the BIP in the Piscataqua River estuary. EPA concludes that this same analysis establishes that New Hampshire's biologically-focused narrative water quality criteria will also be satisfied by the proposed permit conditions. For example, EPA's analysis indicates that these limits will satisfy the NHWQS's mandate that "[a]ll surface waters shall provide, wherever attainable, for the protection and propagation of fish, shellfish and wildlife, and for recreation in and on the surface waters." N.H. Code R. Env-Wq 1703.01(c). This requirement closely tracks the standard applied under CWA § 316(a). Furthermore, these permit limits will also satisfy the state's water quality criterion for "Biological and Aquatic Community Integrity," which requires that the state's waters "support and maintain a balanced, integrated, and adaptive community of organisms having a species composition, diversity, and functional organization comparable to that of similar natural habitats of a region," and that any "[d]ifferences from naturally occurring conditions shall be limited to non-detrimental differences in community structure and function." *See* N.H. Code R. Env-Wq 1703.19(a) & (b), 1703.01(b), and 1702.07. In addition, EPA's analysis under CWA § 316(a) indicates that the proposed thermal discharge will neither "…appreciably interfere with the uses assigned to this class…, [including] being acceptable for fishing …" nor "be inimical to aquatic life or to the maintenance of aquatic life …" in the river. RSA 485-A:8, II.

As indicated above, the NHWQS define "mixing zones" to be "… a defined area or volume of the surface water surrounding or adjacent to a wastewater discharge where the surface water, as a result of the discharge, might not meet all applicable water quality standards." Env-Wq 1702.27. As explained above, however, the proposed thermal discharge limits *will* satisfy applicable NHWQS without the application of a mixing zone.

6.4.7 Requested Increase in Thermal Limits by Permittee

PSNH has requested that the temperature criteria for Outfalls 002, 003 and 004 be increased from 95°F/25°C to 100°F/30°C. As previously discussed, however, EPA proposes to reject this request under CWA § 316(a) for the draft permit. For the same reasons provided under CWA § 316(a), EPA finds that it is unable to conclude that the NHWQS would be satisfied with the requested increase in the Max-T limit. Moreover, EPA does not believe a mixing zone could be designated to allow the discharge temperature increase because, as discussed above, Schiller Station has not provided "sufficient scientifically valid documentation to allow the department [or EPA] to independently determine that all criteria in Env-Wq 1707.02 have been met." Env-Wq 1707.01(b). In addition, the permittee has provided no justification that an increase in their permitted thermal limits is necessary for continued facility operation.

The permittee has also requested that temperature limits be removed at Outfall 001. EPA proposes to reject this request because detailed supporting information and justification was not included with the request.

6.4.8 Draft Permit Thermal Limits

Based upon this analysis of the thermal plume and a review of the applicable State Surface Water Quality Standards, EPA is proposing that the 1990 thermal limits be carried forward in the 2013 draft permit. Specifically, the proposed limitations are

- a maximum 25°F difference between intake and discharge, except during a two hour period during condenser maintenance when the maximum difference is 30°F;
- a maximum discharge water temperature of 95°F; and
- at no time shall the discharge cause the receiving water to exceed a maximum temperature of 84°F at a distance of 200 feet in any direction from the point of discharge.

7. Cooling Water Intake Structure (CWIS) Requirements

7.1 Introduction

With any NPDES permit issuance or reissuance, EPA is required to evaluate or re-evaluate compliance with applicable standards, including those specified in Section 316(b) of the CWA, 33 U.S.C. § 1326(b), cooling water intake structures (CWISs). CWA §316(b) applies to point source dischargers that need an NPDES permit and also seek to withdraw water from a "waters of the United States" through a CWIS to use for cooling purposes (*see, e.g.,* 40 C.F.R. § 125.91). To satisfy §316(b), the location, design, construction, and capacity of the facility's CWIS(s) must reflect "the best technology available for minimizing adverse environmental impacts" ("BTA"). Such impacts include death or injury to aquatic organisms by "impingement" (the process by which fish and other organisms are killed or injured when they are pulled against the CWIS's screens when water is being withdrawn from a water body) and "entrainment" (the process by which fish larvae and eggs and other very small organisms are killed or injured when they are pulled into the CWIS and sent through a facility's cooling system along with the water taken from the source water body for cooling) (*see, e.g.,* 40 C.F.R. § 125.92(h) and(n)). Entrained organisms are subjected to thermal, physical and, in some cases, chemical stresses in the facility's cooling system.

As explained and presented below, Region 1's BTA determination for the Schiller Station permit has been developed on a site-specific basis, consistent with EPA's New CWA § 316(b) Regulations. In addition, because the NHWQS apply to the effects of CWISs on the State's waters, EPA has also considered what they require for Schiller Station's CWISs.

The following Sections 7.2-10 of this document present EPA's determination of the CWIS requirements for the renewed NPDES permit for Schiller Station. To lay the foundation for this determination, this section explains the legal requirements applicable to CWISs.

7.2 Legal Requirements Governing Cooling Water Intake Structures

7.2.1 CWA § 316(b) – Statutory Language

Section 316(b) is the CWA's only provision that directly requires regulation of the *withdrawal* of water from a water body, as opposed to the discharge of pollutants into water bodies. Rather than address all types of water withdrawal, however, this provision only governs the withdrawal of water for cooling purposes through a CWIS by a point source discharger. Specifically, CWA § 316(b) provides that:

> *[a]ny standard established pursuant to [CWA sections 301 or 306] and applicable to a point source shall require that the location, design, construction, and capacity of cooling water intake structures reflect the best technology available for minimizing adverse environmental impact.*

33 U.S.C. § 1326(b). The plain meaning of this language is that Congress wanted EPA to ensure that the best technology available for minimizing adverse environmental impacts from CWISs would be utilized by plants withdrawing water from the Nation's water bodies for their cooling processes.

The legislative history related to CWA § 316(b) is relatively sparse, but what exists reinforces the plain meaning of the statutory language. In the House Consideration of the Report of the Conference Committee (Oct. 4, 1972) on the final version of the 1972 CWA Amendments, Representative Clausen stated that "[s]ection 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." 1972 Legislative History at 264. The impetus for enacting CWA § 316(b) seems to have been Congressional awareness of the problem of fish being harmed by power plant CWISs, as evidenced by the Senate Consideration of the Report of the Conference Committee (Oct. 4, 1972) for the final 1972 CWA Amendments. *Id*. at 196–99, 202.[19]

7.2.2 Regulations under CWA § 316(b)

As a general matter, in determining the BTA for CWISs, EPA evaluates and compares technological alternatives for reducing the adverse environmental impacts associated with cooling water withdrawals. The adverse impacts at issue in this context are primarily the entrainment and impingement of aquatic organisms. The Agency determines which technologies are feasible and the extent to which each would reduce adverse environmental impacts. EPA also typically considers a variety of additional factors in evaluating and comparing the alternatives, such as engineering considerations, cost, non-water environmental effects, energy effects and a comparison of the costs and benefits of the alternatives.

EPA's New CWA § 316(b) Regulations became effective on October 14, 2014. These regulations set national requirements under CWA § 316(b) for CWISs at existing facilities. Before discussing these requirements, this section discusses the complicated history of EPA efforts to promulgate regulations setting national, categorical requirements for CWISs under CWA § 316(b). This section describes important aspects of that history to provide the reader with background information helpful for understanding the Agency's regulatory approach.

EPA attempted over many years to promulgate regulations setting national categorical requirements under CWA § 316(b). Its efforts were plagued, however, by delays, setbacks and alterations arising out of litigation over the regulations proposed by the Agency. *See* 79 Fed. Reg. 48313-48318. In the absence of categorical regulatory requirements, EPA for decades

[19] *Accord Seabrook*, 1977 EPA App. LEXIS 16, *19–*20; *In re Brunswick Steam Elec. Plant*, Decision of the Gen. Counsel No. 41, at 200–01 (1976) [hereinafter "*Brunswick*"].

applied the BTA standard to both new and existing facilities with regulated CWISs on a site-specific, Best Professional Judgment ("BPJ") basis. *See, e.g.*, 79 Fed. Reg. 48314, 48317; *Entergy Corp. v. Riverkeeper, Inc.*, 129 S.Ct. 1498, 1503 (2009). This approach was consistent with CWA §§ 402(a)(1)(B) and 402(a)(2), 40 C.F.R. §§ 122.43(a), 122.44(b)(3), 401.12(h) and 401.14, and longstanding EPA practice upheld by the courts. It was later expressly required by 40 C.F.R. § 125.90(b), promulgated in 2004.

EPA first promulgated § 316(b) regulations governing CWISs in 1976, *see* Best Technology Available for the Location, Design, Construction, and Capacity of Cooling Water Intake Structures for Minimizing Adverse Environmental Impact, 41 Fed. Reg. 17387 (Apr. 26, 1976), but then withdrew the regulations three years later, after a federal court remanded them to the Agency due to procedural error. *See Appalachian Power Co. v. Train*, 566 F. 2d 451 (4th Cir. 1977) (regulations remanded on procedural grounds without reaching their substantive merits); 44 Fed. Reg. at 32956 (withdrawal of regulations). *See also* 66 Fed. Reg. at 65261 (discussion of regulatory history).

In 1995, EPA was sued for failing to promulgate regulations applying the BTA standard under CWA § 316(b). The parties to the case settled the litigation by entering into a consent decree in which EPA committed to develop new § 316(b) regulations in three phases. In general, Phase I was to set BTA requirements for *new facilities* with CWISs, while Phase II was to set BTA standards for *large, existing power plants* with CWISs (defined as those with intake flows of 50 MGD or more). Given Schiller Station's intake flow of 125 MGD, the facility was expected to be covered by the Phase II Rule. Phase III was to address all remaining existing facilities with CWISs, such as manufacturing facilities and smaller power plants.

The "Phase I Rule" was promulgated in 2001. *See generally* 66 Fed. Reg. 65255. The regulations were challenged in federal court but were upheld with the exception of certain provisions that authorized compliance with the BTA standard by implementing environmental "restoration" measures. *See Riverkeeper, Inc. v. U.S. Environmental Protection Agency*, 358 F.3d 174, 189–91 (2d Cir. 2004) (hereinafter "*Riverkeeper I*"). The Phase I regulations for new facilities are currently in effect and are codified at 40 C.F.R. Part 125, Subpart I. They do not, however, apply to *existing* facilities such as Schiller Station.

EPA next promulgated the "Phase II Rule" for large, existing power plants in September 2004. *See Final Regulations to Establish Requirements for Cooling Water Intake Structures at Phase II Existing Facilities*, 69 Fed. Reg. 41576 (Jul. 9, 2004). The Phase II regulations were codified at 40 C.F.R. Part 125, Subpart J, and would have applied to Schiller Station had they remained in effect. They were also challenged in federal court, however, and the reviewing court struck down or remanded to the Agency numerous provisions of the Phase II regulations. *Riverkeeper, Inc. v. U.S. Envtl. Prot. Agency*, 475 F.3d 83, 89, 130–31 (2d Cir. 2007) (hereinafter "*Riverkeeper II*"), *rev'd in part Entergy*, 129 S.Ct. at 1507 (reversing Second Circuit's holding that EPA did not have authority to consider a comparative cost/benefit analysis in determining the BTA). In response to *Riverkeeper II*, EPA formally suspended the Phase II Rule on July 9, 2007, with the exception of 40 C.F.R. § 125.90(b), which remained in effect. *See National Pollutant Discharge Elimination System–Suspension of Regulations Establishing Requirements for Cooling Water Intake Structures at Phase II Existing Facilities*, 72 Fed. Reg. 37107 (Jul. 9, 2007). According to 40 C.F.R. § 125.90(b) (2004), "[e]xisting facilities that are not subject to requirements under this [subpart J] or another subpart of this part [125] must meet requirements under section 316(b) of the CWA determined by the Director on a case-by-case, best professional judgment (BPJ) basis."

In 2006, EPA promulgated the "Phase III Rule." *See Final Regulations To Establish Requirements for Cooling Water Intake Structures at Phase III Facilities*, 71 Fed. Reg. 35,006 (Jun. 16, 2006). The Phase III Rule was codified at 40 C.F.R. Part 125, Subpart N, and it addressed all existing facilities not addressed by the Phase II Rule (*i.e.*, smaller power plants and manufacturing facilities). It also addressed new offshore oil and gas extraction facilities because the Phase I Rule had not covered them. 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 parts of the Phase III Rule that 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 reconsider 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. U.S. Envtl. Prot. Agency*, 612 F.3d 822, 842 (5th Cir. 2010).

After the suspension of the Phase II and III Rules, and under the then-effective terms of 40 C.F.R. § 125.90(b), EPA made BTA determinations on a site-specific, BPJ basis. Neither the CWA nor EPA regulations dictate specific, detailed methodologies for determining a site-specific BTA under § 316(b). Therefore, EPA developed reasonable, appropriate approaches for its BPJ determinations of site-specific BTAs. EPA looked by analogy to the factors considered in the development of effluent limitations under the CWA and EPA regulations for guidance concerning additional factors that might be relevant to consider in determining the BTA under CWA § 316(b). In setting effluent limitations on either a national categorical basis or a site-specific BPJ basis, EPA considers a set 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).[20] These factors 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). EPA also considered the appropriate technology for the category or class of point sources of which the applicant is a member and any unique factors relating to the applicant. 40 C.F.R. § 125.3(c)(2)(i)–(ii). Thus, EPA considered these factors in making its BPJ determinations of the BTA for a facility's CWISs. In addition, as discussed above, and as is considered when setting BPT and BCT effluent limitations, EPA also considered the relationship of an option's costs and benefits in determining the BTA.

The New CWA § 316(b) Regulations

On April 20, 2011, EPA proposed new regulations setting categorical standards applying CWA § 316(b) to CWISs at existing power plants and manufacturers, and new units at existing facilities.

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[20] *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.").

76 Fed. Reg. 22174-22288 (April 20, 2011). On August 15, 2014, EPA promulgated new final regulations at 40 C.F.R. Part 125, Subpart J, setting categorical BTA standards for existing facilities with CWISs with design intake flows greater than 2 MGD and which use 25% or more of the intake water for cooling purposes. Schiller Station satisfies these criteria and the new regulations apply to the Facility. *See* 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 became effective on October 14, 2014. *See* 79 Fed. Reg. 48300, 48358. (EPA notes that multiple petitions challenging the New CWA § 316(b) Regulations have been filed in federal court.)

As explained above, in the decades prior to promulgation of the New CWA § 316(b) Regulations, EPA determined the BTA for individual permits on a site-specific, BPJ basis. In many ways, the new process for determining the BTA created by the New CWA § 316(b) Regulations builds upon that prior site-specific, BPJ determination process. The new regulations continue to call for the BTA for each individual facility to be determined on a site-specific, case-by-case basis. Unlike the case-by-case nature of "pure BPJ permitting," however, the new regulations make specific provision for many aspects of that site-specific analysis.

For impingement mortality control, the new regulations specify a number of "pre-approved" technologies that a facility can choose to implement to satisfy the BTA standard. The regulations also allow a facility to use other technologies to satisfy the BTA standard if it can demonstrate that they will perform adequately. *See* 40 C.F.R. §§ 125.94(c)(6) and (7). Thus, approval of such an alternative technology would involve a site-specific decision. The regulations also have a number of additional provisions that pertain to specific issues concerning impingement, such as fragile species, *de minimis* effects and more. *See, e.g.,* New CWA § 316(b) Regulations, 40 C.F.R. §§ 125.95(c)(5), (6), (9) and (11).

For entrainment control, the regulations expressly call for the permitting agency to make a site-specific determination of which technologies and/or practices satisfy the BTA standard for each individual facility. *See* 40 C.F.R. § 125.94(d). The BTA "must reflect the Director's determination of the maximum reduction in entrainment warranted after consideration of the relevant factors as specified in § 125.98." *See also* 40 C.F.R. § 125.98(f). The regulations also give permitting authorities the discretion to "reject an otherwise available technology" as the BTA for entrainment if the social costs are "not justified" by the social benefits or if there are other unacceptable adverse factors that cannot be mitigated. *Id.* § 125.98(f)(4); 79 Fed. Reg. at 48,351-52.

The factors to be considered in determining the BTA for entrainment under various permitting circumstances are spelled out in 40 C.F.R. § 125.98(f). First, 40 C.F.R. § 125.98(f)(2) specifies the following factors that *must* be considered:

> (i) numbers and types of organisms entrained, including, specifically, the numbers and species (or lowest taxonomic classification possible) of Federally-listed, threatened and endangered species, and designated critical habitat (e.g., prey base);
>
> (ii) impact of changes in particulate emissions or other pollutants associated with

entrainment technologies;

(iii) land availability inasmuch as it relates to the feasibility of entrainment technology;

(iv) remaining useful plant life; and

(v) quantified and qualitative social benefits and costs of available entrainment technologies when such information on both benefits and costs is of sufficient rigor to make a decision.

The regulations specify that, “[t]he weight given to each factor is within the Director’s discretion based upon the circumstances of each facility.” 40 C.F.R. § 125.95(f)(3). In addition, 40 C.F.R. § 125.95(f)(3) provides that the following factors *may* be considered in determining a site-specific BTA:

(i) entrainment impacts on the waterbody;

(ii) thermal discharge impacts;

(iii) credit for reductions in flow associated with the retirement of units occurring within the ten years preceding October 14, 2014;

(iv) impacts on the reliability of energy delivery within the immediate area;

(v) impacts on water consumption; and

(vi) availability of process water, gray water, waste water, reclaimed water, or other waters of appropriate quantity and quality for reuse as cooling water.

Again, the regulations leave the permitting authority with discretion to decide on precisely *how* to consider all these factors.

Consistent with the *Entergy* decision and the reasoning described above, EPA’s New CWA § 316(b) Regulations call for consideration of relative costs and benefits in determining the BTA for entrainment reduction. (This is not made an element for evaluation with regard to impingement mortality reduction, for which a variety of compliance options are specified in 40 C.F.R. § 125.94(c).) The New CWA § 316(b) Regulations specify that in determining the site-specific BTA for entrainment reduction by a facility, one of the factors that must be considered is the “[q]uantified and qualitative social benefits and costs of available entrainment technologies when such information on both benefits and costs is of sufficient rigor to make a decision.” 40 C.F.R. § 125.98(f)(2)(v). *See also* 40 C.F.R. §§ 125.92(x) and (y) (definitions of social benefits and social costs); 79 Fed. Reg. 48368, 48371. Thus, this sort of information does not have to be considered if the permitting authority decides the available information is “not of sufficient rigor.”

Also consistent with *Entergy*, the New CWA § 316(b) Regulations do not propose a specific comparative cost/benefit test. The regulations call, instead, for “the maximum reduction in entrainment *warranted* after consideration of the relevant factors as specified in § 125.98.” 40

C.F.R. § 125.94(d)(emphasis added).[21] *See also* 40 C.F.R. § 125.98(f). Similarly, the regulations also provide that "[t]he Director may reject an otherwise available technology as a BTA standard for entrainment if the social costs are not justified by the social benefits." 40 C.F.R. § 125.98(f)(4).

The New CWA § 316(b) Regulations also include specific "transition" provisions that specify procedures for permits that were in various stages of the permit development process at the time the new regulations were promulgated. Relevant to the Schiller Station permit proceeding, 40 C.F.R. § 125.98(g), 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 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.

The new regulations make clear that for an ongoing proceeding, when sufficient information has already been collected, the permitting authority may proceed to determine a site-specific BTA for entrainment and impingement mortality reduction and EPA does not intend that the ongoing permit proceeding must backtrack and go through the full information gathering and submission process set out by the new regulations for new permit proceedings. *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)."). Furthermore, the regulation also states that the permitting authority may base its site-specific BTA determination for entrainment on some or all of the factors specified in 40 C.F.R. §§ 125.98(f)(2) and (3).

The permit proceeding for Schiller Station is an "ongoing permit proceeding" under 40 C.F.R. § 125.98(g). The Facility's existing NPDES permit expired in 1995 and PSNH timely applied for permit renewal prior to its expiration. (Schiller Station's existing permit has been administratively extended pursuant to 40 C.F.R. § 122.6(a).) Region 1 was working on the permit prior to promulgation of the New CWA § 316(b) Regulations and had gathered substantial additional information from the Facility through the use of information request letters (sent under CWA § 308(a)) and site visits. In this case, the Region has considered whether any of the permit application information specified at 40 C.F.R. § 122.21(r) is necessary to support this permit decision, but has determined that the information already submitted by the Facility is sufficient. Therefore, Region 1 will proceed to determine the site-specific BTA for controlling impingement mortality and entrainment at Schiller Station. This BTA determination is presented

[21] Of course, as explained below in the main body of the text, for ongoing permit proceedings under 40 C.F.R. § 125.98(g), the permitting authority has the discretion to decide *whether or not* to consider some or all of the factors under 40 C.F.R. §§ 125.98(f)(2) and (3).

in detail farther below.

7.2.3 State Water Quality Standards

a. Application to Cooling Water Intake Structures

CWA § 316(b) requires CWISs to satisfy the BTA standard. This federal technology standard establishes the minimum requirements that all CWISs must meet. CWISs must also satisfy any more stringent state law requirements that may apply. *See* CWA §§ 301(b)(1)(C), 401(a)(1) & (d), & 510; 40 C.F.R. §§ 122.4(d), 122.44(d), & 125.84(e). *See also In re Dominion Energy Brayton Point, LLC (Formerly USGen New England, Inc.) Brayton Point Station*, 12 E.A.D. 490, 626 (EAB 2006). CWA § 510 expressly authorizes states to impose more stringent water pollution control standards than those dictated by the minimum federal requirements. *See* 40 C.F.R. § 131.4(a); *PUD No. 1 of Jefferson County v. Wash. Dep't of Ecology*, 511 U.S. 700, 705 (1994). States have this authority with regard to pollutant discharges and cooling water withdrawals through CWISs. *See* 40 C.F.R. § 125.90(c). For example, a state could adopt technology-based requirements for CWISs more stringent than the federal requirements under CWA § 316(b), or its water quality standards could apply to the effects of CWISs and require more stringent permit conditions than those called for by CWA § 316(b). Accordingly, EPA's New CWA § 316(b) Regulations provide:

> (i) *More stringent standards.* The Director must establish more stringent requirements as best technology available for minimizing adverse environmental impact if the Director determines that compliance with the applicable requirements of this section would not meet the requirements of applicable State or Tribal law, including compliance with applicable water quality standards (including designated uses, criteria, and antidegradation requirements).

40 C.F.R. § 125.94(i). *See also* 40 C.F.R. § 125.90(c) and 40 C.F.R. §§ 125.80(d) and 125.84(e) (provisions in regulations mandating that CWIS requirements in permits for new facilities must satisfy any more stringent state requirements).

NPDES permits issued by EPA are also subject to the State certification process under CWA § 401. CWA § 401(a)(1) provides, in pertinent part, that:

> [a]ny applicant for a Federal license or permit to conduct any activity…which may result in any discharge into the navigable waters, shall provide the licensing or permitting agency a certification from the State in which the discharge originates…that any such discharge will comply with the applicable provisions of sections 1311, 1312, 1313, 1316, and 1317 of this title…No license or permit shall be granted until the certification required by this section has been obtained or has been waived…No license or permit shall be granted if certification has been denied by the State…

33 U.S.C. § 1341(a)(1). The plain language of § 401(a)(1) dictates that unless State certification has been waived, no NPDES permit may be issued by EPA without that certification. *See PUD No. 1*, 511 U.S. at 707. This language also indicates that a denial of certification by the State bars issuance of the Federal permit or license. EPA regulations reiterate these commands. *See* 40 C.F.R. §§ 122.4(b), 124.53(a), & 124.55(a). Neither the statute nor the regulations identify any

exceptions to the certification requirement. Denial of certification by a state could, of course, be challenged by the permittee through State legal proceedings. *See, e.g.*, 40 C.F.R. § 124.55(e); *Dubois v. U.S.D.A.*, 102 F.3d 1273 (1st Cir. 1996).

With regard to State certifications, CWA § 401(d) provides, in pertinent part, that:

> [a]ny certification provided under this section shall set forth any effluent limitations and other limitations, and monitoring requirements necessary to assure that any applicant for a Federal license or permit will comply with any applicable effluent limitations and other limitations, under section 1311 or 1312 of this title . . . and with any other appropriate requirement of State law set forth in such certification, and shall become a condition on any Federal license or permit subject to the provisions of this section.

33 U.S.C. § 1341(d). The plain language of § 401(d) makes clear that the State's § 401 certification must contain any conditions needed to ensure compliance with CWA § 301, including § 301(b)(1)(C), and any appropriate requirement of State law, and that such limitations imposed in a certification must be included as conditions in the federal permit. *See also PUD No. 1*, 511 U.S. at 707–08. EPA regulations repeat these commands from the statute. 40 C.F.R. §§ 121.2, 122.44(d)(3), 124.53(e)(1), & 124.55(a)(2). *See also* 40 C.F.R. § 122.4(d). Limits included in a federal permit based on State certification requirements can be challenged in State legal proceedings. 40 C.F.R. § 124.55(e). *See also Roosevelt Campobello Int'l Park Comm'n v. U.S. Envtl. Prot. Agency*, 684 F.2d 1041, 1055–56 (1st Cir. 1982).

The U.S. Supreme Court has held that once the CWA § 401 State 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 needed to ensure compliance with State water quality standards or other applicable requirements of State law. The Court explained that:

> [t]he 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."…Section 401(a)(1) identifies the category of activities subject to certification – namely, those with discharges. And § 401(d) is most reasonably read as authorizing additional conditions and limitations on the activity as a whole once the threshold condition, the existence of a discharge, is satisfied.

PUD No. 1, 511 U.S. at 711–12. Thus, 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 State water quality standards. *See id.* at 713. This also helps to confirm that in setting *discharge* conditions to achieve water quality standards, a State can and should take account of the effects of *other aspects of the activity* that may influence the discharge conditions that will be needed to attain water quality standards.

b. New Hampshire Water Quality Standards

New Hampshire's water quality standards apply to regulate the effects of cooling water withdrawals. That is, permit conditions on cooling water withdrawals must comply with (or not cause or contribute to a failure to attain) relevant water quality criteria, designated uses, and antidegradation requirements. New Hampshire's standards state as follows:

> [t]hese rules shall apply to any person who causes point or nonpoint source discharge(s) of pollutants to surface waters, or who undertakes hydrologic modifications, such as dam construction or water withdrawals, or who undertakes any other activity that affects the beneficial uses or the level of water quality of surface waters.

N.H. Code R. Env-Wq 1701.02(b) (Applicability). *See also id.* 1708.03 (Submittal of Data). This language clearly indicates the applicability of New Hampshire's WQS to cooling water withdrawals from the State's waters.

Given that withdrawals of water for cooling can harm aquatic life, such withdrawals must comply with the designated uses and water quality criteria included in the State's WQS for the purpose of protecting aquatic organisms and their habitat. For example, as discussed farther above, the state's standards dictate, in pertinent part, that:

> (b) All surface waters shall be restored to meet the water quality criteria for their designated classification including existing and designated uses, and to maintain the chemical, physical, and biological integrity of surface waters.
> (c) All surface waters shall provide, wherever attainable, for the protection and propagation of fish, shellfish and wildlife, and for recreation in and on the surface waters.

Id. 1703.01(b) and (c) (Water Use Classifications). The State's standards also prescribe the following water quality criterion for "biological and aquatic community integrity":

> (a) The surface waters shall support and maintain a balanced, integrated, and adaptive community of organisms having a species composition, diversity, and functional organization comparable to that of similar natural habitats of a region.
> (b) Differences from naturally occurring conditions shall be limited to non-detrimental differences in community structure and function.

Id. 1703.19. *See also id.* 1702.07 (definition of "biological integrity").

In sum, the limits in EPA-issued NPDES permits that address cooling water intake structures must satisfy both CWA § 316(b) and any more stringent requirements necessary to satisfy applicable state water quality standards. The NPDES permit that EPA expects to issue to Schiller Station will be subject to state certification under CWA § 401(a)(1) and, therefore, will also need to satisfy any conditions of such a certification. The New Hampshire Department of Environmental Services (NHDES) administers the certification process for the state. EPA expects that NHDES will provide its certification sometime after it has reviewed the Draft Permit, but before EPA issues the Final Permit, or that the certification is determined to be waived.

7.3 Conclusion

The permit requirements in Schiller Station's new NPDES permit must satisfy the federal technology-based BTA standard of CWA § 316(b) as well as any more stringent requirements necessary to achieve compliance with New Hampshire's water quality standards. While this permit proceeding is covered by EPA's New CWA § 316(b) Regulations, these regulations call for the BTA for Schiller Station, and the permit requirements associated with the BTA, to be determined on a site-specific basis. Permit requirements needed to satisfy New Hampshire water quality standards must also be determined on a site-specific basis. EPA's determination of permit requirements for CWISs is set forth in the following sections and, as stated above, these requirements will be subject to the CWA § 401(a)(1) water quality certification process.

8. Biological Impacts Associated with Schiller Station's CWIS's

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, e.g.,* 79 Fed. Reg. at 48318. Entrainment and impingement can kill or injure large numbers of the aforementioned aquatic organisms. In some cases, these losses may contribute to diminished populations of local species of commercial and/or recreational importance, locally important forage species, and/or local threatened or endangered species. As a result, CWISs can have effects across the food web. In effect, CWISs can substantially degrade the quality of aquatic habitat by placing within the ecosystem a significant anthropogenic source of mortality to resident organisms. In addition to considering the direct adverse impacts of CWISs, their effects as cumulative impacts or stressors in conjunction with other existing stressors, including CWISs at multiple facilities, on the affected 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 Fed. Reg. 65256, 65262-65 (Dec. 18, 2001) (preamble to Final Phase I rule under CWA § 316(b)).

As indicated above, 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 Fed. Reg. 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 character of 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 the season during which the water is being taken from the water body. 66 Fed. Reg. 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. Facilities also have various methods for removing organisms from the screens and returning them to the water body (or disposing of the material).

In some cases, fragile species may be killed either as a result of being impinged against the screens or as a result of injury from the facility's process for removing the organisms from the screens. Even if not killed directly, contact with the screens or other equipment may cause an organism to lose its protective slime and/or scales or suffer other injuries which can result in eventual, albeit 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 Fed. Reg. at 65263. For resident fish in the Piscataqua River, 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. In addition, CWISs can also potentially harm other types of organisms (*e.g.*, shellfish or macrocrustaceans).

8.1 Local Biology

As previously mentioned, Schiller Station withdraws water from (and discharges to) the lower Piscataqua River. The Piscataqua River is a high value habitat for a variety of marine and estuarine species, and serves as the only conduit between the Gulf of Maine and Great Bay. In fact, the Great Bay Estuary, which includes the Piscataqua River is one of the most extensive and biologically significant eelgrass and salt marsh systems in New England. Part of the Great Bay Estuary is studied, managed and protected as part of the National Estuarine Research Reserve System (NERRS).[22]

While some fish species permanently reside in the river, most use it to either access spawning or nursery habitats in Great Bay and its associated influent rivers, or to migrate from these areas to marine habitats in the Gulf of Maine and beyond. Still others are seasonally present, preying on the concentrated but temporal influx of migrating forage species. The location of Schiller Station's CWIS's in highly productive tidal waters raises concern for the organisms that use this habitat. Tidal rivers and estuaries are among the most productive aquatic ecosystems and provide spawning and nursery habitat for many species, as well as permanent habitat for adult organisms.

Short (1992) published a comprehensive ecological profile of the Great Bay Estuary. Drawing from historical reports and sampling by New Hampshire Fish and Game Department, Short determined that a mix of 52 marine, estuarine and freshwater fish species occurred in at least some part of the Great Bay Estuarine system. *See* Short, F.T., The Ecology of the Great Bay Estuary, New Hampshire and Maine: An Estuarine Profile and Bibliography, NOAA – Coastal Ocean Program Publ., 1992.

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[22] The New Hampshire Fish and Game Department manages the Great Bay National Estuarine Research Reserve (NERR), which was designated in 1989. The Reserve is also supported by the Great Bay Stewards, a non-profit friends group. The Great Bay NERR is part of the National Estuarine Research Reserve System (NERRS). Established by the Coastal Zone Management Act of 1972, the NERRS operates as a partnership between the National Oceanic and Atmospheric Administration (NOAA) and the coastal states. *See* 2009 Great Bay 20th Report (AR-186).

Several impingement and entrainment studies that were conducted in this reach of the Piscataqua River are available for characterization of local and anadromous fish and shellfish communities. Marine Research Inc. issued a report in 2004 entitled Newington Power Facility Post-operational Impingement Sampling Final Report (hereinafter TRC, 2004). Newington Station is geographically very close to Schiller Station. TRC (2004) collected 324 fish of 13 different species off the screens at Newington Station between October 2002 and January 2004. Fish species collected included American eel, Atlantic menhaden, Atlantic tomcod, hake, mummichog, Atlantic silverside, threespine stickleback, grubby, white perch, tautog, cunner, winter flounder and smooth flounder.

In addition, from 2006 to 2007, Normandeau Associates, Inc., conducted the most recent entrainment and impingement studies at Schiller Station. *See* Normandeau Associates, Inc., Entrainment and Impingement Studies Performed at Schiller Generating Station from September 2006 through September 2007, April 2008 (hereinafter "Normandeau, 2008 studies"). Data from these studies provide insight as to what species are present in the Piscataqua River in and around Schiller Station. These studies should not, of course, be interpreted as the definitive list of all species that occur in the Great Bay estuary.

Schiller Station impinged 33 species of fish and, typical of estuaries, they included a mix of marine (cod, sea raven, hakes), estuarine (striped bass, tomcod, sticklebacks) and freshwater species (pumpkinseed, bluegill). Several species of anadromous fish (rainbow smelt, alewife, and blueback herring) were collected as well. Many of these estuarine species are broadcast spawners that disperse their eggs to the water column. The eggs and larvae of these species drift 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 offshore water.

Several of the fishes noted in the studies are desirable species for recreational and commercial fishermen (*e.g.*, winter flounder, Atlantic herring, skate species, pollock, Atlantic cod, tautog, hake species and striped bass). Eight of the species sampled during the Normandeau 2008 studies have fishery management plans or restrictions managed by the New England Fishery Management Council (white hake, silver hake, red hake, Atlantic herring, Atlantic cod, winter flounder, skate species and pollock). 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. Three of the species (Atlantic cod, tautog and skate species, which is most likely winter skate) subject to impingement and entrainment are considered "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, several fish species observed in Schiller Station impingement samples from 2006 through 2007 – namely, rainbow smelt, Atlantic menhaden, Atlantic herring, blueback herring and alewife – are considered "fragile species" under 40 C.F.R. § 125.92(m) of the New CWA § 316(b) Regulations. *See also* 40 C.F.R. §§ 125.94(c)(5), (6) and (9).

In addition to fishes, several species of invertebrates, including commercially and/or recreationally important species such as the Jonah crab, cancer crab, horseshoe crab and American lobster, are present in the Piscataqua River. Schiller Station has impinged adults and juveniles of these species, and also has entrained their eggs and larvae.

8.2 Impingement and Entrainment Impacts

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 Piscataqua River near Schiller Station's CWISs provides for conditions such as high egg and larval densities, numerous juvenile and adult fish and macrocrustaceans, and anadromous fish migrating to spawning habitat, all of which could potentially lead to high rates of entrainment and impingement. This section discusses the results of the Normandeau 2008 studies biological monitoring conducted at Schiller Station during 2006-2007 and the potential for adverse environmental impacts to aquatic organisms as a result of the operation of Schiller Station's CWISs.

8.2.1 Entrainment Studies

Entrainment samples were collected through a 0.300 mm mesh plankton net suspended outside of Screen House #2 (intake for Units 5 and 6). Entrainment monitoring was not conducted for Unit 4's intake. Normandeau estimated ichthyoplankton entrainment for Schiller Station from October 2006 to September 2007.

Entrainment samples consisted of compositing four separate 100 m^3 samples collected every 6 hours over a 24-hour period. Entrainment samples were processed in Normandeau's laboratory facility in Bedford, New Hampshire. Sorting, species and life stage identification and enumeration were all completed by Normandeau to generate entrainment rates (number of eggs or larvae per volume of water). Entrainment losses were calculated by multiplying the entrainment rate by the weekly plant cooling water flow.

Schiller Station also conducted monthly entrainment survival studies. Samples were collected in Screen House #2 prior to the water passing through the facility. At least 200 fish eggs, fish larvae and macrocrustacean larvae were collected for initial (Time 0) assessment and at least 100 were available for latent (24-hour) survival observations. Samples were sorted into six categories (initial alive, initial stunned, initial dead, latent alive, latent stunned, and latent dead)[23].

8.2.2 Impingement Studies

Fish for impingement sampling were collected in the fish and debris return sluice coming off of the traveling screens for each unit. Normandeau reported impingement losses from October 2006 to September of 2007. Impingement samples were collected over a continuous 24-hour period, once a week. Each individual sample represented a six-hour collection period. Impingement sampling was only conducted when the plant was operational (defined as having at least one

[23] For sorting, larvae that are actively moving are sorted as alive, larvae that move in response to physical prompting are stunned, and larvae that show no response to physical prompting are sorted as dead.

circulating pump running at the time of sampling).

Schiller Station conducted an impingement collection efficiency study to determine what percentage of impinged fish on the screens they were able to collect within the fish return sluice. Once a month, they marked 100 dead fish and introduced the marked fish via a small pipe to a point within the screenhouse directly in front of the traveling screens. The number of marked fish collected at the end of the sampling period divided by the number of marked fish released represented the collection efficiency. The collection efficiency was then applied to their fish impingement abundance estimates.

Schiller also conducted impingement survival studies. Wild caught fish and macrocrustaceans were collected during routine impingement monitoring sampling. Their initial condition at the time of collection (Time 0) was assessed and they were classified as alive, stunned or dead. All live animals were then held for at least an additional 12 hours to determine latent survival rates.[24] Animal status was again classified as alive, stunned, or dead. Latent survival rate was determined by the number of fish alive after 12 hours divided by the total number of fish impinged at Time 0. Impingement losses were adjusted by these measured survival rates. Impingement losses were calculated using design flow, because this represents a worst-case impact analysis.

8.2.3 Summary of Impingement and Entrainment Impacts

EPA's analyses of the entrainment and impingement losses from Schiller Station are presented in this section.

One key question to address in an analysis of entrainment effects is whether or not to assume 100% mortality for entrained organisms. For the national analyses supporting the New CWA § 316(b) Regulations, and consistent with prior analyses supporting the development of regulations, EPA adopted a presumption of 100% mortality for entrained organisms. This is a reasonable presumption to apply in general given the fragility of the entrained organisms (*i.e.*, very small eggs and larvae) and the nature of the stresses they are subjected to when entrained through a cooling system (*e.g.*, extreme water temperatures, sheer stress, physical impacts, and potential exposure to biocides). *See* 79 Fed. Reg. 48318. At the same time, EPA's New CWA § 316(b) Regulations allow a permittee to try to make a site-specific demonstration that entrainment mortality is actually less than 100% for its cooling system. *See* 40 C.F.R. § 125.96(d)(3); 79 Fed. Reg. 48355. *See also* 40 C.F.R. § 122.21(r)(7).

In this case, Schiller Station conducted site-specific entrainment survival studies and has presented results suggesting that survival rates of the larval stage of certain fish species appear to be quite high at the Facility. EPA does not find this study to be convincing, however, because the organisms sampled for entrainment survival were not exposed to a degree of trauma equivalent to what a larval organism would experience if it actually transited Schiller Station's full cooling

[24] For EPA's New CWA § 316(b) Regulations, the Agency specifies that latent survival be assessed using holding times between 18-96 hours, unless the permitting authority specifies an alternative holding period. *See* 40 C.F.R. § 125.94(c)(7); 79 Fed. Reg. 48321, 48323, 48434. Ultimately, the exact duration of holding fish to assess latent survival is a balancing act. Fish should be held a sufficient quantity of time to allow them to succumb to any injuries incurred from being impinged. Conversely, being held in captivity is in its own right stressful for the fish and could lead to mortality.

system during typical plant operations. Larvae in the Schiller Station's entrainment survival study were collected at the screenhouse at a point *before* they had entered the facility's cooling system. As a result, larvae in the study were not exposed to the stressors that entrained organisms transiting the plant would experience (*e.g.*, very high water temperatures, physical impacts in the cooling system pumps and piping, sheer stress, chlorine exposure). As a result, EPA cannot find that the study conditions provide a valid comparison with actual conditions at the Facility. Therefore, EPA's analysis of entrainment losses at Schiller Station continues to reflect the default assumption of 100% mortality for entrained larvae.

In addition, to be more conservative, EPA's presentation of Schiller Station entrainment losses reflect the plant design flow of 124.4 MGD, which represents a 7.3% increase over Normandeau's estimates using a 5-year average operating flow.

EPA reviewed Schiller's Impingement Efficiency and Survival studies and found them to be reasonable and valid. Therefore, the impingement losses presented here reflect adjustments made based on the results of those studies.

Entrainment losses are presented in two ways, first they are presented in Tables 8-A and 8-B by species (both adjusted raw numbers at design flow); second, Figures 8-1 and 8-2 show entrainment losses by month. Impingement losses are presented in the same way in Table 8-C and 8-D and Figures 8-3 and 8-4.

Entrainment losses of ichthyoplankton peaked in July, with a much smaller peak in the winter (January-March) (Figure 8-1). Cunner eggs accounted for a large percentage of the losses in the July period (Normandeau, 2008). The peak in entrainment losses in the winter was comprised of winter spawners, such as American sand lance and rock gunnel (Normandeau, 2008). Macrocrustacean entrainment losses also peaked in July and were essentially almost non-existent during spring, fall and winter (Figure 8-2).

Fish impingement losses peaked in April, with secondary peaks in the fall and early winter (Figure 8-3). White hake, Atlantic herring and cunner were fish exhibiting the highest impingement losses in April (Normandeau, 2008). In the fall, rainbow smelt, grubby and white hake were the species with the highest impingement losses (Normandeau, 2008). Macrocrustacean impingement losses peaked in April and December (Figure 8-4), with green crabs and Atlantic rock crabs being the species comprising the largest percentages (Normandeau, 2008).

Table 8-A: Estimated Annual Entrainment Losses for Fish from Schiller Station

Common Name	Eggs & Larvae
Alligator fish	134,305
American eel	8,420
American plaice	1,061,867
American sand lance	13,677,174
Atlantic cod	329,888

Common Name	Eggs & Larvae
Atlantic cod/haddock	161,177
Atlantic cod/haddock/witch flounder	344,498
Atlantic herring	1,921,628
Atlantic mackerel	5,846,389
Atlantic menhaden	633,228
Atlantic seasnail	389,677
Atlantic tomcod	53,043
Cunner	32,539,552
Cunner/yellowtail flounder	72,955,812
Fourbeard rockling	1,723,189
Fourbeard rockling/hake	6,394,256
Goosefish	135,665
Grubby	3,393,233
Gulf snailfish	21,770
Haddock	7,072
Hake family	1,397,166
Longhorn sculpin	424,745
Northern pipefish	716,836
Pollock	661,273
Radiated shanny	201,269
Rainbow smelt	1,752,755
Rock gunnel	7,634,337
Sculpin family	59,139
Sea raven	13,329
Sea robin family	71,494
Shorthorn sculpin	93,113
Silver hake	275,997
Striped killifish	8,420
Summer flounder	11,904
Tautog	56,294
Unidentified	246,244
Windowpane	547,224
Winter flounder	372,846
Witch flounder	17,617
Wrymouth	5,790
Total Entrainment	**156,179,633**

Table 8-B: Estimated Annual Macrocrustacean Entrainment Losses from Schiller Station

Taxon	Larvae
American lobster	60,593
Artic lyre crab	309,518

Taxon	Larvae
Atlantic lyre crab	51,723
Atlantic rock crab	1,690,396
Cancer sp.	615,100,527
Green crab	782,297,724
Japanese shore crab	5,271,807
Jonah crab	281,774
Total Entrainment	**1,405,064,062**

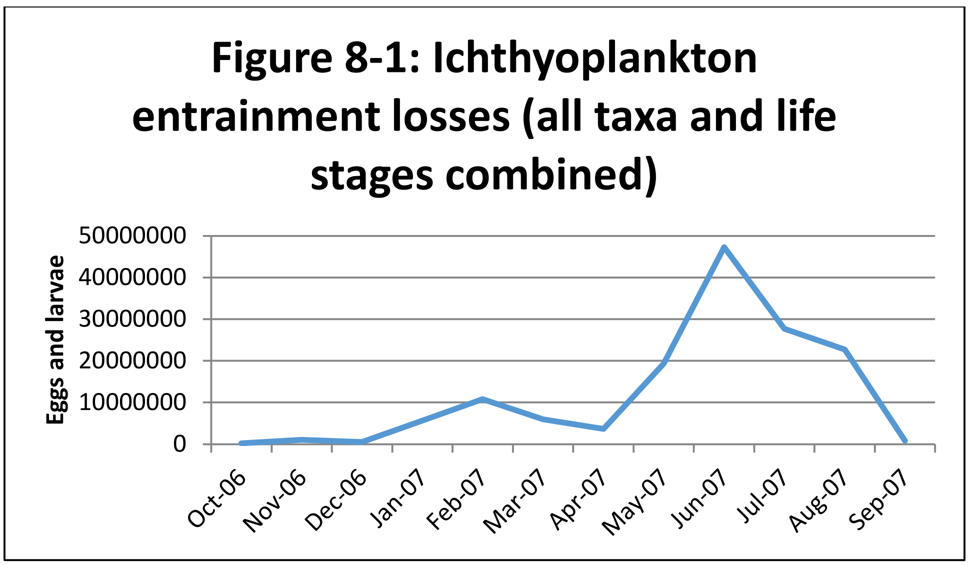
Table 8-C: Estimated Annual Fish Impingement Losses from Schiller Station

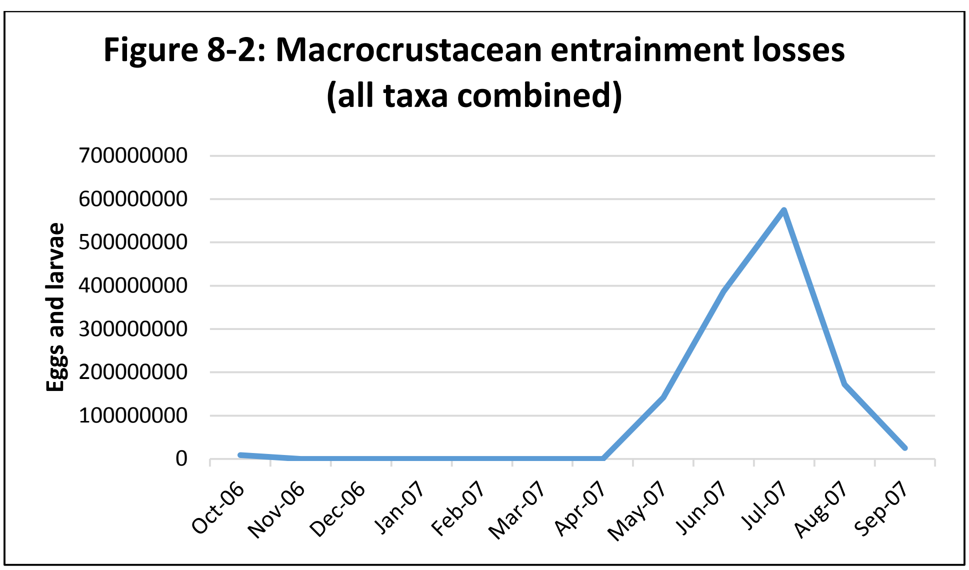
Common Name	Fish Impinged
Alewife	25
American sand lance	9
Atlantic cod	38
Atlantic herring	297
Atlantic menhaden	328
Atlantic silverside	122
Atlantic tomcod	50
Blueback herring	68
Bluegill	64
Cunner	668
Emerald shiner	33
Grubby	491
Herring family	9
Inland silverside	16
Lumpfish	357
Ninespine stickleback	149
Northern pipefish	621
Pollock	25
Pumpkinseed	9
Rainbow smelt	622
Red hake	9
Roch gunnel	26
Sea raven	16
Shorthorn sculpin	8
Silver hake	9
Skate family	17
Striped bass	25
Tautog	9
Threespine stickleback	53
Unidentifiable	0
White hake	736
White perch	198
Windowpane	75

Common Name	Fish Impinged
Winter flounder	573
Total Impingement	**5,557**

Table 8-D: Estimated Annual Macrocrustacean Impingement Abundance from Schiller Station

Taxon	Estimated Impingement
American lobster	461
Atlantic rock crab	3,597
Green crab	9,474
Horseshoe crab	4
Total Impingement	**13,536**





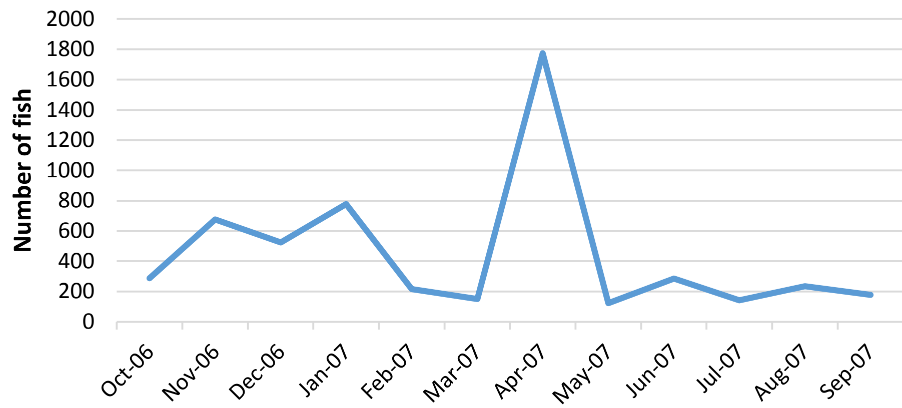


Figure 8-3: Fish impinged at Schiller Station by month (all taxa combined)

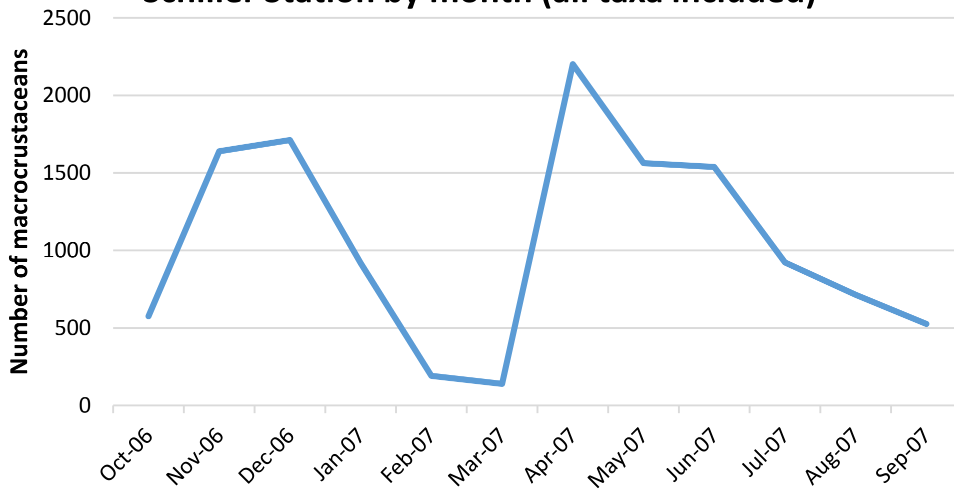


Figure 8-4: Macrocrustaceans impinged at Schiller Station by month (all taxa included)

Schiller Station entrains and impinges large numbers of fish and macrocrustacean eggs, larvae, juveniles and adults. EPA considers these entrainment and impingement losses from the current operation to be adverse environmental impacts. Under CWA § 316(b), the design, construction, location and capacity of the Facility's CWISs must reflect the BTA for minimizing these adverse environmental impacts. At the same time, the available information is insufficient to draw conclusions that these losses have caused either a particular reduction in the Great Bay estuary's populations of the affected species or an imbalance in the overall assemblage of aquatic organisms in the estuary.

9. BTA Options

This section evaluates Schiller Station'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 7.2 of this Fact Sheet for discussion of the methodology underlying the application of BPJ in this determination). Section 10 then 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 Schiller Station. As described in Section 7, viewed broadly and as dictated by CWA § 316(b), several major aspects of CWISs must be considered in determining the BTA for reducing adverse impacts from CWISs. EPA must consider:

1) *location options*, which for an existing plant would involve *re*-locating the CWIS to a new, less biologically productive or sensitive site or part of the water column in order to reduce entrainment and/or impingement effects;

2) *design options* to lessen entrainment and/or impingement by reducing the velocity of the water drawn into the CWIS, by reducing the mesh size of intake barriers so that additional or all life stages are excluded from entrainment, and by enhancing screening and fish return systems to try to maximize the degree to which impinged organisms can be returned to the source water body unharmed;

3) *capacity (or flow) reduction options*, which reduce the number of organisms entrained and impinged by the CWIS as a result of reducing the volume of water withdrawn from the source water body; and

4) *construction options*, which are applicable for any option that requires construction, and which entails considering the adverse environmental impact of constructing the technology along with alternatives for minimizing those impacts. For example, moving a cooling water intake to a new location might offer potential reductions in entrainment and impingement, but the necessary construction could have adverse environmental effects that would also need to be considered in deciding whether such a re-location should be considered the BTA under CWA § 316(b).

Within the broad categories described above, there are numerous specific technological options to consider. Some of these technologies have been in use for many years and, as a result, are well-established and understood. Indeed, many of these options are discussed in EPA's 1977 Draft CWA § 316(b) Guidance, EPA's Development Document for Best Technology Available for the Location, Design, Construction and Capacity of Cooling Water Intake Structures for Minimizing Adverse Environmental Impact, EPA 440/1-76/015-a, April 1976 (hereinafter EPA 1976 Development Document), the 1994 EPA Background Paper No. 3, and the 1996 EPA Supplement to Background Paper No. 3. These longstanding technologies, as well as newer developing technologies, are also discussed in more recent regulatory preambles issued by EPA, such as the preambles for the proposed and final Phase I CWA § 316(b) regulations for new facilities (promulgated in 2001), the proposed and final Phase II regulations for large existing power plants (promulgated in 2004 and later withdrawn), and the proposed and final New CWA § 316(b) Regulations for existing facilities (promulgated in August 2014).

To determine the BTA for minimizing the adverse environmental impacts of the CWISs at Schiller Station, EPA examined the plant's existing CWISs as well as a range of technologies and operational measures for reducing their impingement and entrainment. EPA first evaluated the performance of the technologies and operational measures in terms of the extent to which they could reduce entrainment and impingement if installed at Schiller Station, and then considered additional relevant factors, such as secondary environmental effects, energy effects, and cost.

9.1 Schiller Station's Existing CWIS Technologies

9.1.1 Existing CWIS Location

The location of a CWIS can vary in terms of where they are placed in relation to the shoreline (*i.e.*, at the shoreline or offshore) as well as in terms of where they are located in the water column (*e.g.*, near the bottom). Furthermore, the location chosen for a CWIS can affect the type or amount of organisms present in the water body and impacted by the CWIS. For example, a CWIS could be located within an estuary, a lake, a river, or another type of water body, and the water body in question might or might not provide spawning and nursery habitat, migratory corridors, or some other type of significant habitat. One of EPA's original guidance documents for minimizing adverse environmental impacts from a CWIS recommends selecting CWIS locations to avoid important spawning areas, juvenile rearing areas, fish migration paths, shellfish beds, or other areas of particular importance for aquatic life. *See* EPA 1976 Development Document.

Schiller Station has two CWISs located on the southwestern bank of the lower Piscataqua River in Portsmouth, New Hampshire. These CWISs provide once-through cooling water to the facility's condensers. The Unit 4 CWIS is located approximately 50 feet north of the CWIS that services Units 5 and 6.

The Unit 4 CWIS (Screen House #1) is equipped with a submerged offshore intake tunnel. PSNH has claimed the precise length of the tunnel to be confidential business information (CBI) under 40 C.F.R. Part 2 Subpart B. PSNH reports that dredging is performed "to preserve the 2-foot elevation difference between the river bottom and the floor of the intake." Enercon Services, Inc. for PSNH, Response to Environmental Protection Agency CWA §308 Letter, PSNH Schiller Station, Portsmouth, New Hampshire, October 7, 2008 (hereinafter "Enercon, 2008"), p. 4. One conventional single-entry, single-exit vertical traveling screen within the bulkhead is used to prevent debris from entering the circulating water system for Unit 4. Screen House #1 was also used for Unit 3, which is now retired. Two additional intake tunnels that used to provide water to the Unit 3 intake well are no longer in use. *Id*.

The CWIS for Units 5 and 6 (Screen House #2) draws water from the Piscataqua River through a nearshore intake. *Id*. at 88. This CWIS has four conventional traveling screens and four corresponding circulating water pumps. Two screens/pumps are operated for each unit. *Id*. at 5.

The location of a CWIS opening within the water column is an important characteristic that affects the structure's capacity to impinge particular organisms. Structures that withdraw from mid-water column or surface waters tend to impinge pelagic (i.e., open water) species of fishes, while intakes that withdraw from bottom waters are more likely to impinge demersal (i.e., bottom-oriented) species. The intake for Unit 4 withdraws water from a 6.5 foot diameter tunnel located about 2 feet above the river bottom. *Id*. at 4. The Unit 5 and 6 CWIS, withdraws from nearly the entire water column, from two feet above the bottom up to the deck at elevation 10 feet above mean sea level (MSL). *Id*. at 5. Based on location of the openings of Schiller Station's CWISs, which collectively withdraw nearly from the entire water column, the plant's intakes have the capacity to impinge and entrain organisms that occupy any portion of the water column, including areas near the bottom.

9.1.2 Existing CWIS Design

Power plant CWISs must be designed to provide a sufficient volume of cooling water necessary for condensing steam in the plant's condensers. In the context of a CWA § 316(b) BTA evaluation, the "design" of a CWIS refers to technological features of the intake structure itself that tend to influence the number of organisms that are entrained and impinged, such as an intake screening system of one type or another, while still allowing the necessary volume of cooling water to be provided.

The Electric Power Research Institute (EPRI) indicates that

> … there are numerous designs for debris and fish protection screens that are contained in the intake structure. Cannon et al. (1979) reviewed intake structures and concluded that the design features that contributed to high rates of impingement are (1) undesirable location in biologically productive areas; (2) relatively large intake system flow; (3) high screenwell velocities; (4) intake conveyance channels; (5) intrusion of the intake structure into the main streamflow; (6) non-uniform velocities across the screen face that may reduce the effective screen area; and (7) screenwell entrapment areas.

EPRI, Technical Evaluation of the Utility of Intake Approach Velocity as an Indicator of Potential Adverse Environmental Impact under Clean Water Act Section 316(b), December 2000, (hereinafter EPRI, 2000), p. 2-1. Some fish species and other aquatic organisms are generally capable of surviving impingement if they are quickly and gently returned to their environment. Several components of a CWIS's design affect whether an impinged organism is likely to be harmed or returned alive and uninjured to the receiving water. These critical components include the intake opening, intake velocity, the type of traveling screen technology, the type of power spray wash system, and the characteristics of the fish return system. These aspects of the existing intake design will be discussed below. Proper maintenance and operation of the existing technologies are also critical to minimizing impingement losses.

a. Existing Intake Opening Design and Velocities

The quantity of water required for cooling and the dimensions of the intake structure openings dictate the velocity at which the water is withdrawn from the source water body. The speed of the water passing through CWIS screens is commonly referred to as the “through-screen velocity.” The speed of water being drawn into the CWIS and toward the screens is often referred to as the “approach velocity.” Higher intake velocities tend to represent a greater potential for impingement. When aquatic organisms swim or are pulled into a CWIS, high intake velocities may overwhelm their ability to swim away. Once impinged against the intake screens, the pressure of the fast flowing water can then hold the fish (or other organism) against the screens, increasing the potential for killing or injuring them.

Schiller Station operates two CWISs that withdraw water from the Piscataqua River. Each CWIS provides cooling water to two circulation pumps. As previously indicated, Unit 4 has a submerged offshore intake pipe that is 6.5 feet in diameter. The opening is equipped with a course mesh (12-inch by 12-inch grating) stationary bar rack type screen to prevent large debris from entering the intake. In addition, there is another 1.5 inch mesh fixed screen at the bottom of the tunnel entrance to divert lobsters from crawling into the intake, which had been a problem in the past. Enercon, 2008, p. 4. PSNH first reported that the through-screen velocity at the rotating screens within the screen house is 1.38 feet per second (ft/sec or fps) at mean low water (MLW). *Id*. at 12. However, PSNH later reported to EPA that the intake velocity at the tunnel entrance is 1.97 fps. PSNH, Response to EPA’s Information Request for NPDES Permit Re-Issuance, August 19, 2013, (hereinafter Enercon, 2013), p. 6. This configuration may result in entrapment. *See* 40 C.F.R. § 125.92(j).

The four screen openings used for Units 5 and 6 are approximately 5.5-feet wide each. The openings are protected by bar racks with 4 3/8-inch by 4-inch gratings. The mesh size of the traveling screens is 3/8-inch square. Enercon, 2008, p. 5. According to PSNH, the through-screen velocities for these two units at the intake screens is 0.68 fps at MLW. *Id*. at 12.

EPA has identified an intake velocity of 0.5 ft/sec as being effective for minimizing impingement because a broad range of fish species are strong enough swimmers to escape an intake velocity equal to or less than 0.5 ft/sec. This rate “has been an informal guideline since the 1970s. It has been used in National Environmental Policy Act Environmental Impact Statements and numerous licensing proceedings.” EPRI, 2000, p.1-2. EPA identified this target intake velocity in the Phase I CWA § 316(b) Rule, which applies to new facilities with CWISs (*See* 40 C.F.R. § 125.84(b)(2)), and the New CWA § 316(b) Regulations (*See* 40 C.F.R. § 125.94(c)(2)); 79 Fed. Reg. 48125, 48325, 48336.

Looking at the information underlying this intake velocity standard, EPA found that studies assessing the ability of fish to swim against current velocities found wide variation depending on species, body length, and water temperature. In general, based on the species reviewed, the shorter the length of the fish and/or the lower the temperature, the lower the mean critical velocity observed. *See* EPRI, 2000. The critical velocities of Atlantic menhaden (a resident species of the Piscataqua River) ranged from 0.31 ft/sec to 0.98 ft/sec. Critical velocities of Atlantic herring (also a resident species of the Piscataqua River), however, ranged from 1.2 ft/sec to 4.7 ft/sec depending on the size of fish and ambient temperature of the water. *Id*., Table A-1.

Prolonged swimming speeds are highly dependent on fish length, with smaller (and younger) fish of a particular species typically being weaker swimmers. EPRI found that water temperature had a strong effect on the critical swimming speed of nearly all species tested. According to the report, all fish appeared "less motivated" to swim at lower temperatures. *Id*. at 4-20.

b. Existing Traveling Screens

Schiller Station still utilizes the same traveling screen design and technology that was originally installed with each unit: Unit 4 in 1952, Unit 5 in 1955, and Unit 6 in 1957. Enercon, 2008, p. 15. *See* Figure 9-1 below. The mesh size of the traveling screens is 3/8-inch (9.5 mm) square, which is a size commonly used in the industry for CWIS screens. This mesh size should be small enough to prevent the entrainment of adult fish and most juvenile fish, but not all juvenile fish and earlier lifestages (*i.e.*, eggs and larvae). In addition, narrow shelves (2–3 inches wide) are attached to the screens which carry debris and fish up as the screen rotates. These shelves are designed primarily for moving debris, not fish. Since there are no buckets or troughs used to carry fish safely (in water) to the fish return trough, fish can fall off the screen shelves as the screens emerge from the water. Consequently, fish can suffer injury or exhaustion from being dropped and re-impinged as the screens rotate.

Schiller Station's traveling screens are typically rotated twice daily and more frequently when debris load is high. Fish that are impinged when the screens are stationary suffer the physical trauma of being pinned against the screen, potentially for hours, until the screens are rotated. These fish are much less likely to survive than fish that are promptly removed from the screens and returned to their habitat in a safe and gentle manner. *See* EPRI, 2006, p. 3-18, 3-19. *See also* EPA, Technical Development Document for Final Section 316(b) Existing Facilities Rule, May 2011, EPA-821-R-14-002, (hereinafter TDD, 2014), p. 6-22 ("Insufficiently strong species or life stages may suffocate after prolonged contact with the screens."). Fish impinged on the screens may also be exposed to biocides such as chlorine, which is injected periodically to remove fouling organisms throughout the cooling system.[25] These exposures, combined with the physical stresses of being impinged, are likely to further reduce the chance of survival.

[25] Sodium hypochlorite is pumped to each of three intake forebays (in front of the screens) for 15 minute intervals once per hour for 8 hours. This amounts to 2 hours of biocide use per Unit per day. Enercon, 2008, p. 12.

Figure 9-1: Schiller Station's Unit 5 Intake Screen

Photographed during EPA site visit February 13, 2013.

c. Spray Wash Systems

As rotating traveling screen panels emerge from the water, containing fish and debris, a power spray wash system clears the material from the screens. Each traveling screen has a single-pressure spray header. According to information provided by Schiller Station, the pressure of all the spray wash systems is 40 pounds per square inch (psi). Enercon, 2008, p. 19. EPA considers this pressure higher than that used in a low pressure spray systems designed specifically for fish removal, but lower than the high pressure systems used primarily for debris removal. More recently, spray wash systems have been developed for use by power plants that use both high and low pressure spray washes for the removal of debris and fish, respectively. With such systems, as the traveling screens rotate, they are first hit by the low pressure spray wash (typically 20 psi or less), which is intended to remove fish from the screens without injuring them. The screen is then hit by a high pressure wash (60 psi or greater) that clears off all remaining debris. However, "[d]epending on the spray head's position relative to the screen panel, it may be advantageous to remove debris before fish." TDD, 2014, p. 6-29. The Arthur Kill Station in New York uses a 10 psi low pressure spray wash. *Id*. at 6-34. In addition, the low pressure spray wash used in an EPRI impingement survival study was 10 psi. *See* EPRI, Laboratory Evaluation of Modified Ristroph Traveling Screens for Protecting Fish at Cooling Water Intakes, June 2006.

EPA considers the spray wash systems at Schiller Station to have been designed to remove debris from the traveling screens, not to safely remove fish and other soft-bodied aquatic organisms. These systems are typical for CWISs built during the 1950s and 1960s.

An additional concern for impinged organisms at Schiller Station is posed by the Facility's practice of spraying steam on the travelling screens during times of cold weather to prevent them from freezing. *See* PSNH, Schiller Station NPDES Reapplication, September 2010 (Outfalls 020, 021/022). Spraying steam onto any fish or other aquatic organisms trapped on the screens is likely to injure the creatures and make them less likely to survive being impinged.

d. Fish Return Conduits

Power plants that utilize once-through cooling typically power spray fish and debris off their traveling screens into some form of fish return system which transports the fish (and in some cases debris as well) back to the aquatic habitat from which they were withdrawn. At Schiller Station, fish and debris washed from the Unit 4 traveling screens drop together into a trough where they are carried with wash water into a cement trough and then to a 14-inch covered vinylester resin fiberglass sluice that discharges into the air above the Piscataqua River at an elevation of 4 feet above MSL. The trough servicing both Units 5 and 6 screens carries fish, debris, and wash water from the screens to another fiberglass chute that also discharges to the air above the Piscataqua River at an elevation of 8 feet above MSL.

Both fish return sluiceways return fish to a location between the two intake screen houses, close to Screenhouse #2. Re-impingement of fish from both fish returns systems is likely to be a problem for Screenhouse #2 (Units 5 and 6) because of the close proximity of the fish/debris return locations to the intake, which is located at the shoreline and includes surface withdrawal. Re-impingement of fish into Screenhouse #1 (Unit 4) is less likely because the intake is submerged and offshore, while the fish are returned to the water surface.

9.1.3 Existing Cooling Water Flow Requirements

Schiller Station's once-through cooling system is designed to withdraw up to 125.7 MGD of water from the Piscataqua River.[26]

As discussed above, the facility uses this water for condensing steam in the power plant's condensers. Until the relatively recently (*i.e.*, 2011 or so), Schiller Station operated as a "base-load" plant, meaning that it operated more or less continuously except for scheduled or unscheduled maintenance outages. The common practice of the facility has been to run all six pumps the majority of the time.

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[26] This includes a relatively small amount used for spray washing the intake screens.

For Units 4 and 6, maintenance outages occur every 18 months, and last approximately four weeks. For Unit 5, maintenance outages occur every year, and last approximately three weeks with a six week outage scheduled every five years. "[T]he maintenance outages are staggered so that all Units are not offline at the same time." Enercon, 2008, p. 10.

As part of issuing the existing NPDES permit to Schiller Station in 1990, EPA determined that Schiller Station's existing system satisfied the BTA standard of CWA § 316(b). *See* 1990 Schiller Station NPDES Permit, Part I.A.1.f and EPA Fact Sheet for the 1990 Permit, pp. 6-7. In addition, the 1990 permit requires that:

> All live fish, shellfish and other aquatic organisms collected or trapped on the intake screens shall be returned to their natural habitat. All solid materials removed from the screens shall have land disposal.

1990 Schiller Station NPDES Permit, Part I.A.1.c. EPA is now applying CWA § 316(b) to Schiller Station once more in light of the now existing facts and law.

9.2 EPA's Assessment of Schiller Station's Existing CWIS

EPA considered the location, design and capacity of Schiller Station's existing CWIS (i.e., without any additional "construction" needed) and concluded that these aspects of the CWIS do not reflect the BTA for minimizing adverse environmental impacts (specifically entrainment and impingement). As a power plant with an open-cycle cooling system, Schiller Station uses a maximally water-intensive process for condensing steam in its process for generating electricity. Given the moderately large water withdrawals (maximum 125.7 MGD) coupled with the location of the Facility's CWISs in highly productive estuarine waters, the facility entrains and impinges large numbers of fish and crustaceans of different life stages. (Data from the Facility, as presented above, indicate that the highest entrainment rates occur in the warmer weather months, whereas impingement is generally more consistent across the year.) Furthermore, given the relatively high intake velocities and the lack of updated, fish friendly screening technologies and fish return system equipment, the effects of impingement on aquatic organisms are likely far more adverse than they would be with alternative, update technology. In light of these considerations, EPA determines that the location, design and capacity of Schiller Station's existing CWISs do not, in combination, reflect the BTA for minimizing adverse environmental effects, as required by CWA § 316(b).

9.3 Alternative Intake Location Option

In evaluating the location of Schiller Station's CWISs, it is critical to recognize that because Schiller Station is an existing facility, the question to be answered is whether *relocating* the CWISs would be appropriate. EPA evaluated the existing location of Schiller Station's CWISs in the water body (e.g., proximity to a shoreline), the type of waterbody, and the depth of the intake structure.

As noted above, Schiller Station is located on the tidally influenced Piscataqua River, which makes up part of the Great Bay estuary. Locating the CWIS for an open-cycle cooling system in an estuary will typically present serious entrainment and impingement concerns. Estuaries, such as the tidal portion of the Piscataqua River, are biologically highly productive environments. They are also ecologically critical to other marine systems and are valuable to people. 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 Fed. Reg. 17140 (April 9, 2002) (preamble to the Proposed Phase II rule). Estuaries also 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, Current State and Trends Assessment Chapter 19: Coastal Systems, Ecosystems and Human Well-Being, Island Press, Washington, D.C., 2005.

In developing national standards for § 316(b), EPA has recognized that tidal rivers and estuaries are particularly sensitive water bodies and that both impingement and entrainment are of concern. 79 Fed. Reg. 48424. With regard to locating new CWISs, as long ago as 1976, EPA has recommended selecting locations to avoid important spawning areas, juvenile rearing areas, fish migration paths, shellfish beds or areas of particular importance for aquatic life. See EPA 1976 Development Document.

At the same time, Schiller Station is an existing facility with CWISs that are already in place. The CWISs would need to be extended a very long way to get outside of the Great Bay estuary and the Piscataqua River and the cost and environmental effects of such an undertaking would be huge. Moreover, it is not clear that a location outside the estuary in more of an open ocean environment would necessarily have lesser adverse environmental effects. Certainly EPA does not have any data identifying a feasible, environmentally preferable location for the CWISs outside of the river and estuary.

EPA also considered more modest changes to the location of the Facility's CWISs. PSNH evaluated the conversion of Unit 4's offshore intake to a nearshore intake. Based on the biological data collected for the Units 5 and 6 nearshore intake,[27] PSNH determined that relocating the offshore Unit 4 intake to a nearshore location could reduce impingement of fish and macrocrustaceans. Entrainment was not evaluated for an alternative intake location due to the lack of icthyoplankton data for any new alternative intake location. PSNH cautioned that this determination is dependent on conducting field studies, including biological monitoring, to establish if this option is technologically feasible and whether it would also be beneficial in terms of entrainment reduction. In addition, PSNH rejected the option of converting the nearshore Unit 5 and 6 intake to an offshore location because of the potential to increase impingement. *See* Enercon, 2008, pp. 88-89.

EPA suspects that the high impingement rate for Unit 4 compared to Units 5 and 6 is at least partly due to the high intake velocity at the tunnel entrance to the Unit 4 intake structure, thereby trapping aquatic life in the Unit 4 screen well. EPA agrees that further studies would be required to determine both the feasibility and potential biological benefits of this option. Based on

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[27] "For EA fish, the Unit 4 impingement was approximately two times the average of Units 5 and 6. For macrocrustaceans, the Unit 4 impingement was approximately six times the average of Units 5 and 6." Enercon, 2008, p. 88.

insufficient information, EPA cannot conclude at this time that relocating the Unit 4 intake to a near-shore location is a potential BTA for minimizing impingement and entrainment. In addition, EPA agrees with the Facility that relocating the Units 5 and 6 intake to an offshore location does not constitute an option for the BTA for this CWIS.

9.4 CWIS Design and Construction Options

CWISs can be designed to include various types of "exclusion" technologies that aim to prevent or minimize mortality to aquatic organisms from entrainment and/or impingement by excluding them from being drawn into the CWIS and/or through the intake screens. Exclusion technologies typically use some type of screening system to block organisms from being taken from their aquatic habitat and pulled into the CWIS and through the intake screens.[28] There are many different exclusion technologies, but they can generally be grouped into two broad categories: coarse-mesh or fine-mesh screening systems.

It must also be understood, however, that to the extent that a screen blocks an organism from being entrained, that organism has necessarily been impinged against that screen. As a result, in order to assess the ultimate benefit of the technology, EPA must also assess whether or not these impinged organisms can safely be removed from the screens and returned to their habitat. This is a particular challenge with regard to tiny, fragile icthyoplankton. Moreover, successful methods for monitoring whether eggs and larvae survive after being impinged, removed from screens and returned to the water are not widely available. Just the process of collecting and examining these organisms can destroy them. Nevertheless, EPA must assess whether an exclusion technology capable of preventing entrainment mortality is merely replacing it with impingement mortality.

Fine-mesh screening technologies attempt to reduce both the entrainment of fish eggs and larva and impingement mortality. According to PSNH, a mesh size of no greater than 1.0 mm is necessary to effectively screen most fish eggs and larvae. Enercon, 2008, p. 80. The degree of success that mesh of different sizes would have at any particular site will depend, in part, on the size of the mesh relative to the size of the eggs and larvae present at the site. It will also depend, in part, on intake velocity, as excessive intake velocity can result in eggs and/or larvae being impinged and pulled through the screens. Fine-mesh traveling screens rely on small mesh-size and low intake velocity to try to reduce or prevent entrainment by excluding (or blocking) organisms from being pulled into the plant's CWIS, but may substitute impingement mortality for entrainment. If intake velocity is reduced, passing currents in the water body may be more likely to sweep organisms past the intake. At the same time, however, if intake velocity and screen mesh size are both to be reduced, the intake area will need to be increased to provide adequate water volume. *See* TDD, 2014, p. 6-50. Another exclusion technology, wedgewire screens, also relies upon very small mesh sizes and low intake velocities to exclude organisms and enable passing currents to sweep organisms past the CWIS. Indeed, the design of wedgewire screens is intended particularly to minimize any contact of eggs and larvae against the fine-mesh screens and to facilitate any eggs and larvae that do contact the screens being washed off by

[28] For this Fact Sheet, EPA does not evaluate "behavioral" systems that have been discussed in the literature and that use lights or sounds to try to prevent impingement (primarily). To EPA's knowledge, the effectiveness of this type of system has not been demonstrated. Moreover, PSNH has not proposed such a system for Schiller Station. Therefore, EPA focuses its evaluation of exclusion system options that seek to prevent or reduce entrainment and/or impingement by reducing intake velocities and/or by blocking organisms with some type of screening system.

passing currents.

PSNH reviewed several exclusion technologies. The Enercon, 2008 report evaluates coarse-mesh Ristroph screens, dual flow conversion traveling screens, Geiger MultiDisc® screens, Beaudrey's W Intake Protection Screen (WIP), aquatic microfiltration barrier, as well as "wide-slot" and "narrow-slot" wedgewire screens. Below EPA reviews the exclusion technologies presented by PSNH as potential BTA options.

The following is a discussion of the exclusion technologies evaluated by PSNH, including EPA's assessment of whether these technologies are "available" for Schiller Station.

9.4.1 Wedgewire Screens

"Wedgewire screens utilize "V" or wedge-shaped, cross-section wire welded to a framing system to form a slotted screening element." Taft, 2000, p. S354. In its evaluation of this technology, PSNH differentiated between "wide slot" and "narrow slot" screens. Although neither is specifically defined in the evaluation, PSNH provides data for slot sizes ranging from 0.6 mm – 1.0 mm in its discussion of "narrow slot" wedgewire screens. In the present discussion, the terms "wide slot" and "narrow slot" when used in the context of wedgewire screens are equivalent to the terms "coarse-mesh" and "fine-mesh," respectively, when used in the context of other types of screening systems.

Wedgewire screens can potentially reduce both entrainment and impingement by physically excluding organisms from being drawn into the CWIS and by generating low intake velocities that allow motile organisms to swim away from the screens and avoid being impinged. This technology relies on the presence of swift ambient currents passing by the screens so that organisms will be swept away from the CWIS to safety. Thus, the extent to which installing wedgewire screens at a particular facility will reduce mortality to aquatic organisms from impingement or entrainment will depend on a variety of factors including the screen slot size relative to the size of the organisms, the characteristics of the organisms present (*e.g.*, their size, life stage, motility or lack thereof, swimming strength, durability or hardiness), water depths, water withdrawal volumes and intake velocities, the type of system used to prevent screen clogging by debris or biological growth (*e.g.*, air-burst systems, application of biocides, physical cleaning techniques), and the presence of sufficient ambient current to sweep organisms away from the intake screens. To the extent that a small slot size wedgewire screen prevents entrainment by physically blocking or excluding the organism from entering the CWIS, a key question is whether the organism will survive being impinged against the screen. This is discussed in more detail below. *See* 79 Fed. Reg. 48331.

An important issue for fine-mesh screens is whether and to what extent the screens may suffer clogging problems, either from debris in the water body or biological growth. If the screen openings are clogged, intake velocities may increase and/or the facility may have trouble obtaining adequate water volumes. There are several methods that a facility may use alone or in combination to deal with clogging, such as an air burst system (low or high pressure), application of biocides, physical scraping. Depending on the method chosen, it may be more or less detrimental to any organisms caught on the screens.

Wedgewire Screens – PSNH's Review

In its 2008 analysis, PSNH rejected wide-slot wedgewire screens for Schiller Station because they would not help to reduce entrainment. *See* Enercon, 2008, p. 79.

With regard to screens with smaller slot sizes, PSNH's 2008 analysis evaluated four sizes (0.6 mm, 0.69 mm, 0.8 mm, and 1.0 mm). These slot sizes were chosen to provide entrainment reduction based on the size of different life stages of organisms found in the Piscataqua River in the vicinity of Schiller Station. In order to maintain a through-screen velocity less than 0.5 fps, PSNH indicated that an installation of six screens would be necessary. PSNH also indicated that if the 1.0 mm slot size was chosen, each of the six screens would be 166" long and 54" in diameter. PSNH further reported that the other 3 options would have screens with lengths of 190" and 60" diameters. *Id*. at 81.

PSNH also indicated that the wedgewire screen system would include an airburst cleaning system to remove accumulated debris, but that calcareous algae, barnacles, mussels and other organisms would require manual removal quarterly. To aid in the prevention of biological growth on the screen mesh, PSNH stated that copper-based alloy screen materials would most likely be used, as well as the potential routine application of biocides. PSNH indicated that operation costs would slightly increase with the need to use the airburst system at a higher frequency than normal (i.e., three times per day versus once per day).

PSNH proposed that the screens would require quarterly inspection for the first 12 to 15 months after installation in order to evaluate the rate of fouling. According to the company, both the internal and external surfaces of the screens would require periodic cleaning using either scraping tools or high-pressure hydro-lancing. To facilitate cleaning, PSNH also indicated that either a man-way could be installed to allow internal access to the screens or the screens could be designed to be removable, allowing for cleaning above the water surface.

In addition, PSNH estimated a range for the capital cost of replacing the existing traveling screens with the narrow-slot wedgewire screens, which is considered CBI. *Id*. at 85.

Ultimately, PSNH concluded that wedgewire screens could effectively reduce impingement and entrainment mortality. The company indicated that impingement would be minimized by maintaining through-screen velocities less than 0.5 fps while the Piscataqua River would provide sufficient ambient river current velocity to sweep eggs, larvae, and fouling debris past the screens. According to PSNH, the use of wedgewire screens with different slot widths would decrease impingement mortality and entrainment by the percentages shown in Table 9-A. (The Region notes that the figures for entrainment reduction do not necessarily represent an equal reduction in entrainment *mortality* because they do not reflect an evaluation of whether or to what extent organisms will contact the screens and survive such contact.)

Table 9-A: PSNH Estimates of Impingement Mortality and Entrainment Exclusion for Equivalent Adult Fish and Macrocrustaceans Using Wedgewire Screens

Slot/Mesh Size	Estimated % Reduction in EA Fish Impingement Mortality	Estimated % Reduction in EA Macrocrustacean Impingement Mortality	Estimated % Reduction in EA Fish Entrainment	Estimated % Reduction in EA Macrocrustacean Entrainment
1.0 mm	80-95	80-95	73.3	100
0.8 mm	80-95	80-95	89.6	100
0.69 mm	80-95	80-95	92.4	100
0.6 mm	80-95	80-95	98.9	100

Id. at 85 and 105. Citing the then suspended 316(b) Phase II Rule, PSNH pointed out that the estimates for impingement reduction are based on reducing the through-screen velocity to 0.5 fps or less. PSNH also recommended a one year pilot study in order to evaluate (1) the effectiveness of different slot for reducing entrainment, and (2) the ability of different construction materials to hold up to the marine environment without clogging.

In October 2014, PSNH submitted a supplemental information report to Region 1 titled, Engineering Response Supplement to United States Environmental Protection Agency CWA § 308 Letter, prepared by Enercon Services, Inc., October 2014 (hereinafter Enercon, 2014). In this report, PSNH proposed wide-slot wedgewire screens as a compliance candidate for Section 316(b) of the CWA under §125.94(c)(2).[29] According to PSNH, this option would include two Johnson Screens Model T-78HC half-screens with a slot width of 3/8 inches (9.5 mm) for Screen House #1 (the Unit 4 intake) and three of the same screens for Screen House #2 (Units 5 and 6 intakes). The company indicated that each of the two screens installed for Screen House #1 would be 18.25 feet long and have a diameter of 78 inches, and that each of the three Screen House #2 screens would be 20.75 feet long and have a width/diameter of 84 inches. PSNH further stated that "the maximum through-screen velocity would [be] 0.33 fps, which is less than the 0.5 fps design intake velocity required to be considered a candidate technology under §125.94(c)(2)." Enercon, 2014, p. 29. Similar to the smaller slot size screens discussed above, PSNH also indicates that this option would include an airburst cleaning system to remove accumulated debris.

Compared to the Enercon 2008 report, the 2014 report adds an evaluation of the variables that need to be considered in the design and construction of wedgewire screens. These considerations include the use of high grade stainless steel, hydrodynamic load, hydrostatic load, wave load, impact load[30] weight of the structures and the stability of the bedrock underneath, marine construction methodologies, potential concerns of having lower water levels in the intake bays

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[29] This report also evaluates Parallel Condensing System™ technology and drum screens, which are not considered feasible and not discussed in this Fact Sheet.

[30] "The wedgewire screens are installed on the bottom of the river, and the probability of direct impact from the floating debris is low. Therefore, the 'normal impact' case would be considered during detailed design. Previous project experience has also shown that impact of debris on wedgewire screens at water velocities similar to this case results in localized damage of the wedgewire screens, but not complete failure." Enercon 2014, p. 32.

and increased hydraulic head across the circulating water pumps, as well as the need for wedgewire screen by-pass capabilities during emergency situations.

PSNH provides cost estimates for the wide-slot screens, but again claims that they are CBI. As a result, these values are not reported here.

Finally, the biological efficacy of wide-slot wedgewire screens was not evaluated in Enercon, 2014 since, according to Enercon, "biological efficacy is not required under the final § 316(b) regulations." Enercon, 2014, p. 48.

Wedgewire Screens – EPA's Review

As discussed below, EPA's analysis concludes that wedgewire screens are a viable, promising BTA option for Schiller Station. Depending on the configuration of the wedgewire screens that would be applied at the Facility, this technology may be able to substantially reduce mortality to aquatic organisms from impingement and entrainment by Schiller Station's CWISs. That said, the exact percentage by which entrainment mortality would be reduced by this technology is scientifically uncertain.

Necessary Site Characteristics

Adequate water depth near the intakes is required to ensure that wedgewire screens remain submerged at all times. PSNH reports that the depth in front of the current intakes is nearly 20 feet and that it must periodically dredge sediment that accumulates in front of the intake structures. Enercon, 2008, p. 4 and 5. Based on a proposed maximum wedgewire screen diameter of 60 inches, adequate water depth would be expected to be maintained at all times. Generally, "[t]he available water depth should be at least twice the diameter of the intake screen." http://www.wedgewire.com/intakescreen.htm. Further, dredging would not likely be necessary with wedgewire screens because the screen cylinders are commonly located off the river bottom mounted on a central intake pipe as shown in the figure below (shown with an active airburst system for removing small debris and silt from the screens) (TDD, 2014, p. 6-22).

Figure 9-2: Example Wedgewire Screen Installation

Not only is adequate water depth needed, but the water body itself must be large enough to accommodate the wedgewire screen installation without excessive interference with the water body's beneficial uses, such as navigation. As wedgewire screen slot sizes are reduced, and through-screen intake velocities are reduced, both of which are necessary to maximize entrainment and impingement mortality reductions, the size of a wedgewire screen installation must increase in order to ensure that an adequate volume of cooling water is provided to the facility. For this reason, wedgewire screens are best suited – though they may or may not prove to be viable or effective – in cases where the cooling water withdrawal volumes are low relative to the size of the water body in which they are to be located. In such cases, the water body is most likely to be able to accommodate an adequate number of wedgewire screens to meet the facility's cooling water demand. At Schiller Station, the intake flow of 125 MGD is relatively small as compared to the river width and depth, and an adequately sized wedgewire screen installation is not likely to interfere with other uses of the river. The proposed locations of the wedgewire screens are inshore of the facility's pier. Navigation and use of this area is already restricted due to the presence of the company's pier and other infrastructure. Thus, the installation of the wedgewire screens would not alter its use. (The number and size of screens proposed for Schiller's two CWISs are specified above.)

As mentioned above, the presence of adequate ambient sweeping current velocities in the source water body is critical to the success of wedgewire screen technology. Sweeping currents must be sufficient to move organisms away from the CWIS to minimize any entrapment against the screens. Currents in the Piscataqua River in the vicinity of Schiller Station appear to be sufficient for this purpose. PSNH reports that the average maximum ebb velocity (seaward flow) is 4.89 feet per second ("fps") and the average maximum flood velocity (landward flow) is 4.39 fps.[31] The velocity of the river current drops below 0.5 knots (0.8 ft/sec) only for short periods around slack tide. For the great majority of the time, the upstream and downstream forces exerted by the tidal river velocity would be much greater than the 0.5 ft/sec through-screen velocity of the proposed wedgewire screen installation. Fish swimming in the vicinity of the screens must also contend with these tidally induced river velocities that move across the intake screens. In this high energy estuarine environment, the relatively small through-screen velocity would not be expected to significantly influence adult and juvenile fish. These currents would also be sufficient to move a proportion of drifting organisms past the screens.[32] EPA considers the relatively high velocity conditions (except the brief slack tide periods) in the Piscataqua River

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[31] NOAA reports the following average river current velocities (depth in parentheses) for the area of the river adjacent to Schiller Station: flood tides - 4.0fps (9d), 3.8fps (29d), and 3.5fps (52d); and ebb tides - 3.6fps (9d), 3.5fps (29d), and 2.9fps (52d). http://tidesandcurrents.noaa.gov/currents12/tab2ac1.html.

[32] The Piscataqua's high velocity currents are already capable of sweeping some portion of the river's aquatic organisms past the existing CWISs, but the intake velocity and wide-mesh traveling screens still result in the impingement and entrainment, as evidenced in the data presented above. By reducing the intake velocity, wedgewire screens would reduce impingement by potentially enabling adult and juvenile fish to escape from the intakes and may also facilitate drifting organisms being swept past the intakes. This effect on drifting organisms may, to some extent, be counteracted by the larger surface area of the wedgewire screens in the river as compared to the area of the existing intakes. EPA does not have sufficient information enabling the Agency to quantify the result of these opposing forces. Therefore, at present, EPA is conservatively assuming that the same number of eggs and larvae will be drawn to the wedgewire screens as are currently entrained at the Facility. EPA expects that this is a conservative assumption because of the information, discussed below, suggesting that eggs and larvae may be swept past a wedgewire screen installation.

suitable for the effective use of wedgewire screens.

In its evaluation of wedgewire screens in support of New CWA § 316(b) Regulations, EPA has also noted the following additional logistical issue:

> As with any intake structure, the presence of large debris poses a risk of damage to the structure if not properly managed. Cylindrical wedgewire screens, because of their need to be submerged in the water current away from shore, might be more susceptible to debris interaction than other onshore technologies. Vendor engineers and facility representatives indicated that large debris has been a concern at several of their existing installations, but the risk associated with it has been effectively minimized by selecting the optimal site and constructing debris diversion structures. Significant damage to a wedgewire screen is most likely to occur from fast-moving submerged debris. Because wedgewire screens do not need to be sited in the area with the fastest current, a less damage-prone area closer to shore or in a cove or constructed embayment can be selected, provided it maintains a minimum ambient current around the screen assembly. If placement in the main channel is unavoidable, deflecting structures can be employed to prevent free-floating debris from contacting the screen assembly. Typical installations of cylindrical wedgewire place them roughly parallel to the direction of the current, exposing only the upstream nose to direct impacts with debris traveling downstream. EPA has noted several installations where debris-deflecting nose cones have been installed to effectively eliminate the damage risk associated with most debris.

TDD, 2014, p. 6-42 to 6-43. Given the size and characteristics of the river around Schiller Station, and the size of the wedgewire screen array that would likely be needed, EPA concludes that wedgewire screens could be installed at Schiller Station in a location that would minimize the threat of damage from large debris. For example, wedgewire screens at Schiller Station would be located in the shadow of the Facility's pier, which is likely to offer some protection from vessels and debris.

Reductions in Impingement Mortality

Wedgewire screens prevent or minimize impingement by maintaining intake velocities low enough that most fish and other motile organisms should be able to swim away from the screens and avoid being pulled against them. Low intake velocities result from the cylindrical shape and relatively large surface area of a wedgewire screen, which quickly dissipates through-screen intake velocity. As mentioned above, if a large amount of cooling water is needed, the size of the wedgewire screen array may need to be quite large to provide enough water while maintaining a low intake velocity. Yet, even if the installation is large, organisms should still be able to avoid becoming impinged as long as the intake velocity is low.

Although an intake velocity of 0.5 fps is generally expected to protect 96% of fish from impingement, *see* Phase I Rule (66 Fed. Reg. 65256); TDD, 2014, p. 6-66), EPA has decided to use PSNH's lower value of an 80-95% (87.5% average) impingement reduction for both fish and macrocrustaceans for this case because the critical swim speeds for some resident species in the Piscataqua River are below 0.5 fps. In other words, some species may not be able to escape certain intake velocities below 0.5 fps. For example, the critical velocities of Atlantic menhaden ranged from 0.31 ft/sec to 0.98 ft/sec. *See* EPRI, 2000, Table A. Thus, even using PSNH's lower values, wedgewire screens are estimated to achieve a large reduction in impingement mortality.

All of the wedgewire screen options proposed would be designed to achieve an intake through-screen velocity of 0.5 fps or less under all conditions. As a result, all of these options would satisfy the impingement mortality reduction standard for the BTA under the New CWA § 316(b) Regulations. *See* 40 C.F.R. § 125.94(c)(2).

Reductions in Entrainment and Entrainment Mortality

Wedgewire screens can also reduce entrainment and entrainment mortality. This technology achieves these reductions in two different ways. *See* 40 C.F.R. § 125.92(h) and (i) (definitions of "entrainment" and "entrainment mortality" in New CWA § 316(b) Regulations). First, by siting the screens in an area with sufficiently rapid ambient sweeping currents, wedgewire screens may make it more likely that organisms will be swept past the CWIS rather than ever coming into contact with it. *See* 79 Fed. Reg. 48334 ("Limited evidence also suggests that extremely low intake velocities can allow some egg and larval life stages to avoid the intake because of hydrodynamic influences of the crossflow"); TDD, 2014, pp. 6-50 to 6-51; EPRI, 2003. At the same time, maintaining adequate water withdrawal volumes despite low intake velocities and small slot sizes will require a larger screen area than a CWIS with a higher intake velocity and wider-mesh screens. *See* TDD, 2014, p. 6-50. The increased area of the screen array in the water may, in turn, tend to result in more drifting organisms coming into contact with the screens as water is drawn through them. *See id.* at p. 6-44 (wedgewire screens oriented parallel to river current may result in more contact with the screens for aquatic organisms). In other words, this appears likely to lessen the chance that organisms will avoid the screens entirely. EPA does not have sufficient information to quantify the product of these potentially offsetting processes at Schiller Station (*i.e.*, the effect on screen avoidance of reduced intake velocity versus increased screen area).

Second, wedgewire screens can also reduce entrainment by making the slot width of the wedgewire screen mesh small enough to preclude organisms in the source water body from passing through the screen along with the water being withdrawn for cooling purposes. Entrainment is typically a problem for very small organisms (eggs, larvae and potentially juvenile organisms), which are immotile or weak swimmers and tend to drift with prevailing currents. As a result, the screen slot size must be quite small to prevent entrainment. More specifically, the screens' slot size must be small enough relative to the size of the organisms that are present to exclude or prevent their being pulled through the screens.[33] PSNH has presented exclusion estimates for wedgewire screens with different slot sizes, as indicated in the table above.

Based on the size of the resident species' eggs and larvae, EPA agrees with PSNH that a slot size of 0.6 mm to 0.8 mm will likely be needed to maximize entrainment reductions at Schiller

[33] For larvae, the critical measurement is not their length, but their head capsule width. This is because even if a larva is longer than a particular screen opening, it can be pulled through that opening if the head capsule is narrower than the opening.

Station. As a result, EPA rejects PSNH's 2014 proposal of wide-slot wedgewire screens (9.5 mm), as presented in the Enercon, 2014 report, as a possible BTA for reducing entrainment mortality at Schiller Station because such screens would be of limited value for reducing entrainment. With a mesh size that large, as PSNH has recognized previously, eggs and larvae will be entrained with the water withdrawn by the Facility through its CWISs.[34]

At the same time, smaller slot sizes may be more likely to have screen fouling problems from debris and/or biological growth. Screens with very small slot sizes require greater screen surface areas to provide adequate water volumes while maintaining sufficiently low intake velocity. Thus, all of these factors must be balanced to decide upon the optimal screen slot size for a particular facility. *See* TDD, 2014, p. 6-50 (citing EPRI study which cautioned "that the available data are not sufficient to determine the biological and engineering factors that would need to be optimized, and in what manner, for future applications of wedgewire screens").

According to PSNH's proposal, six wedgewire screens would need to be installed in the Piscataqua River based on a range of mesh sizes from 0.6 mm to 1.0 mm. Screen house #1 would require two screens and screen house #2 would have four screens. As reported above, PSNH has indicated that with a 1.0 mm slot size, each screen would be 166" long and 54" in diameter, while the other 3 slot size options would have screens with a length of 190" and a diameter of 60". Enercon, 2008, p. 81. Each screen installation configuration was determined to result in a through-screen velocity less than 0.5 fps. *See id*. Of course, as screen fouling increases, screen intake velocity increases, too. Therefore, the proposed air burst system and periodic manual cleaning would be necessary to prevent such fouling of the screens and any attendant increase in intake velocity. In addition, EPA agrees that the screens may need to be constructed with copper (or nickel) alloys to discourage biofouling. *See* TDD, 2014, p. 6-42. However, EPA does not necessarily agree that emergency by-pass capability is warranted at this location and welcomes comment and more information on this design feature.

PSNH's consultants estimated the number of eggs and larvae that would be excluded by wedgewire screens with different slot sizes (see Table 9-A above). However, these values are based on adult equivalents. [35] EPA considers adult equivalents, but also focuses on absolute loss numbers of eggs and larvae when making control decisions. Basing decisions solely on adult equivalents would ignore the valuable ecological role eggs and larvae play in the food chain. Tables 6-19 through 6-20 in Attachment 6 of the Enercon 2008 report show the total number of fish eggs and larvae entrained per unit and wedgewire slot size. These estimates are based the dimensional sizes of various eggs and larvae from literature sources plus assumptions of the percent of eggs and larvae retained on the screens. Accordingly, PSNH estimated the % entrainment reduction for total numbers of fish eggs and larvae is 11.5% for 1.0 mm screens,

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[34] To the extent that PSNH is suggesting that Schiller Station is not subject to entrainment controls under the New CWA § 316(b) Regulations, this is incorrect. The Facility plainly is subject to entrainment control requirements under 40 C.F.R. § 125.94(d), as well as impingement control requirements under 40 C.F.R. § 125.94(c). This is so regardless of whether information submission requirements vary under the New CWA § 316(b) Regulations based on whether a facility withdraws more or less than 125 MGD.

[35] An adult equivalents analysis estimates the number of adult fish of a certain age that a particular number of eggs and larvae would produce based on certain assumptions about the normal development and survival of the early life stages of each species.

79.2% for 0.8 mm screens, 85% for 0.69 mm screens and 94.4% for 0.6 mm screens. The same type of analysis is also presented for macrocrustaceans (*e.g.*, various species of crab and lobsters) and concludes that all the mesh sizes would reduce the entrainment of these organisms by 100%.

Based on PSNH's evaluation of total numbers of organisms, including fish eggs and larvae and macrocrustaceans, the following numbers of individuals are expected to be excluded from wedgewire screens:

Table 9-B: Entrainment Exclusion Estimates for Total Numbers of Organisms Using Wedgewire Screens

Slot/Mesh Size	Estimated % of Fish Excluded from Entrainment	Estimated % of Macrocrustacean Excluded from Entrainment	Total % of Organisms Excluded from Entrainment
1.0 mm	11.5	100	85.9
0.8 mm	79.2	100	96.7
0.69 mm	85.0	100	97.6
0.6 mm	94.4	100	99.1

Another critical issue to consider when assessing whether wedgewire screens should be the BTA at a particular facility is whether organisms (primarily eggs and larvae) being excluded from entrainment by the screens will *survive* any contact that they may have with the screens. Because such organisms tend to be relatively fragile, befitting their small size and early stage of development, using a screen to exclude eggs and larvae from being entrained is not necessarily the same thing as providing for their survival. The organisms may die from being impinged against the screens. *See* 79 Fed. Reg. 48330-48331, 48334-48335, 48340-48341, 48377; TDD, 2014, pp. 6-23, 6-50; 76 Fed. Reg. 22186 (Apr. 20, 2011) (preamble to Proposed CWA § 316(b) Regulations for Existing Facilities). *See also* New CWA § 316(b) Regulations, 40 C.F.R. §§ 125.92(h) and (i) (definitions of "entrainment" and "entrainment mortality"). To reduce mortality, therefore, the eggs and larvae excluded from the intake by fine-mesh wedgewire 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 CWIS's adverse environmental impact will not have been reduced. PSNH's consultants did not, however, evaluate such survival. They only assessed the ability of different screen slot sizes to exclude organisms from being entrained.

At present, EPA has insufficient information that directly assesses egg and larval survival after contacting a fine-mesh wedgewire screen. 79 Fed. Reg. 48335-48336, 48435. *See id.* at 48331. Studying egg and larval survival after contact with a wedgewire screen would be difficult. Indeed, larvae in particular can be so fragile that they are killed merely by the process of trying to collect them for analysis. *See* 79 Fed. Reg. 48323; TDD, 2014, p. 11-10. That said, EPA has collected and reviewed some information from the scientific literature concerning the survival of eggs and larvae after being impinged against a fine-mesh traveling screen. This is not the same technology, but they exclude organisms from entrainment by relying, at least in part, on a small screen mesh size relative to the size of the otherwise entrainable organisms. This data suggests that under some circumstances (*e.g.*, low intake velocity) the eggs of some fish species, as well as crustacean larvae, may be capable of surviving contact with a fine-mesh wedgewire screen. Given the manner in which wedgewire screens are intended to take advantage of passing currents to move organisms, EPA would expect fish eggs to do equally well or better after contact with a wedgewire screen as with a travelling screen. The literature data also suggests, however, that fish larvae are unlikely, or at least are much less likely, to survive such an impact against a fine-mesh screen. Again, EPA would expect fish larvae to have similar or somewhat better survival after contact with a wedgewire screen. Region 1 discussed this information in some detail in its Fact Sheet (*see* pp. 27-29) for the Draft NPDES Permit for the GE Aviation facility in Lynn, Massachusetts (NPDES Permit No. 0003905). *See also* 76 Fed. Reg. 22186 (Apr. 20, 2011).

EPA further evaluated the issue by considering (1) the prevalence of each species and life stage identified in Schiller Station's entrainment samples, and (2) the characteristics of the egg and larval stages of these species that would or would not tend to promote their survival. EPA used the results from the Schiller Station entrainment study and site specific egg and larval exclusion rates supplied by Normandeau (Enercon, 2008, p. 85) to calculate an estimate of the quantity of eggs and larvae that would be excluded from going through the plant. EPA then applied a conservative survival estimate of 80% for eggs and 12% for larvae based on the performance of fine mesh traveling screens[36]. *See* TDD, 2014, p. 6-45 to 6-48. Based on the calculation shown below, the effective reduction in entrainment mortality of fish eggs and larvae for the 1 mm mesh size would be approximately 6%, for 0.8 mm mesh it would be 37%. For the 0.69 mm mesh size, the effective reduction would be 44% and for 0.6 mm the effective reduction would be 49%. All mesh sizes performed equally for macrocrustaceans with a high level of exclusion and subsequent survival.

Total Entrainment = E_T = 156,179,633 (See Section 8.2.3)
Eggs Entrained (E_E) = E_T × 0.58 (eggs comprise 58% of the entrainment losses) = 90,584,187
Larvae Entrained (E_L) = E_T × 0.42 (larvae comprise 42% of the entrainment losses) = 65,595,446

Eggs Screened Out (S_E) = E_E × (Enercon, 2008 slot size %)[37]

1 mm	90,584,187 × 0.115 = 10,417,182
0.8 mm	90,584,187 × 0.729 = 66,035,872
0.69 mm	90,584,187 × 0.85 = 76,996,559
0.6 mm	90,584,187 × 0.944 = 85,511,473

Larvae Screened Out (S_L) = E_L × (Enercon, 2008 slot size %)

1 mm	65,595,446 × 0.115 = 7,543,476
0.8 mm	65,595,446 × 0.729 = 47,819,080
0.69 mm	65,595,446 × 0.85 = 55,756,129
0.6 mm	65,595,446 × 0.944 = 61,922,101

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[36] Based on EPA's review of various EPRI reports (2003, 2005, 2007), EPA's TDD for the 316(b) rule and our site specific knowledge of the Piscataqua River, EPA estimated egg survival to be 80% and larval survival to be 12%. The high ambient velocity in the Piscataqua produces a substantial sweeping flow that should minimize egg and larvae contact time with the screens. Obviously, complete avoidance of the screens would produce the lowest mortality rates for larvae and eggs, but EPA believes that reducing contact time with the screen is an important factor is reducing egg and larval mortality.

[37] See Tables 6-19, 6-20, and 6-21 of the Enercon 2008 Report.

Egg Survival (A_E) = S_E × 0.8 (80% of screened out eggs survive)

1 mm	10,417,182 × 0.8 = 8,333,745
0.8 mm	66,035,872 × 0.8 = 52,828,698
0.69 mm	76,996,559 × 0.8 = 61,597,247
0.6 mm	85,511,473 × 0.8 = 68,409,178

Larvae Survival (A_L) = S_L × 0.12

1 mm	7,543,476 × 0.12 = 905,217
0.8 mm	47,819,080 × 0.12 = 5,738,290
0.69 mm	55,756,129 × 0.12 = 6,690,735
0.6 mm	61,922,101 × 0.12 = 7,430,652

Total Survival (T_S) = A_E + A_L

1 mm	8,333,745 + 905,217 = 9,238,962
0.8 mm	52,828,698 + 5,738,290 = 58,566,988
0.69 mm	61,597,247 + 6,690,735 = 68,287,982
0.6 mm	68,409,178 + 7,430,652 = 75,839,830

Effective Reduction = T_S/E_T × 100%

1 mm	9,238,962 / 156,179,633 × 100 = 6%
0.8 mm	58,566,988 / 156,179,633 × 100 = 37%
0.69 mm	68,287,982 / 156,179,633 × 100 = 44%
0.6 mm	75,839,830 / 156,179,633 × 100 = 49%

In sum, under certain environmental conditions, narrow slot wedgewire screen technology may be capable of substantial reductions in entrainment and impingement mortality at facilities with certain characteristics. EPA concludes that the necessary conditions for an effective wedgewire screen installation are likely present at Schiller Station. Therefore, this technology warrants further consideration as a potential BTA for reducing both entrainment and impingement mortality under the New CWA § 316(b) Regulations.

That said, any estimate of the amount of entrainment mortality reduction that this technology will achieve at Schiller Station unavoidably will reflect considerable uncertainty. Section 10 of this Fact Sheet presents EPA's BTA determination.

9.4.2 Traveling Screens and Intake Renovations

Traveling screens at a power plant are self-cleaning screening devices used to remove fish and debris from flowing water prior to its being drawn into the plant's condenser cooling system. Early designs, such as those still in use at Schiller Station, include a series of screen panels oriented perpendicular to the water flow. When operating, which may be continuously or periodically, these panels rotate vertically on a track, rising upwards on the upstream-side of the screen structure. Fish and debris are collected on shelves or baskets on the upstream-side of the screens structure, raised out of the water, and then washed off by a power spray system into a fish/debris return sluice before the screen descends back down into the water on the downstream side. Fish and debris that are not removed from the screen may drop off on the downstream side of the screen structure. This "carryover" continues into the intake screen well and potentially into the circulating water pump intake. Enercon, 2008, p.6.

PSNH identifies the features of a traveling screen that it considers "desirable" for minimizing impingement and entrainment. They are as follows:

- approach and through-flow intake velocities less than 1 fps;
- open or short intake channels with "escape routes";
- small mesh openings;
- provisions to gently handle impinged fish;
- continuous operation; and
- low-pressure wash system to gently remove impinged fish.

See Id. at 18. EPA has previously identified additional design features to minimize impingement mortality, including the following:

- using redesigned collection buckets with flow spoilers to minimize injuries;
- using fish guard rails to keep fish from escaping the buckets or baskets;
- determining the best order for performing fish removal with low-pressure spray and debris removal with high-pressure washing; and
- using smooth-woven screen mesh to minimize fish de-scaling.

See TDD, 2014, p. 6-25. In addition, another design feature is to relocate chlorine (biocide) dosing from in front of the screens to the back-side of screens to reduce exposure to impinged fish and other organisms. Furthermore, in the Phase I CWA § 316(b) Rule, EPA designated a maximum through-screen intake velocity rate of 0.5 ft/sec as a component of the BTA for minimizing impingement mortality at new facilities.

PSNH evaluated several types of traveling screen technologies; namely Ristroph, MultiDisc®, Dual Flow, and Beaudrey W Intake Protection screens. Some of these technologies use coarse-mesh screening designed to prevent the entrainment of juvenile and adult fish, but not the smaller egg and larval stages. Other technologies employ (or are capable of employing) fine-mesh screens designed to prevent the entrainment of all life stages of fish. These technologies, and evaluations of their suitability for Schiller Station by EPA and PSNH, are discussed below.

a. Ristroph Screens

Coarse-Mesh Ristroph Screens

Conventional traveling screens can be replaced with coarse-mesh Ristroph screen panels fitted with fish buckets. PSNH identifies the following features of the Ristroph screen that are designed to significantly reduce impingement mortality:

- mesh size that minimizes harm to fish;
- basket that maximizes the screening area available;
- fish bucket with opening designed to encourage fish to enter the bucket;
- bucket large enough to safely retain fish in the bucket;
- bucket that provides a hydraulically stable "stalled" fluid zone that attracts fish,

prevents injury to the fish while in the bucket, and prevents fish from escaping the bucket;
- bucket that is shaped to allow gentle and complete removal of impinged fish; and
- bucket that maintains a minimum water depth while transporting fish.

See Enercon, 2008, p. 67-68. The buckets on Ristroph screens are designed to collect fish and hold them in water as the screen rotates up, lifting the fish to a point where they can be gently sluiced away with a low-pressure spray prior to debris removal. Converting to this type of system would not change the through-screen velocity.

Coarse-Mesh Ristroph Screens – PSNH's Review

PSNH estimates that Ristroph screens would reduce fish impingement mortality by 75.5 percent for Unit 4, 73.5 percent for Unit 5, and 75.3 percent for Unit 6. Impingement reduction of macro crustaceans was not quantified. The capital cost for this option was estimated but is considered CBI, and PSNH expects only a slight higher maintenance cost compared to the existing screens. *Id*. at 63 and 69.

Coarse-Mesh Ristroph Screens – EPA's Review

PSNH's estimates for impingement survival using coarse-mesh Ristroph screens are based on studies conducted from April 15 to December 7, 1985, at a plant (Indian Point, Unit 2) in New York on the Hudson River. PSNH then compares these results with results from its own "impingement rates and collection efficiencies" observed in 2008 at Schiller Station using "non-Ristroph" screens and assuming continuous screen washing. There are, however, a number of problems with this comparison. To begin with, the Indian Point information is not adequately explained to demonstrate whether data from that facility can be considered representative of the specific conditions and species found in-the Piscataqua River, or if the components of Indian Point's CWIS are similar to those of Schiller Station.

Approximately 24% of the fish impinged at Schiller are pelagic (most are also anadromous) species. According to Schiller's own impingement survival study, these types of species generally have very low impingement survival rates, often expiring shortly after contacting the screens. Of the six pelagic/anadromous species (pollock, alewife, Atlantic herring, Atlantic menhaden, blueback herring and rainbow smelt) collected, survivability at time 0 (i.e., shortly after contact with screen) was 3%. These species would be considered "fragile species" under the New CWA § 316(b) Regulations. *See* 40 C.F.R. § 125.92(m). In addition, initial survival of some demersal species (winter flounder, grubby, lumpfish, pipefish, hake, and cunner) was better at 55%. The long term survival of these demersal species (based on 12 hour post screen contact) was lower, ranging from 0-30%.

It is unlikely that Ristroph screens will significantly improve initial survival for the pelagic fragile species. Ristroph screens may, however, improve the initial survival and latent impingement survival for the demersal fish to some degree. The most optimistic estimate of demersal fish survival would yield a 76% reduction in impingement mortality overall for Schiller Station's CWIS's. This, however, assumes 100% survival of the demersal species, which seems unlikely based on how poorly they did with the existing screens in PSNH's study at Schiller

Station. EPA does not, however, have a good basis for proposing a different number at this time. Therefore, EPA has decided to use PSNH's estimates for the average for the three units (74.8%) as the metric for further evaluating Ristroph Screens in Section 10 for this Fact Sheet, while recognizing that this is likely an overestimate, and perhaps a substantial overestimate, of survival. While it appears, therefore, that this technology could satisfy the impingement mortality reduction standard in 40 C.F.R. § 125.94(c)(5) or (7), it could be ruled out if additional measures are required to protect fragile species under 40 C.F.R. § 125.94(c)(9) and 125.98(d).

In addition, EPA agrees with PSNH's assessment that they "[do] not expect appreciably higher maintenance of Ristroph screens compared to the existing screens." EPA finds that Ristroph screens could potentially be part of the BTA for reducing impingement mortality, and that this technology warrants further review for this purpose. This technology does not, however, reduce entrainment. Section 10 of this Fact Sheet consists of EPA's BTA determination.

Fine-Mesh Ristroph Screens

Unlike coarse-mesh screens, fine-mesh Ristroph screens have mesh small enough to reduce entrainment by excluding fish eggs and larvae from being drawn into the condenser cooling system. The efficacy of the screens for preventing entrainment at a specific site will depend primarily on the size of the mesh relative to the sizes of the aquatic organisms of concern. In essence, entrainment is reduced or prevented by impinging eggs and larvae on the fine-mesh screens. The extent to which any of these tiny, fragile organisms may survive being impinged on the screens will depend on how hardy the organisms are, the nature of the contact they have with the screens, and whether a system can be designed to safely remove them from the screens and return them to the aquatic environment. In addition to fine mesh screens, the other modifications identified for coarse-mesh Ristroph screens would also need to be provided.

The existing 3/8-inch (9.5 mm) screens at Schiller Station are ineffective for excluding fish eggs and larvae from being entrained through the facility. In fact, entrainment studies conducted at Schiller Station in 2006-2007 captured fish from seven different species as large 34 mm (1.3 inches). *See* Normandeau Associates, Entrainment and Impingement Studies Performed at Schiller Generating Station from September 2006 through September 2007, April 2008. R-20887.000.

Although more than three times as long as the width of the screen mesh, these fish are not as wide as they are long, and they may have been extruded through the screens due to the CWISs' relatively high through-screen intake velocities (0.68 fps at MLW for Units 5 and 6 and 1.97 fps at the Unit 4 intake tunnel entrance). Alternatively, they may have been carried over the traveling screens and into the circulating water pump intake.

Fine-Mesh Ristroph Screens – PSNH's Review

PSNH rejected fine-mesh Ristroph screens because the intake would need to be greatly expanded to maintain existing through screen velocities and not cause additional head loss across the screens, which would reduce pumping efficiency. In addition, PSNH is concerned that impingement mortality of previously entrained organisms would increase to a level above the current entrainment mortality caused by the circulating water system. PSNH does not consider retrofitting its CWISs with fine-mesh Ristroph screens to be a viable option and therefore, did not provide further analysis of cost or biological effectiveness.

Fine-Mesh Ristroph Screens – EPA's Review

EPA evaluated the availability of fine-mesh traveling screens at Schiller Station. At Schiller Station, a 0.6-0.8 mm mesh size would be needed to effectively prevent the entrainment of eggs and larvae. As PSNH has pointed out, the surface area of the screens would need to be substantially larger than the current configuration in order to provide enough water for cooling and still maintain a low through-screen velocity. As a result, the existing CWISs would need to be totally replaced and expanded, and new fine-mesh traveling screens, with their associated machinery, would need to be added.

As explained above, preventing entrainment by using fine-mesh screens to block eggs and larvae from being drawn into the facility's condenser cooling system necessarily results in the impingement of these organisms. Thus, the survival of eggs and larvae following impingement on fine-mesh screens is integral to the overall performance of the technology. The probability of such survival is species- and life stage-specific, and is influenced by a number of factors, including the hardiness of the organisms, the through-screen intake velocity, the duration of impingement, and the methods of removing organisms from the screens and returning them to the receiving waters. The survival of post-yolk-sac rainbow smelt fish eggs and larvae impinged on 1 mm Ristroph-type traveling screens was evaluated at Somerset Station, located on the southern shore of Lake Ontario. The 96-hour survival rate was estimated to be only 26.9 percent. *See* McLaren, J.B., and L.R. Tuttle, Jr., Fish survival on fine mesh traveling screens, 2000, Environmental Science and Policy 3(S): 369-376. (hereinafter McLaren and Tuttle, 2000)

Like PSNH, EPA does not consider fine-mesh Ristroph screening technologies to be the BTA for Schiller Station. It appears likely that to the extent that this technology can reduce entrainment of fish eggs and larvae, it will simply replace it with impingement mortality for those organisms. Without site-specific survival studies to demonstrate the efficacy of this system in keeping impinged organisms alive and uninjured, EPA must assume that impinging these tiny, delicate organisms will lead to their mortality. In addition, converting to fine-mesh Ristroph screens would require a major expansion of the CWISs, which PSNH does not consider viable.

b. MultiDisc® Screens – Coarse Mesh

Geiger MultiDisc® screens are oriented the same way as traditional through flow screens but have different designs. *See* Enercon, 2008, p. 72-74. Geiger MultiDisc® screens are comprised of circulating sickle-shaped mesh panels that are connected to a frame via a revolving chain. For Schiller Station, PSNH evaluated only the coarse-mesh version of this technology.

Like Ristroph screens, MultiDisc® screen systems include special components that should be more protective of impinged fish and other aquatic organisms compared to Schiller Station's existing equipment. Fish buckets attached to the screen panels retain some of the water during their upward travel, thereby allowing any captured fish to remain within water once the buckets rise above water level. A low pressure spray header recovers organisms that are transported upwards on the screen surface to the bucket. Fish buckets are gently discharged into the fish return sluice.

MultiDisc® Screens – Coarse Mesh – PSNH's Review

Due to the manner in which Geiger MultiDisc® screens would be installed across the intake chamber, they can be can retrofitted into the space of the existing traveling screens, minimizing structural modifications. The construction cost, including the renovations made to the Unit 3 intake, was estimated by PSNH but not included in this fact sheet because it is considered to be CBI. *Id*.

Maintenance requirements for MultiDisc® screens are predicted to be lower than those of the existing traveling screens because 1) each screen can be removed for cleaning/maintenance and 2) carryover of organisms and debris is eliminated, thereby reducing maintenance of the condensers.

PSNH contends that retrofitting Schiller Station's intakes with MultiDisc® screens would not be the BTA because it would provide no biological benefit. PSNH explains that the configuration of the intakes with MultiDisc® screens, including renovations made to the Unit 3 intake structure, would result in higher through-screen velocities.

MultiDisc® Screens – Coarse Mesh – EPA's Review

PSNH explains that if renovations to Unit 3 intake are done along with the installation of MultiDisc® screens on Unit 4's intake, the resulting through-screen velocity would be approximately 0.55 fps, which is significantly lower than the current value of 1.38 fps. Enercon, 2013, p. 11. For Units 5 and 6, however, the through-screen velocity would increase to approximately 0.82 fps from 0.68 fps because these intakes are independent from any renovations made to the abandoned Unit 3 intake structure and screen area available for flow is smaller than that of the existing screens. *Id*.

Considering the increase in through screen velocity for Units 5 and 6 and the higher cost of MultiDisc® screens compared to Ristroph screens, EPA has determined that the installation of Geiger MultiDisc® screens coarse-mesh screens is not considered an available technology for further consideration.

c. Dual-Flow Traveling Screens

Dual-flow traveling screens are essentially a through-flow system turned 90 degrees, placing the screens' surfaces parallel to the flow. This re-orientation allows more of the screen surface to be utilized at one time, which results in a decrease in the current velocity through the screens. Additionally, since all the flow is going through the screens, the potential for carryover of fish and debris into the condenser cooling system is eliminated. Enercon, 2008, p. 71-72. A dual flow system typically uses a low-pressure wash to transfer organisms to a sluice and return them to the river, followed by a high-pressure wash to remove debris. For Schiller Station, PSNH evaluated only the coarse-mesh version of this technology.

Dual-Flow Traveling Screens – Coarse Mesh – PSNH's Review

PSNH determined that dual-flow screens were technologically infeasible at Schiller Station because the size of the existing intake structure cannot accommodate a dual-flow retrofit. Total replacement or extensive modifications of the intake structures would be required at a cost much higher than the cost of the screens themselves.

Dual-Flow Traveling Screens – Course Mesh – EPA's Review

EPA asked for further explanation or supporting information to document or explain the issues that PSNH initially raised. In the Enercon 2013 report, page 19, PSNH explains that

> [d]ual flow screens create higher flow velocities as the flow approaches the screen. Because the plate and gull wings that are installed to divert the flow to either side of the dual flow screen, there is less flow area in the region after the flow splits. This creates higher approach velocities as the flow passes around the plate and turns in towards the screening surface.

PSNH further details that the through-screen velocity would be 0.5 fps but that the velocity through the side entrances would be as high as 1.27 fps. Furthermore, "[e]xpanding the intake channel to achieve a side entrance velocity of 0.5 feet per second around the dual flow screens requires more space than is available and therefore is not feasible." *Id*. at 20. Based on this explanation, EPA has eliminated dual-flow screens from further consideration as the potential BTA for minimizing impingement mortality.

d. Beaudrey W Intake Protection Screen

A Beaudrey W Intake Protection Screen (WIP) system places a rotating screening disk with a mesh panel in the intake to arrest debris and fish. A recuperation channel or scoop is situated adjacent to the mesh panel, with the concave side of the scoop facing the filter element. The rotating screening disk guides fish to this scoop where suction is applied by a "fish safe pump" to cause an opposite circulation of water through the mesh panel in the area of the scoop. The scoop acts as a safeguard for the fish and the opposite circulation of water at the scoop detaches fish from the filter element in the area of the scoop and carries them to a fish return pipe. The WIP system utilizes coarse-mesh screens and, therefore, is not designed to reduce the entrainment of eggs and larvae.

WIP System – PSNH's Review

PSNH determined that retrofitting Schiller Station's intakes with the WIP system would not provide any biological benefit. Replacing all intake screens, including the renovated Unit 3 screens with WIP would result in a smaller screen surface area overall. This would in effect increase through-screen velocity and potentially increase impingement mortality.

The WIP system is designed to fit into the existing traveling screen guides, therefore no modifications to the intake would be required. Enercon, 2008, p. 76. Since the WIP system can be raised out of the water, PSNH expects that it would be easier to maintain than its existing traveling screens. The construction cost for this option was estimated by PSNH but is considered CBI. *Id*. at 77.

WIP System – EPA's Review

In the Enercon 2013 report, PSNH explains that the screen area of WIP screens are smaller than that of traditional traveling screens, Ristroph screens, or MultiDisc® screens. Therefore, even with the Unit 3 renovations, "installing WIP screens would result in higher through-screen velocities over other comparable screening technologies." Enercon, 2013, p. 13. For this reason, EPA does not consider the WIP System to be worthy of further consideration as the potential BTA for minimizing impingement mortality.

e. Unit 3 Intake Renovation

Unit 3 Intake Renovation - PSNH's Review

PSNH proposes to restore the retired Unit 3 intake structure and reopen the gate valves that previously connecting the now retired Unit 3 and Unit 4 forebays. The gate valves are located downstream of the traveling screens. The use of the two Unit 3 off-shore tunnels to provide an additional source of water to the Unit 4 intake would potentially reduce the through-screen velocity to 0.46 ft/s at MLW. In addition, two new Ristroph screens would be installed, as well as trash racks, lobster diversion piping, and a fish return system. The capital cost of the renovation is considered CBI by PSNH but the increased maintenance costs would be $20,000 per year. Enercon, 2008, p. 63. Based on through-screen velocities of less than 0.5 ft/s in the Unit 4 screen house, the reduction in impingement mortality is expected to be 80 – 90 percent.

Unit 3 Intake Renovation - EPA's Review

EPA agrees that the renovation of the Unit 3 intake is feasible and available. However, a reduced through screen velocity is of little consequence if the intake velocity at the tunnel entrances are high enough to prevent fish from escaping. The increase in screen area with the use of all three tunnels in this case would still result in the average maximum velocity within the tunnels of approximately 0.66 fps, even though the through screen velocity would be below 0.5 fps. Therefore, EPA expects impingement mortality may be slightly higher than the company estimates. However, this option includes Ristroph screens and a marginal reduction in the intake velocity at the tunnel entrances and therefore is considered worthy of further consideration as the potential BTA or component of BTA for minimizing impingement mortality. Section 10 of this Fact Sheet consists of EPA's BTA determination.

f. Continuous Operation of Screens

Continuous Operation of Screens – PSNH's Review

PSNH evaluated the cost and environmental benefit of continually operating the Station's existing intake screens. Removing the opportunity for debris build up on the screens by continuous operation would result in the through-screen velocity remaining near or at the design through-screen velocity, thereby reducing impingement. Further, organisms that are impinged will be returned to the source water body in a timelier manner, reducing stress and mortality, depending on the species. To carry out this option, two additional screen wash pumps would need to be installed. The capital and maintenance costs were estimated by PSNH but are considered CBI. *Id*. Although PSNH affirms that continuous washing provides improvement in impingement survival, they did not quantify the benefits.

Continuous Operation of Screens– EPA's Review

Without continuous screen rotation, fish impinged on the screens during times the screens are not rotating could remain impinged for hours, which greatly increases the risk of impingement mortality. Furthermore, the accumulation of fish and debris on the screens reduces the amount of screen area through which water can pass. This accumulation can cause an increase in through-screen velocity which, in turn, can increase the impingement of fish unable to escape the higher intake velocities. EPA acknowledges that the existing screens are not likely designed to be operated continuously and excessive wear and need for a complete overhaul and upgrade would eventually result.

EPA expects little environmental benefit with this option alone, considering both the high through-screen velocity with the existing screens and that a majority of resident species do not survive impingement. With that said, however, BTA may include this option as a component of BTA along with other technology options such as the combination of one or more of the following: 1) the addition of low pressure (<20 psi) screen wash pumps; 2) reduced approach velocity <0.5 fps; 3) new more fish friendly traveling screens; and 4) upgraded fish return systems as discussed below. Section 10 of this Fact Sheet consists of EPA's BTA determination.

g. Upgraded Fish Return Troughs

After having been drawn into a plant's cooling system through the CWIS, impinged against a traveling screen, raised out of the water, and dislodged from the screen with a pressurized spray wash, an impinged organism then begins the trip back to its aquatic habitat. The fish return system is a critical component of any CWIS designed to return fish safely to the waters from which they were taken. All of the screening technologies discussed above (excluding wedgewire screens) would require the construction of a new fish return sluice or trough.

Upgraded Fish Return Troughs – PSNH's Proposal

PSNH describes what it considers to be a "quality" fish return trough, or sluice, that would adequately return fish to the Piscataqua River with a minimum of stress. Such a trough would be designed so that:

- maximum water velocities within the trough are 3-5 fps;
- a minimum water depth of 4-6 inches is maintained;
- there would be no sharp-radius turns;
- it would discharge slightly above the low water level;
- it would be covered with a removable cover to prevent access by predators, such as birds;
- it would use the optimal slope for maximum survival, which is a 1/16 foot drop per

linear foot; and

- it would return impinged fish downstream of the intakes, thereby reducing re-impingement.

See Enercon, 2008, p. 66. In order to maintain a 1/16 slope and discharge the fish downstream from the plant's cooling water intakes – which is needed to avoid re-impingement problems – new fish return sluices at Schiller Station would have to be 170 ft long for Screen House #1 and 180 ft long for Screen House #2. However, PSNH explains that there is insufficient space between the two screen houses to accommodate 350 ft of fish return sluices. PSNH instead proposes an "acceptable" slope of ¼ ft drop per linear ft for the "slide" of the returns sections (i.e., outside the screen houses) resulting in an estimated length of 45 ft for each slide. *Id*.

PSNH did not evaluate the reduction in impingement mortality with the use of a state-of-the-art fish return system at Schiller Station because no quantitative data specific to Schiller exits. *Id*. PSNH did presume that re-impingement, hence impingement mortality would be reduced significantly if the return sluices are positioned in the most beneficial location relative to the direction of tidal flow. The total estimated capital cost to upgrade the fish return sluices is considered a CBI estimate by PSNH although no increase in maintenance compared to the current configuration is expected. *Id*. The following picture shows a segment of the Unit 4 fish return trough.

Figure 9-3: Unit 4 Fish Return Trough

Photographed during EPA site visit, February 13, 2013.

Upgraded Fish Return Troughs – EPA's Review

Schiller Station's present fish returns are unacceptable if the use of travelling screens are continued. The photograph shows a barrier in the trough and the transition from concrete to fiberglass is not smooth.[38] Another indication that there is stress to returned fish is that rubber

[38] EPA was informed that the rusted metal blockage (barrier) shown in the picture had been removed. *See* email to S. DeMeo, EPA from M. Cobb, EPA, March 5, 2013.

mats are "installed on the back wall of the screen housing to soften the impact to aquatic life during transfer from the traveling water screens to the return sluiceway." Enercon, 2008, p. 19. In addition, all troughs do not maintain a minimum water level and a segment of the Unit 4 return consists of a 90 degree turn. Further, the Screen Houses #2 return empty's too far (8 feet) above MLW elevation. *Id.* at 20.

PSNH mentions survival study results conducted for another plant, Indian Point, located on the Hudson River, in New York, providing little information about the Indian Point study, however. It did note that the Schiller Station fish return would be 25 percent shorter compared to Indian Point. Absent more information on the specifics of Indian Point's survival study, EPA cannot assess its applicability to Schiller Station, or verify PSNH's predicted survival rates. At the same time, EPA generally agrees with PSNH's description of the features of a "quality" fish return that would be part of the BTA for minimizing impingement mortality, with two concerns. First, PSNH cannot maintain the optimal slope of the sluice all the way to the water. According to the company, due to practical considerations a drop of ¼ foot per linear foot would need to be used for the slide. Enercon, 2008, p. 66. Second, PSNH indicates that a quality fish return would deliver organisms "slightly above the low water level". *Id*. EPA believes that the return sluice should discharge at a location either below the low water level or at a reasonable height above the low water level (no more than 6 feet) to reduce stress. *See* TDD, 2014, p. 6-30. *See also* EPRI, Evaluation of Factors Affecting Juvenile and Larval Fish Survival in Fish Return Systems at Cooling Water Intakes, December 2010 (Report No. 1021372).

Furthermore, an upgrade or redesign of the fish return conduits may also be necessary to minimize re-impingement. EPA requested that PSNH evaluate a combined fish return system that connects both screen houses and engineered to transport fish away from the intake structures based on the direction of tidal flow. *See* Email to A. Palmer, PSNH from M. Cobb, March 18, 2013. PSNH's response included a list of considerations and/or evaluations that would be required in order to design such a system, including an assessment of current re-impingement rates for each tidal condition. In addition, hydraulic modeling was suggested to fully understand river flow near the intakes in order to determine optimal fish return location(s). Enercon, 2013, p. 14-17.

Although Enercon points out that there are valid design considerations and potential limitations, they do not indicate that this fish return configuration is not feasible. PSNH did express concern whether a bi-directional return system was cost-effective. If the use of travelling screens were determined to be a component of BTA for Schiller Station, an effective fish return sluice would also be required that is in place and operational year round.

9.4.3 Traveling Screens and Intake Renovations – Summary

EPA has determined that PSNH's use of its existing traveling screens without additional screening technology does not satisfy the BTA standard of CWA § 316(b). The existing technology, developed in the 1950s and 1960s, does not include provisions to gently handle live impinged fish but is designed more for handling debris. Moreover, there are available technologies that have been developed since the existing traveling screens were installed that would reduce current levels of impingement mortality at Schiller Station. EPA has determined that the renovation of Unit 3's intake and the use of Ristroph coarse-mesh traveling screen technology for all the units is "available" and warrants further review as potential BTA selections for minimizing impingement mortality at Schiller Station.

In order to satisfy the BTA standard, EPA considers it a fundamental requirement for any traveling screen technology to have an effective, well designed fish return system in place. This means that the CWIS's screening system should be operational at all times when the plant is withdrawing water and impingement may be occurring, and that the system should be capable of safely catching fish on the screens, removing them from the screens, and returning them to the water body. Furthermore, chlorine dosing should occur after the screens in order to minimize exposure to impinged organisms.

9.4.4 Aquatic Microfiltration Barriers

PSNH and EPA also investigated aquatic microfiltration barriers, another type of exclusion system. This technology is composed of a custom-designed and sized filtration fabric installed in a boom-like configuration in front of a facility's CWISs to reduce or eliminate entrainment and impingement of fish eggs, larvae, and larger organisms. The filtration fabric has a very small pore size which enables it not only to block juvenile and adult fish from being drawn into the CWIS, but also, at least theoretically, to block most eggs and larvae. This technology can also be used to reduce intake volumes to 0.5 fps or less, which can prevent impingement mortality by enabling most fish species to swim away from the CWIS. Having excluded ichthyoplankton from being entrained, the question, once again, arises as to whether the organisms can be safely removed from the barriers and returned to their aquatic habitat.

One type of aquatic microfiltration barrier, a Gunderboom Marine Life Exclusion System (MLES™), has been used at a power plant on the Hudson River, in New York (Lovett Station), which closed on April 19, 2008. Although there were problems anchoring the device, the system was reported to significantly reduce entrainment at that plant, though concerns about biofouling undermining performance were also raised. *See* Taft, 2000, p.S355; but *see also* P.A. Henderson, R. M. Seaby, C. Cailes and J.R. Somes (Pisces Conservation Ltd.), "Gunderboom Fouling Studies in Bowline Pond" (July 2001).

Aquatic Microfiltration Barriers – PSNH's Review

PSNH determined that the seasonal deployment of the MLES™ to be infeasible because the length of the curtain would impair "other existing uses" of the Piscataqua River. Enercon, 2008, p. 86. Considering the maximum design intake flow, the depth of the river in front of the intake structures, and assuming the use of 20 micron mesh size, PSNH estimated that at least a 550-foot curtain would be required in order to allow the needed cooling water flow. In addition, since the MLES™ fabric is susceptible to ice formation, PSNH indicated that the curtain could only be deployed seasonally. PSNH determined that the use of an aquatic microfiltration barrier was infeasible at Schiller Station. Therefore, no further analysis was done on maintenance requirements, cost or environmental benefits. *Id*.

Aquatic Microfiltration Barriers – EPA's Review

EPA is concerned that the strong tidal currents in the Piscataqua River would cause much difficulty with anchoring the microfiltration barrier fabric to the river bottom, especially given the length that would be needed. Therefore, the feasibility of this technology at Schiller Station remains uncertain.

EPA evaluated the Gunderboom during the 2014 final 316(b) rulemaking and found the following:

> To date, the only facility where the Gunderboom was used at a full-scale level is the Lovett Generating Station along the Hudson River in New York, where pilot testing began in the mid-1990s. Initial testing at that facility showed significant potential for reducing entrainment. Entrainment reductions of up to 82 percent were observed for eggs and larvae, and these levels were maintained for extended month-to-month periods from 1999 through 2001. At Lovett, some operational difficulties affected long-term performance. These difficulties, including tearing, overtopping, and plugging/clogging, were addressed, to a large extent, through subsequent design modifications. Gunderboom, Inc. specifically has designed and installed a microburst cleaning system to remove particulates. As noted above, the Lovett Generating Station recently closed operations.
>
> Each of the challenges encountered at Lovett could be of significant concern at marine sites, as these have higher wave action and debris flows. Gunderboom systems have been successfully deployed in marine conditions to prevent migration of particulates and bacteria, including in areas with waves up to 5 feet. The Gunderboom system is being tested for potential use at the Contra Costa Plant along the San Joaquin River (a tidal river) in northern California. An additional question related to the utility of the Gunderboom and other microfiltration systems is sizing and the physical limitations and other uses of the source waterbody. With a 20-micron mesh, 144 mgd and 288 mgd intakes would require filter systems 500 and 1,000 feet long (assuming a 20-foot depth). In some locations, this may preclude the successful deployment of the system because of space limitations or conflicts with other waterbody uses.

TDD, 2014, p. 6-56. Although there has been some more recent improvement to reduce wave action and debris, EPA is not aware of the use of aquatic filtration barriers at any other existing industrial facilities. *Id.* In light of all these issues, EPA does not consider the use of a microfiltration barrier, such as the Gunderboom MLES™, as the potential BTA for Schiller Station.

9.4.5 Fish Net Barriers

PSNH's October 2008 submission briefly evaluated the possibility of installing a wide-mesh barrier net in front of the intake structures at Schiller Station. Like aquatic microfiltration barriers, PSNH rejected the use of fish net barriers due to physical limitations for net placement, size of the net required (although not provided) and possible interference with existing uses of the Piscataqua River.

PSNH re-evaluated the use of a barrier net for Schiller Station in 2014 and found that approximately 6615 ft^2 of netting would assure a through-screen velocity of 0.5 fps or lower at all times for both intake structures (245 feet in length and height of 27 feet). Enercon, 2014, p.

44.

> [T]he operations and maintenance costs associated with the barrier net system are expected to be relatively high compared to wedgewire screens. In summary, the reliability of a barrier net system would be expected to be lower than that of wedgewire screens. A pilot test or study is recommended to ensure that debris loading, the local velocity, and frequency and size distribution of ice floes do not require additional preventive measures to protect the net.

Id. at 45.

One of EPA's concerns is that a wide-mesh barrier net would provide no protection against entrainment as small aquatic organisms (e.g., eggs and larvae) would go through the net openings. The technology is, accordingly, intended only to reduce the impingement of fish against a facility's existing intake screens. Yet, even as an impingement reduction technology, there would be a number of problems with using this technology at Schiller Station given the high velocity of the river currents. In addition, this type of barrier net would likely only be able to be deployed in ice-free months and would likely be subject to significant fouling from debris during autumn and other periods with high debris loadings. Since PSNH has seen high impingement during winter months, the net would not be able to be deployed when much of the annual impingement is occurring. Given these concerns, EPA, like PSNH in its October 2008 Report, does not consider this technology a viable component of the BTA for Schiller Station.

9.4.6 Behavioral Barriers

PSNH evaluated alternative technologies such as "air bubble curtains," light and acoustic barriers, none of which effectively reduce entrainment, but which might conceivably play a role in impingement reduction as a component of an overall BTA. *See* Technical Development Document for the Final Section 316(b) Phase II Rule, Feb. 12, 2004, p. 4-19. PSNH's review of these technologies, however, identifies problems with their effectiveness in reducing impingement mortality and/or applying them to Schiller Station. Most studies of "behavioral barriers," such as bubble curtains or acoustic barriers "have been inconclusive or have shown no significant reduction in impingement or entrainment." Enercon, 2008, p. 87.

PSNH points to the successful application of acoustic fish deterrence systems at D.C. Cook Nuclear Plant in Michigan and at J.A. FitzPatrick Nuclear Plant in New York. Both plants intake water from the Great Lakes and impinge mostly Clupeiformes (Clupeid fish). The technology shows some success at these locations because some Clupeid fish are able to detect sound. Clupeid fish in the Picataqua River (e.g., Atlantic herring and Atlantic menhaden) represent less than 1% of the impinged fish at Schiller Station. Therefore, an acoustic deterrence system would not likely reduce impingement significantly. *Id*. For these reasons, EPA has eliminated the use of behavioral barrier technologies as potential BTA at Schiller Station.

9.5 CWIS Capacity Options

Under CWA § 316(b), a CWIS's "capacity," as well as its location, construction, and design, must reflect the BTA for minimizing adverse environmental impacts (such as entrainment and impingement mortality). Capacity in this sense refers to the volume of water being withdrawn by a CWIS. Reduced CWIS capacity is considered to reduce entrainment and impingement by the same proportion that the flow is reduced. In other words, a 95 percent reduction in the volume of water withdrawn achieves a 95 percent reduction in entrainment and impingement.

Indeed, intake capacity reductions have often been referred to as the most effective means of reducing entrainment, especially for existing facilities located in biologically productive environments. Similarly, impingement can be reduced through flow reductions, as well as by a reduction in the approach velocity in front of the intake structures. There are a number of different technological and operational measures that could reduce a facility's intake capacity (or water withdrawal volumes). Methods of capacity reduction evaluated here include: (1) operational (maintenance) outages; (2) reducing flow by installing and operating two-speed pumps; (3) reducing flow by installing and operating variable frequency drives; (4) reducing flow by using nearby available grey water; and (5) reducing flow by installing and operating cooling towers.

9.5.1 Maintenance Outage Scheduling

PSNH considered a scheduled operational shutdown or outage option as a means of reducing the plant's intake flow and associated impingent and entrainment. Presently, Schiller Station has maintenance outages for Units 4 and 6 every 18 months and for Unit 5 every year. Enercon, 2008, p. 100. The outages typically last approximately three to four weeks. According to PSNH, power pool demands preclude scheduled outages during peak seasons (i.e., high use winter and summer months. "If a peak season outage were allowed by ISO New England, Schiller Station would be penalized dramatically." *Id*. at 101.

When PSNH evaluated what the optimal times would be for scheduling outages based on the highest reductions in adult equivalent fish and macrocrustacean impingement and entrainment, they determined that the periods of highest fish impingement and entrainment does not coincide with the periods of highest macrocrustacean impingement and entrainment. Therefore, PSNH concluded that "the aggregate benefit of an outage shift would be minimal" and gave no more consideration to this option. *Id*. at 103.

EPA concurs that reducing flow by suspending operations during periods when early life stages of fish are present can be an effective strategy for reducing both entrainment and impingement during the outage period. At Schiller Station, however, a three-to-four-week outage each year would not cover the entire period when fish eggs and larvae as well as macrocrustaceans are present in the source water. Moreover, it also would not address the issues associated with impingement mortality during the rest of the year. PSNH has demonstrated through its impingement sampling (2006–2007) that impingement occurs year-round. Therefore, EPA does not consider scheduled outages alone to be BTA for impingement at Schiller Station.

With that said, scheduling outages to reduce entrainment during peak spawning periods could be *a component* of the overall BTA for the Facility, perhaps in combination with other technologies. For example, scheduling the annual Unit 5 maintenance outage for three weeks in June (the month with the highest concentration of eggs and larvae in the water column) could be a component of the BTA for reducing entrainment, coupled with Ristroph screens and improved fish return systems as BTA components to reduce impingement mortality. To the extent that maintenance outages for Unit 5 need to happen each year and can involve suspending cooling water withdrawals, it makes sense from the perspective of reducing adverse environmental impacts to schedule the outages during the high entrainment season.

Based on PSNH's data on entrainment of fish and macrocrustacean eggs, and larvae, June is the month of highest fish and macrocrustacean egg and larval abundance. Natural mortality of eggs and larvae are high due to predation, which shows their importance in the food chain. While PSNH determined that a scheduled outage in March for Unit 5 would yield an annual 24% reduction in adult equivalent fish entrainment, Enercon, 2008, p. 103, EPA makes control decisions based on consideration of the absolute numbers of eggs and larvae lost, not necessarily solely on adult equivalents. Basing decisions solely on adult equivalents would ignore the valuable ecological role that eggs and larvae play in the food chain.

Furthermore, operating data shows that the annual Unit 5 outage likely takes place in April when demand is lower and that Unit 5 operates at or near full capacity during June each year. *See* Excel spreadsheet titled Unit5Schiller_operatingtime.xlsx.

To calculate the environmental benefit of a scheduled outage for Unit 5 in June compared to April, EPA calculated losses for Unit 5 at design flow in April and June utilizing the Enercon, 2008 (Attachment 6) entrainment and impingement mortality rates. Then, assuming a 3 week outage, EPA calculated the number of eggs and larvae lost in each month. The environmental benefit of having the scheduled outage in June as opposed to April is simply the difference between the number of eggs and larvae lost in June minus the number of eggs and larvae lost in April.

Table 9-C: Biological Value of Shifting Unit 5 3-Week Outage from April to June

	June	April	# of Organisms Saved	Annual % Reduction[39]
Fish Entrainment (millions)	11.2	0.7	10.5	4%
Macro Entrainment (millions)	91	0	91	7%
Fish Impingement Mortality	48	105	-57	---
Macro Impingement Mortality	58	51	7	0.05%

EPA found that shifting the outage from April to June would result in a 4% reduction in fish entrainment and 7% reduction in macrocrustacean entrainment (a total of over 100,000,000 individuals saved per year). The same approach was taken for impingement resulting in 0.05% reduction in macrocrustacean impingement (7 individuals saved/year) but with a loss of approximately 57 fish from impingement.

EPA also looked at the cost of an annually scheduled maintenance outage for Unit 5 in June compared to one in April. *See* AR-167. A review of 2010 – 2014 historical wholesale electric

[39] These values are based on a total annual entrainment of approximately 255 million fish and 1342 million macrocrustaceans, as well as a total annual impingement of approximately 6050 fish and 13,828 macrocrustaceans.

prices for the New England Power Pool for the months of April and June showed a range of average price between $30 and $55 per MWh. In 2010, 2011, and 2012 the price of electricity was higher in June than in April by $13.15, $5.08, and $16.61, respectively. For 2013 and 2014, the price of electricity was higher in April than in June by $3.97 and $4.15, respectively. Based on these values, it would have been more economical to have had an outage in June during 2013 and 2014. Worse case, considering a 3 week outage for Unit 5, at full capacity, the average revenue differential between the high and low would be less than $500,000. Therefore, EPA concludes that shifting the annual outage for Unit 5 from April to June is a component of BTA for this draft permit.

9.5.2 Variable Speed Pumps

Each unit at Schiller Station has two single-speed, circulating pumps. Unit 4 has a combined design pumping capacity of about 41 MGD, Unit 5 has a combined designed pumping capacity of 42 MGD, and Unit 6 also has a capacity of approximately 42 MGD. Single speed pumps withdraw water at their design capacity.

As an alternative to single-speed pumps, variable speed pumps enable a facility to adjust the volume of water it withdraws from the source water body for cooling to better match its actual cooling needs. A facility could convert from single-speed to variable speed pumps by replacing the pump motors with motors equipped with variable frequency drives (VFD). VFDs control the speed of the motors by varying the frequency and voltage of electric power to the pumps.

Variable Speed Pumps – PSNH's Review

PSNH concluded that Schiller Station could use variable speed pumps to reduce flow, thus reducing impingement and entrainment, as long as the condenser is operated according to design limitations. These limitations include a minimum water velocity through the condensers of 3 fps. The units currently operate at 3.5 fps. A reduction of 0.5 fps amounts to a 14% reduction in flow. Therefore, the maximum reduction in impingement mortality and entrainment would be 14%, assuming a 1:1 ratio. Enercon, 2008, p. 92.

Another operational limitation is the design pressure limit for each condenser, which corresponds to a maximum inlet water temperature. Above these temperatures, the Station would increase fuel consumption and increase the risk of extensive equipment damage. The inlet water temperature limits are 61.0°F for Unit 4, 58.2°F for Unit 5, and 61.0°F for Unit 6. *Id*.

Using eight years of data collected at Schiller Station (2000-2007), PSNH determined the maximum monthly flow reduction available per unit, based on these design limitations described above. *See id*., Table 6.5, p. 93. The available flow reduction is further limited by the thermal discharge limits imposed by Schiller Station's NPDES permit, especially during the winter months. *See id*., Table 6.8, p. 100. With all other parameters unchanged, reducing cooling water flow would raise the facility's discharge temperatures. The following table presents the flow reductions that could be achieved while staying within design criteria and thermal discharge limitations.

Table 9-D: Potential Flow Reduction Without Power Loss (2000-2007) and Without Exceeding Permitted Thermal Discharge Temperatures

Month	Unit 4	Unit 5	Unit 6
January	13.4%	11.2%	11.6%
February	13.4%	11.2%	11.6%
March	13.4%	11.2%	11.6%
April	13.4%	11.2%	11.6%
May	13.3%	10.7%	11.6%
June	3.2%	0.3%	2.8%
July	0.0%	0.0%	0.0%
August	0.0%	0.0%	0.0%
September	1.4%	0.0%	1.4%
October	12.6%	6.3%	11.6%
November	13.4%	11.2%	11.6%
December	13.4%	11.2%	11.6%
Annual	9.2%	7.0%	8.1%

The new VFD motors would not likely require additional maintenance compared to the current motors. However, further reducing circulating water flow velocity through the condensers will result in increased fouling of the condensers' tubes. In order to counter this fouling, a new mechanical tube cleaning system would be needed in addition to the continued use of hypochlorite injections. The VFD themselves would require periodic inspection and minor maintenance. At the same time, the Station would save a small amount of power by using VFDs as compared to using the current pump motors. PSNH provided an estimate of the total capital and installation cost for implementing variable speed pumps for all three units. EPA is not reporting the value here because the company has claimed it to be CBI. Suffice to say, however, that EPA does not regard the amount to be very substantial for a facility like Schiller Station. *Id*. at 94.

Based on the monthly flow reduction values above and equivalent adult (EA) entrainment abundance estimates, PSNH determined that the maximum reduction in entrainment of fish from January through April would be 9.4%, 9.8%, and 9.8% for Units 4, 5, and 6, respectively. For macrocrustaceans, the highest entrainment reductions would occur in May, June, October, and November. Entrainment reduction values for these combined months are 2.2% for Unit 4, 1.2% for Unit 5, and 2.1% for Unit 6. *Id*. at 95.

Similar to entrainment, PSNH determined the monthly impingement reduction values based on maximum flow reduction with the use of variable speed pumps and EA impingement abundance data. For fish, the maximum impingement reduction would occur in April, and November through January for Unit 4, and January, April, October, and November for Units 5 and 6. The reductions in EA fish impingement for these months combined would be 9.6%, 3.8%, and 11.4% for Units 4, 5, and 6, respectively. For macrocrustaceans, the highest entrainment reductions would occur in April, May, November and December for all the units. Impingement reduction values for these combined months are 7.7% for Unit 4, 6.2% for Unit 5, and 6.5% for Unit 6. *Id*. at 96.

The following table presents PSNH's estimated potential yearly impingement and entrainment reductions based on adult equivalents.

Table 9-E: Summary of VFD Operations Annually Without Power Loss

	% EA Entrainment Reduction			% EA Impingement Reduction		
	Unit 4	**Unit 5**	**Unit 6**	**Unit 4**	**Unit 5**	**Unit 6**
Annual for Fish	10.7	10.9	11.1	12.0	5.7	13.0
Annual for Macrocrustaceans	2.3	1.2	2.3	10.3	7.7	8.1

Data taken from Tables 6.6 and 6.7 of Enercon, 2008.

Variable Speed Pumps – EPA's Review

PSNH indicated that if the six existing circulating water pump motors were converted to VFDs at Schiller Station, reductions in intake volumes (and corresponding reductions in impingement and entrainment) could nevertheless occur only during periods when the Piscataqua River provides a favorable thermal heat sink. In other words, if plant generation remains at peak levels, then cooling water volumes can only be reduced when the water withdrawn from the river for cooling is particularly cold. Those favorable river temperature conditions tend to occur from late fall to early spring. In colder months, less cooling water is required to remove the Facility's waste heat while maintaining the required vacuum in Schiller Station's condensers. Therefore, during such conditions, variable speed pumps could be used to reduce withdrawals.

As Table 9-D above shows, under conditions at Schiller Station, variable speed pumps are of little value during the summer months. In Section 8 of this Fact Sheet, EPA discussed that the highest entrainment rates for organisms are seen during the summer months. EPA found that the entrainment (and impingement) reduction estimates based on total number of organisms are significantly lower than PSNH estimates, which are based on adult equivalents.

Adult equivalent analyses may be useful when trying to place the loss terms of fish and macrocrustacean eggs and larvae into the context of grown fish and in order to combine entrainment and impingement losses into a single metric. When looking at the efficiencies of any control technologies, however, EPA believes that the actual numbers of eggs and larvae saved or lost provides the more appropriate metric. Eggs and larvae have their own inherent ecological value as important components of the food web. This value is ignored or hidden if losses are only considered in terms of adult equivalents. In addition, Equivalent Adult Models require additional assumptions and data manipulation to the raw data (numbers of eggs and larvae). These assumptions introduce new sources of error and variability.

Table 9-F shows EPA's percent reduction estimates based on consideration of the:

- total numbers of organisms impinged and entrained (adjusted for design flow);
- seasonal abundance of those organisms; and
- condenser design and NPDES permit limitations.

To calculate the environmental benefit of variable speed pumps, EPA used Schiller's entrainment and impingement data by unit by month and adjusted those losses to reflect design flow. The adjustment to design flow represented an approximately 7% overall increase in losses over the course of the year compared to what Schiller submitted in Normandeau, 2008. The specific % adjustment for design flow varied by unit by month, due to different historical flow rates among the units from month to month. EPA then used Schiller's estimates of monthly flow reductions that could be achieved without power loss or violations of thermal discharge limits (Table 9-D) and multiplied the monthly entrainment and impingement losses by unit. The product of this calculation divided by total annual losses results in the percent reductions in entrainment and impingement shown in Table 9-F.

Table 9-F: EPA's Summary of VSP Operations Annually without Power Loss and Without Exceeding Permitted Thermal Discharge Temperatures

	% Entrainment Reduction				% Impingement Reduction			
	Unit 4	**Unit 5**	**Unit 6**	**Total**	**Unit 4**	**Unit 5**	**Unit 6**	**Total**
Annual for Fish	5.72	4.09	4.92	**4.90**	12.40	6.15	11.25	**11.0**
Annual for Macrocrustaceans	2.59	1.52	2.34	**2.14**	10.49	6.79	7.24	**9.70**

See Excel spread sheets #1 and #2 attached to email from P. Colarusso, EPA to S. DeMeo, EPA, 7/18/14.

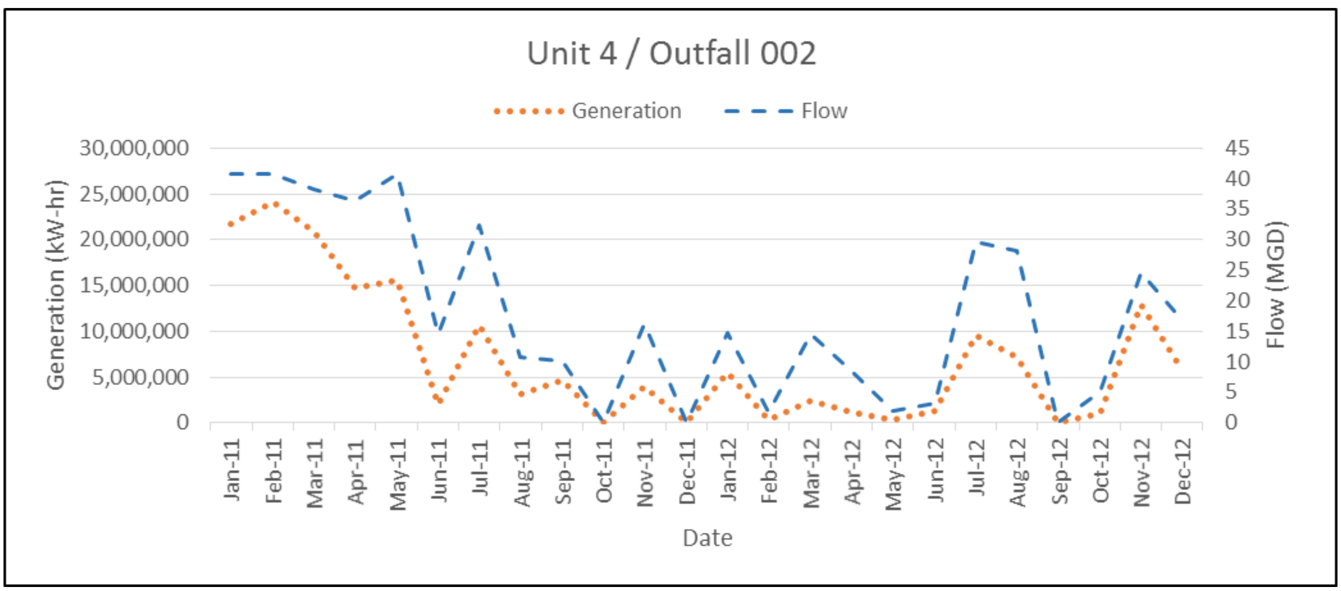
"Since the maximum flow reduction possible is 14%, the maximum power saved through this load reduction would be approximately 0.2 MWe per Unit, with the combined maximum power saved across all three Units approximately 0.6 MWe." Enercon, 2008, p. 94. Based on this amount of power saved, EPA determined that the installation of variable speed pumps would actually save the company more money over time compared to not having the pumps installed. In fact, EPA estimates that the payback or break-even period for the installation of this technology option could be between six and seven years. *See* Excel spread sheet attached to email from E. Beck, EPA to S. DeMeo, EPA, 7/28/14 (contains CBI).

In consideration of all of these factors, EPA regards modifying the circulating water pumps, at least for Units 4 and 6, to add variable frequency drives to be a step that would be likely to reduce impingement and entrainment, to some extent, without impairing Schiller Station's ability to effectively generate electricity or costing the Facility money in the long run.

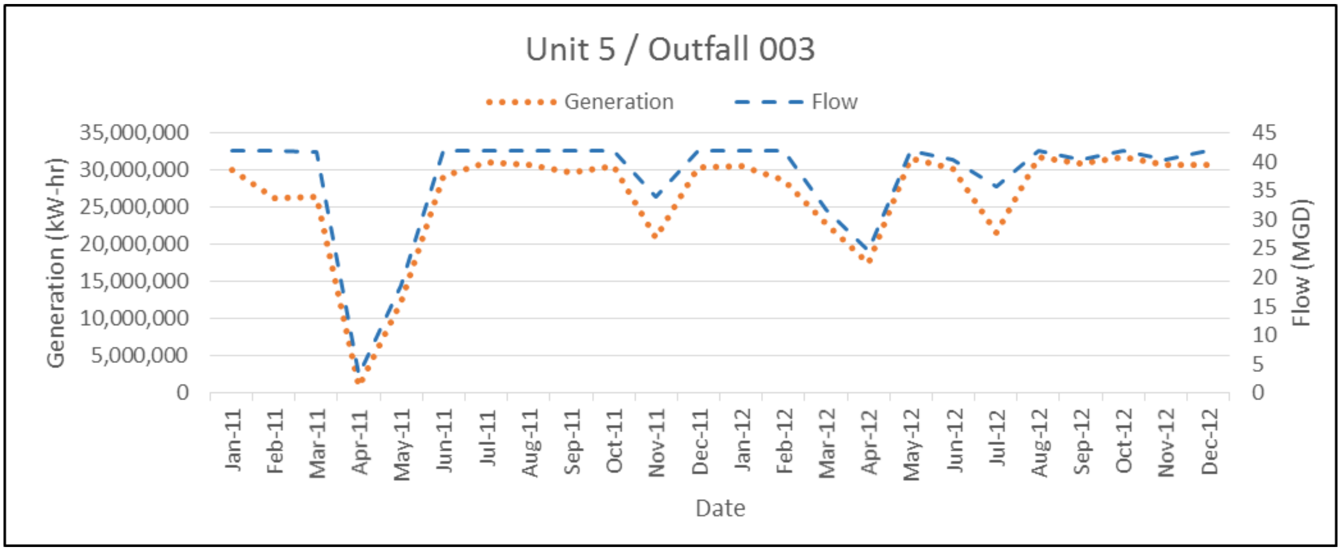
With this said, however and generally speaking, variable speed pumps are a less-promising option for base-load power plants because they are usually running at a high capacity level and provide less opportunity for reducing cooling water withdrawals. While Schiller Station has been considered a base-load electrical generating facility, with all six pumps operating continuously, except during outages (capacity factor[40] is high), this has changed. In the past few years, the capacity factors for Units 4 and 6 have been significantly lower (16.1% and 16% respectively, since the last quarter of 2011). Unit 5, however, currently operates much more consistently (80-85% capacity factor within the last year). This is because this unit burns wood, which is considered a renewable energy resource under the State's Renewable Portfolio Standard (RPS). Therefore, VSP's are unlikely to be effective at reducing flow for Unit 5 and is therefore not considered as a potential component of BTA for this Unit.

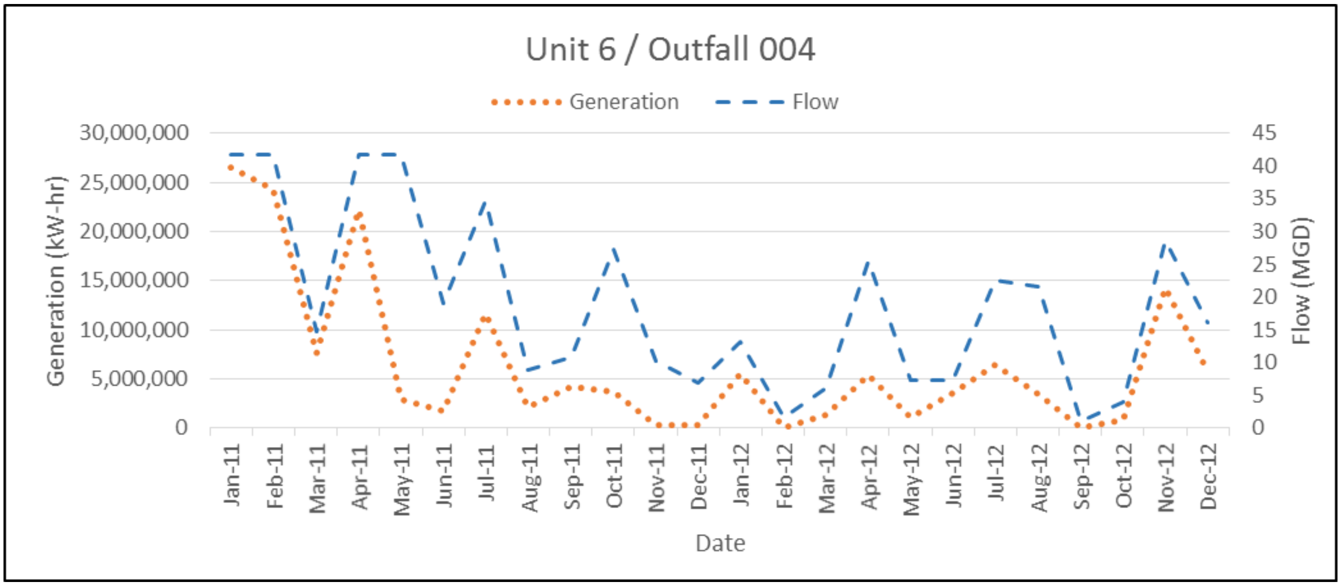
Furthermore, according to monthly average flow data from the facility's discharge monitoring reports (DMR's) and electrical generation data, the circulating cooling water intake pumps for each unit are frequently shut down when a unit is not generating electricity (*i.e.*, on stand-by). This practice results in a significant reduction in flow as well as impingement and entrainment (as well as an energy savings). During EPA's site visit in February 2013, a PSNH representative explained that the pumps may be shut down after 24 hours of non-generation. *See* Sharon DeMeo site visit notes, February 13, 2013. If energy trends continue, shutting down the intake pumps during stand-by may result in a greater reduction of flow than would result from the use of variable speed pumps. Therefore, this operating practice could be a component of BTA for Schiller Station, in place of variable speed pumps, and at little to no cost to the facility. Figure 9-4 shows the correlation between cooling water flow and generation for each of Schiller's three units during 2001 through 2012.

Figure 9-4: Correlation between Total Monthly Generation and Average Monthly Cooling Water Flow at Schiller Station (2011-2012)



[40] The net capacity factor of a power plant is the ratio of its actual output over a period of time, to its potential output if it were possible for it to operate at full nameplate capacity indefinitely.





In addition, these levels can be achieved without reductions in power generation or an exceedance of NPDES thermal discharge limits.

9.5.3 Two-Speed Pumps

In comparison to VSP, PSNH determined that the use of two-speed intake pumps at Schiller Station should not be considered a component of BTA for the following reasons:

- less effective technology;
- greater cost;
- less flow control flexibility; and
- offers no reduction in the power load necessary to operate.

EPA concurs that the use of two-speed motors need not be evaluated further.

9.5.4 Closed-Cycle Cooling

A once-through system, such as that employed at Schiller Station, removes the condensers waste heat and transfers this energy to the receiving water. Steam electric power plants can generate electricity while using substantially less water than is required for a once-through (or open-cycle) cooling system by using a "closed-cycle" cooling system. Generally, steam electric power plants employ one of four basic types of circulating water systems to reject waste heat. These systems are:

- once-through cooling;
- once-through cooling with supplemental cooling of the heated discharge;
- entirely closed-cycle or recirculating cooling; and
- combinations of these three systems.

In a once-through (or open-cycle or non-recirculating) system, the entire amount of waste heat is discharged to the receiving water body (unless some portion of the waste heat is dissipated to the atmosphere in a thermal discharge canal).

Closed-cycle or recirculating cooling water systems employ a cooling device that enables the plant's waste energy to be emitted from the cooling water directly to the atmosphere. As a result the temperature of the cooling water is brought back down and the facility is then able to recirculate and reuse the previously heated water for additional cooling. This enables the facility not only to reduce discharges of heat, but also to reduce withdrawals of water for cooling. As a result, entrainment and impingement mortality are substantially reduced. For example, converting an open-cycle cooling system to closed-cycle technology can enable water withdrawals to be reduced by up to 95% or more, depending on certain site-specific factors. As with other flow reduction technologies, closed-cycle cooling is regarded to reduce the number of organisms entrained by the CWIS by the same amount that it reduces intake flows.

There are two basic methods of heat rejection for closed-cycle recirculating cooling water systems. The first is to use wet (or evaporative) cooling towers.[41] The second uses cooling ponds or lakes. These two methods dramatically reduce cooling water use, though they do require a small amount of "makeup" water. The makeup water is required to replace cooling water lost to evaporation, leaks and periodic cooling tower blowdown discharges.

A third type of closed-cycle cooling system does not use cooling water at all and, instead, employs "dry cooling towers" ("or air-cooled condensers"). This method eliminates the use of cooling water and rejects heat directly to the atmosphere from the surface of the condenser. No evaporation of water is involved.

Another type of closed system worthy of note is the "hybrid" (or "wet/dry") system which combines elements of both wet and dry tower operations. The advantage of this type of cooling

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[41] *See, e.g.,* 66 Fed. Reg. at 65,282; EPA, Economic and Engineering Analysis of the Proposed 316(b) New Facility Rule, August 2000, EPA-821-R-00-019EPA (hereinafter EPA Economic and Engineering Analysis), App. A at 14.

system is that it can be used to reduce and/or eliminate any problematic water vapor plumes from mechanical draft cooling towers.[42] This technology would be less expensive than dry cooling but more expensive than a wet cooling tower system.[43]

As a general matter wet, dry, and wet/dry cooling towers are all practicable, available technologies for power plants. Wet cooling towers have been widely used at power plants for many years.[44] Dry cooling is also clearly a viable technology as dry cooling systems have been installed or proposed for installation at a number of facilities in the United States, including new units at the Mystic Station and the Fore River Station in Massachusetts.[45] In addition, wet/dry cooling towers are also a practicable technology used at a number of plants.[46]

Finally, a single power plant could use both open-cycle and closed-cycle cooling technologies. For example, different types of cooling systems could be provided for different generating units. Alternatively, closed-cycle cooling equipment could be installed for an entire facility but only used during certain parts of the year, while open-cycle cooling would be used at other times. This approach has been taken at various power plants, such as the Vermont Yankee nuclear facility when it was operating. Such "combination options" or "partially closed-cycle cooling options" could be selected for a variety of reasons, such as to address seasonally-focused environmental issues, to reduce overall plant flows and/or thermal discharges to some predetermined level, to deal with a facility's space constraints, or to stay below some specified cost threshold.[47]

In the context of permitting for an existing facility, such as Schiller Station, EPA must assess whether one or more of the above cooling technologies is capable of being retrofitted to the facility. EPA research has identified a number of existing power plants with open-cycle cooling systems that have been converted to closed-cycle cooling by retrofitting wet cooling towers at the facilities. *See, e.g., Draft Permit Determinations Document for Brayton Point Station NPDES Permit,* at 7-37 to 7-38; *Responses to Comments for Brayton Point Station NPDES Permit,* at IV-

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[42] *See* 65 Fed. Reg. at 49,081 (discussion of wet/dry tower); 39 Fed. Reg. at 36,192; EPA Economic and Engineering Analysis, App. A at 14.

[43] *See* 65 Fed. Reg. at 49,081 (discussion of wet/dry tower); Science Applications International Corporation (SAIC) Report (Mar. 15, 2002), Table 5.

[44] *See, e.g., id.*; 65 Fed. Reg. at 49,080-81; 1996 EPA Suppl. to Background Paper No. 3, at A-3; 41 Fed. Reg. at 17,388; 1976 Draft EPA CWA §316(b) Guidance at 13; EPA 1976 Development Document at 149–57, 191; 39 Fed. Reg. at 36,192.

[45] *See also* 65 Fed. Reg. at 49,080–81; Letter from Vernon Lang, USFWS to EPA Proposed Rule Comment Clerk at 3 (Nov. 6, 2000) (comments on EPA's proposed regulations under CWA § 316(b) for new power plants listing a number of facilities currently operating, under construction, or recently approved for dry cooling); EPA Economic and Engineering Analysis, App. A at 14.

[46] *See, e.g.,* 65 Fed. Reg. at 49,080–81; EPA Economic and Engineering Analysis, App. A at 14–15; 39 Fed. Reg. at 36,192; Literature from Marley Cooling Tower Company; Pub. Serv. Comm'n of Wis./Wisc. Dep't of Natural Res., Final Environmental Impact Statement, Badger Generating Company, LLC, Electric Generation and Transmission Facilities (Jun. 2000, 9340-CE-100), Exec. Sum.

[47] *See* 1994 EPA Background Paper No. 3, at 2–3.

115.[48]

EPA has not, however, found a single example of an existing power plant converting from open-cycle cooling to closed-cycle cooling by retrofitting a dry cooling system at the facility. Dry cooling is generally considered to be more expensive, and to require more space for installation, than wet cooling.[49] Therefore, converting to dry cooling would tend to pose greater difficulty than a conversion to wet cooling. Of course, none of this establishes that such a retrofit would be impracticable in all cases and it seems, theoretically, that a retrofit of dry cooling should be possible. Nevertheless, in the absence of a single example of such a conversion ever having taken place, EPA is unable to draw a firm conclusion at this time about the practicability of such a conversion in the future. Retrofits have typically involved wet mechanical draft cooling towers, though the Brayton Point Station facility in Somerset, Massachusetts, chose to retrofit natural draft towers to its formerly open-cycle facility. All of this establishes that converting an existing open-cycle facility to a closed-cycle operation using wet cooling towers is practicable as a general matter.

Beyond the issue of a technology's practicability (or "availability"), EPA also considers other issues pertaining to the effects of using a particular technology that may be pertinent in determining whether the capacity reductions from a particular closed-cycle cooling technology should be determined to reflect the BTA at a specific plant. Such considerations may include the secondary environmental effects, direct and indirect, of using cooling towers (e.g., sound emissions, air emissions of water vapor, mist, or other substances, visual or "aesthetic" effects). Moreover, if such effects require mitigation measures, additional project costs may need to be considered. Finally, use of any closed-cycle cooling technology will also likely result in a marginal loss of electrical output to the power grid by the power plant due to marginally reduced electric generation efficiency ("efficiency penalty") and the need to use some of the plant's output to power cooling tower fans and pumps ("auxiliary energy penalty"). This reduced output has an associated economic cost to the power plant and in an extreme set of circumstances could conceivably affect the adequacy of local energy supplies. Moreover, it could result in the facility, or another facility, burning additional fossil fuel and emitting more air pollution to provide "replacement power" to offset the lost output to the grid. These kinds of issues are discussed further below.

Moving beyond this general discussion, it is necessary to determine whether the above closed-cycle cooling technologies are available specifically for retrofitting at Schiller Station.

"Air" or "Dry" Cooling Towers at Schiller Station

As discussed above, using air (or dry) cooling towers would yield the maximum reduction in flow of any cooling technology by essentially eliminating the use of water for cooling. Thus, this option would essentially eliminate both the heat load to the Piscataqua River and the losses to

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[48] 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).

[49] *See, e.g.,* 66 Fed. Reg. at 65,282–83.

aquatic life resulting from impingement and entrainment associated with cooling water withdrawals.

"Air" or "Dry" Cooling Towers at Schiller Station – PSNH's Review

PSNH's analysis concluded that retrofitting air cooling at Schiller Station would be impracticable. Specifically, PSNH concluded that dry cooling towers would require far greater surface area for construction than is available at Schiller Station. Dry cooling towers are less efficient than wet or hybrid cooling towers using evaporative cooling and this contributes to their greater space requirements. PSNH also stated that lower efficiency of dry cooling towers is such that they "…are not capable of supporting condenser temperatures and associated backpressures necessary to be compatible with the Station's turbine design…" Enercon, 2008, p. 39.

"Air" or "Dry" Cooling Towers at Schiller Station – EPA's Review

EPA has decided based on current information to eliminate dry cooling towers from further consideration for retrofitting at Schiller Station. In PSNH's view, dry cooling would be impracticable because of space constraints. *Id*. While EPA has not independently verified this conclusion, we have previously noted that dry cooling requires more space, and is likely to have greater feasibility problems as a result, than wet cooling towers. Furthermore, as stated above, EPA has not identified a single case of a facility retrofitting from open-cycle cooling to dry cooling. Dry cooling would also be more expensive and create larger marginal energy penalties, while likely achieving only a small marginal additional reduction over the high end of the reduction range for wet cooling towers. In light of the above considerations, including the absence of a single example of an open-cycle plant converting to dry cooling, EPA has determined based on current information that converting to dry cooling is not the BTA for Schiller Station. *See also Riverkeeper, Inc. v. U.S. Environmental Protection Agency,* 358 F.3d 174, 194-196 (2d Cir. 2004) ("Riverkeeper I") (upholding EPA's rejection of dry cooling as the BTA for the Phase I § 316(b) Rule addressing new facilities).

Wet Cooling Towers at Schiller Station

There are two principal types of wet cooling towers that are used in closed cycle systems: natural draft and mechanical draft towers. "Natural draft towers have no mechanical device to create air flow through the tower and are usually applied in either very small or very large applications." EPA, Preliminary Regulatory Development Section 316(b) of the Clean Water Act Background Paper No. 3: Cooling Water Intake Technologies, April 4, 1994, p. 2-4. Mechanical draft towers use fans in the cooling process. *See id.*; EPA, Economic and Engineering Analysis of the Proposed 316(b) New Facility Rule, August 2000, EPA-821-R-00-019, p. 11-2 to 11-3 and App. A, at 14. A third type of cooling tower combines elements of both wet and dry cooling and is referred to, alternatively, either as "wet/dry" cooling towers, "hybrid" cooling towers or "plume abated" cooling towers.

Natural Draft Wet Cooling Towers – PSNH's Review

PSNH evaluated natural draft cooling towers and concluded that this technology should be eliminated as the potential BTA. Natural draft cooling towers function because a "chimney effect" within the tower produces an air flow which provides the cooling medium to cool the heated non-contact cooling water discharged by the condenser. PSNH concluded that the volume of cooling water (i.e., circulation flow) at Schiller Station would not provide an adequate heat load "to fuel the thermal differential required to create and sustain the "chimney effect." Enercon, 2008, p. 39.

Natural Draft Wet Cooling Towers – EPA's Review

EPA has not independently verified that natural draft cooling towers are infeasible at Schiller and is not prepared, without further justification, to agree that it would be infeasible to use natural draft towers in a closed-cycle configuration at Schiller Station given the widespread use of this technology.

At the same time, given PSNH's expressed position and given the undisputed availability of other cooling tower technologies equally effective at reducing impingement mortality and entrainment, EPA considers it unnecessary to further investigate natural draft wet cooling tower technology as the potential BTA for Schiller Station. Furthermore, EPA notes that mechanical draft cooling towers have been used much more frequently in the United States in more recent years, including for retrofits (with the notable exception of the Brayton Point Station facility, as mentioned above), and are expected to be less expensive than natural draft towers. At the same time, PSNH may use any lawful technology, including natural draft cooling towers, to meet NPDES permit limits.

Mechanical Draft Wet Cooling Towers – PSNH's Review

According to PSNH, it would be feasible to convert Schiller Station from open-cycle to closed-cycle cooling by retrofitting mechanical draft cooling towers at the facility. The company estimates that this approach would reduce intake flow, and associated entrainment and impingement, by 96.9 to 100%. PSNH also indicates that mechanical draft towers at Schiller Station would require a maximum 3.8 MGD makeup water for all three units combined. This make-up water would be needed to replace: (1) blow-down; (2) evaporation losses; and (3) drift (water particles carried out by the tower plume).

As EPA requested, PSNH evaluated the use of treated recycled water (e.g., grey water) to augment the use of seawater in the plant's open-cycle cooling systems. If all of the wastewater generated in the Rockingham County area (12 municipal wastewater treatment plants) was routed to Schiller Station, it would only amount to 18.91% of the cooling water flow needed by the Station for condenser cooling. Enercon, 2008, p. 90. Therefore this option was rejected as potential BTA.

However, the Pierce Island Wastewater Treatment Plant would be able to provide sufficient grey water as make-up if the cooling system were converted to closed cycle.[50] Although additional investigations and arrangements would be necessary to determine the feasibility of this option, PSNH noted potential significant advantages of this option. Therefore, EPA considers using grey

[50] If grey water is used instead of sea water, the cycles of concentration in the towers could increase, thereby reducing the amount of makeup water needed to 2.3 MGD.

water for make-up water to be a potential BTA for minimizing impingement and entrainment if cooling towers are installed.

PSNH notes concern about the possibility of water vapor plumes causing fogging and/or icing problems to nearby roads and commercial areas in cold weather. As a result, PSNH considered that the use of hybrid (or wet/dry) mechanical draft cooling towers would be necessary at Schiller Station for plume abatement. PSNH also concluded that noise abatement features would be needed considering that the cooling towers would be located directly across the river from residential areas.

The permittee provided an estimate of the total capital cost of this conversion (including using grey water versus sea water), as well as the total operation and maintenance costs. PSNH has claimed these cost estimates to be CBI, however, and, as a result, the figure is not reported here. Suffice to say, PSNH estimates substantial costs to convert Schiller Station to closed-cycle cooling with wet mechanical draft cooling towers. PSNH's estimate includes the parasitic energy demand of the cooling tower fans and booster pumps (requiring a new dedicated substation), as well as efficiency losses due to higher condenser cooling water inlet temperatures and increased water treatment and maintenance costs.

Mechanical Draft Wet Cooling Towers – EPA's Review

Mechanical draft wet and hybrid wet-dry cooling tower technologies are widely used at steam-electric power plants. These technologies are often used in closed-cycle configurations and have been retrofitted in closed-cycle configurations at a number of plants. *See, e.g.,* Clean Water Act NPDES Permitting Determinations for Thermal Discharge and Cooling Water Intake from Brayton Point Station in Somerset, MA (NPDES Permit No. MA0003654) (Draft Permit) at 7-37 to 7-38 (Jul. 22, 2002); Responses to Comments, Public Review of Brayton Point Station NPDES Permit No. MA0003654, at IV-114 to 115 (Oct. 3, 2003). *See also* US EPA, Technical Development Document for the Final Section 316(b) Existing Facilities Rule (EPA-821-R-14-002, May 2014), § 6.1.1.5.

With regard to Schiller Station specifically, PSNH concluded that converting Schiller Station from open-cycle to closed-cycle cooling by retrofitting mechanical draft wet cooling towers at the facility would be feasible. EPA agrees that such a conversion is a feasible option and concluded it should be further evaluated as a potential BTA for the Facility under CWA § 316(b).

As previously discussed, EPA considers a variety of factors in evaluating technological options for the BTA on a BPJ basis. Based on the intake flow reductions that converting closed-cycle cooling could achieve, this technology could reduce entrainment and impingement by approximately 95 percent, and by as much as 100 percent if gray water was used for make-up water. As indicated above, such a conversion would be feasible in terms of available space at the Facility and engineering considerations. EPA notes that PSNH has expressed concern about possible adverse effects to local neighbors across the river from cooling tower sound emissions, but also has also indicated that steps can and should be taken to mitigate any such effects. EPA agrees that technologies are available to mitigate sound emissions – e.g., low noise fans, sound baffling structures – if they are identified to be a problem. PSNH has also identified a concern about the potential for water vapor plumes from the cooling towers freezing on local roadways during winter weather and causing an icing hazard, but has also identified hybrid (wet/dry) cooling tower technology as a method of mitigating that concern. EPA agrees that such icing concerns can be addressed by using hybrid cooling towers. EPA has not conducted an independent analysis to verify the concerns about sound emissions or icing, but does not regard the concerns to be unreasonable given the local geography and weather conditions at Schiller Station. Moreover, EPA agrees that mitigating technologies are available to address these issues, albeit at some extra modicum of cost.

Converting to closed-cycle cooling would impose a small marginal "energy penalty" on generation by Schiller Station – approximately 2-4 percent less generation due to efficiency and auxiliary energy penalties – but this would not have significant effects on the local or regional power grid because the amount is small, Schiller is not a large generator and the coal units have a relatively low capacity factor in the first place. While some additional air emissions might result from additional power generation by other facilities to replace reduced Schiller Station generation, this is not likely to be significant both because the amount of lost generation is so small and because other cleaner sources might replace the electricity. Finally, EPA also notes that closed-cycle cooling would have the added benefit of reducing thermal discharges by approximately 95 percent. This is not considered to be a major benefit in this case, however, as Schiller Station's thermal discharge is not considered to be particularly problematic. *See* Section 6.4, above.

When making a BTA determination under the CWA § 316(b), one aspect of determining whether a technology is *available* that EPA evaluates is whether the technology is affordable for the permittee. PSNH has submitted initial information regarding its estimates of the capital, operation and maintenance (O&M), and other direct and indirect costs of retrofitting mechanical draft hybrid wet-dry cooling tower technology in a closed-cycle configuration at Schiller Station. Installation of cooling towers, regardless of the type of tower and the specific cooling system configuration, would involve both one-time costs and annually recurring costs. One-time costs include the initial capital investment to procure equipment and construct the facilities, as well as lost profits from any otherwise unnecessary outage period in which one or both units must cease generation in order to allow construction to proceed. Annually recurring costs include incremental costs to operate and maintain the new facilities and costs associated with any reduction in generation efficiency. As stated above, PSNH's cost estimates as well as EPA's assessment of those estimates is considered CBI.

EPA agrees with PSNH that converting Schiller Station from open-cycle to closed-cycle cooling by retrofitting mechanical draft wet cooling towers (using either river water or grey water as make-up) at the facility is a feasible option that should be further considered as the potential BTA under CWA § 316(b). Closed-cycle cooling would also satisfy the impingement mortality reduction standard of the New CWA § 316(b) Regulations. 40 C.F.R. § 125.94(c)(1). As a result, it is an option open to Schiller Station for reducing impingement mortality in compliance with CWA § 316(b). EPA must further evaluate closed-cycle cooling for entrainment mortality reductions under the New CWA § 316(b) Regulations. See 40 C.F.R. §§ 125.94(d), 125.98(f) and 125.98(g). This further evaluation is presented in Section 10 of this Fact Sheet.

9.6 EPA's Conclusions on Alternative Technologies

From the above evaluation, EPA concludes that fine-mesh wedgewire screens, mechanical draft wet closed-cycle cooling towers, variable speed pumps and scheduled maintenance outages should be further evaluated as potential BTA options because they are available technologies that appear capable of appreciably reducing the Facility's entrainment of aquatic organisms. EPA also concludes that impingement mortality could potentially be reduced at Schiller Station by closed-cycle cooling, fine-mesh wedgewire screens, variable speed pumps, scheduled maintenance outages, fish return system improvements and/or the replacement of the Facility's existing traveling screens with Ristroph screens (including the renovation of the abandoned Unit 3 intake). Accordingly, EPA concludes that these BTA options for reducing impingement mortality should also be evaluated. A detailed discussion of EPA's BTA determination and decision process, as an ongoing permitting action, follows in Section 10, including a comparison of the cost-effectiveness of the various options.

10. Consideration of BTA Option Costs, Cost-Effectiveness, and Comparison of Relative Costs and Benefits

In the text above, EPA concluded that the current location, design, construction, and capacity of Schiller Station's CWISs no longer reflect the BTA for minimizing adverse environmental impact (AEI). In addition, EPA evaluated options for technological or operational modification of the Facility's CWISs to reduce impingement and entrainment in order to meet the BTA standard of CWA § 316(b). Based on this analysis, EPA "screened out" certain technological approaches from further evaluation as potential BTA options for Schiller Station's CWISs. Specifically, EPA rejected certain traveling screen technologies (fine-mesh, WIP, MultiDisc®, dual flow), coarse-mesh wedgewire screens, aquatic microfiltration barriers, fish net barriers, two speed pumps, behavioral barriers, open-cycle cooling using grey water, and certain closed cycled cooling options (dry cooling, natural draft).

Below EPA considers the remaining technologies, including their respective costs, cost-effectiveness and relative costs and benefits as part of its determination of the proposed BTA for Schiller Station's CWISs. As described in the preceding discussion of technologies, EPA determined that four general technology options stood out for further consideration, either alone or in combination, as a means for minimizing both impingement and entrainment caused by Schiller Station's CWIS:

- converting to closed-cycle cooling using wet mechanical draft cooling towers;
- installing fine-mesh wedgewire screens;
- installing variable speed pumps or requiring intake pump shutdown when practicable; and
- scheduling maintenance outages to minimize entrainment.

In addition, the following options for reducing impingement mortality (but not entrainment) were also retained for further evaluation:

- upgrading the traveling screens with Ristroph screens;

- renovating the abandoned Unit 3 intake;
- operating the new screens continuously;
- relocating chlorine dosing to downstream side of screens; and
- installing new fish return systems.

Based on information provided by PSNH, EPA further determined that these "impingement only" options could all be instituted concurrently. In fact, PSNH's construction cost estimate includes all of these as line items, except for the cost of operating the screens continuously, though new Ristroph screens are designed to operate continuously and typically are operated in this manner. *See* AR-187, 316(b) BTA Modified Ristroph Fish Handling Traveling Water Screen. *See also* S. Rajagopal, H. Jenner, V. Venugopalan (editors), Operational and Environmental Consequences of Large Industrial Cooling Water Systems, 2012, p. 373. Therefore, this combination of "impingement-only options" is grouped together and labeled the "Ristroph Screen Option."

Furthermore, EPA found that shutting down the intake pumps when a unit is on stand-by could significantly reduce Schiller Station's water withdrawals, and associated impingement and entrainment, if the capacity factor for that unit is low for a given time period. Although there is no way to predict with certainty the seasonal or annual capacity factor for each unit, this option's cost is low compared to the potential benefit. In fact, recent operating experience shows that Units 4 and 6 have not been operating much outside the peak winter and summer seasons and that this status is expected to continue. Therefore, as a component of the BTA for Schiller Station, EPA determined that PSNH should continue its current practice of shutting down intake pumps to reduce intake flow as much as practicable when a unit is not generating electricity.

Using the biological data and cost information, EPA evaluated the cost-effectiveness of the BTA options for reducing impingement mortality separately from the cost-effectiveness of the BTA options for reducing entrainment. EPA also evaluated how certain combinations of the available options would compare, in terms of cost-effectiveness, to each option alone. This discussion is presented below.

10.1 Method of Estimating Cost of BTA Options

All cost values used in the cost-effectiveness comparisons below were derived from the 2008 Enercon report. The relative costs (normalized) of the available technologies are presented in Tables 10-A and 10-B below, except for requiring intake pump shutdown when practicable and scheduling maintenance outages to minimize entrainment (these two options are considered to either save revenue or to cost relatively little in comparison to the environmental benefit and therefore are considered as components of BTA for this permit.) All values cited are in 2013 dollars. These values were provided to EPA in 2008 dollars, but EPA converted them to 2013 dollars using the Construction Cost Index (CCI). *See* http://enr.construction.com/economics/ for details.

For this Fact Sheet, EPA calculated the net present value (NPV) cost of each option, including all up-front expenses and periodic operation and maintenance costs. In this case, EPA finds that the NPV is the appropriate cost metric because it factors in the time value of money.

NPVs were calculated using Excel 2013's built-in function, as documented on Microsoft's website (http://office.microsoft.com/en-us/excel-help/go-with-the-cash-flow-calculate-npv-and-irr-in-excel-HA102753229.aspx?CTT=1). The function was run utilizing a weighted after-tax average cost of capital (5.3% as the discount factor, *See* letter from Michael Fisher and Lisa Tarquinio, Abt Associates, to Kelly Meadows, Tetra Tech, Subject: Cost and Affordability Analysis of Cooling Water System Technology Options at Merrimack Station, Bow, NH – with revised assessment of electricity rate effects, December 7, 2012). NPVs were adjusted to an after-tax basis using an estimate of PSNH's combined federal and New Hampshire state marginal tax rate of 40.5 percent for Merrimack Station. *See* December 7, 2012, Letter from Abt Associates to EPA. This adjustment was applied to capital costs only, not to lost revenue or O&M costs, since the benefits of tax write-offs are generally only available for capital expenses.

NPVs were calculated based on a 30-year time horizon for all options. The useful life of the cooling tower option is estimated to be 30 years. In the case of wedgewire and Ristroph screens, where the technology's useful life is judged to be less than 30 years, adjustments were made to put it on a 30-year basis. Therefore, since the lifetime of a wedgewire screen is understood to be 15 years, the screens would have to be replaced once over the 30 year time frame. The capital costs of the two sets of screens were then "chained" together to construct a 30-year cost basis for deriving net present values. In the case of the Ristroph screens, where the life of the equipment is assumed to be 20 years, a similar approach was taken, except that because the second set of Ristroph screens still has 10 years of life left at the end of the 30-year period of comparison, salvage value for the equipment was estimated via straight-line depreciation and deducted from the 30-year NPV.

The spreadsheet used to make all these calculations has not been made available in the public portion of the administrative record because PSNH has designated the technology cost information to be confidential business information (CBI). EPA cannot release such information to the public under 40 C.F.R. Part 2, Subpart B, unless PSNH withdraws its claim of CBI or EPA determines, after undertaking the CBI review and substantiation process (including any appeals and judicial review), that the material is not properly considered CBI. *See* 40 C.F.R. §§ 2.205 and 2.211.

Further, because of the claim of CBI, EPA cannot put the actual cost estimates derived into this fact sheet. Instead, in the table immediately below (Table 10-A), EPA has computed a ratio of the various costs, essentially setting an index relative to Ristroph screens. This is accomplished by dividing the cost of a technology, in NPV, by the NPV cost of installing Ristroph screens.

10.2 Comparison of Options for Reducing Impingement Mortality

Estimates of the costs and quantitative impingement mortality reduction benefits of the available technologies evaluated in this case are presented in Table 10-A.

Table 10-A Comparison of Cost and Degree of Impingement Mortality Reduction for Schiller Station's Existing CWIS and the BTA Technological Options

	Normalized Net Present Value Cost Ratio[1] *	Annual Fish And Macrocrustacean Impingement Mortality[2]	Estimated % Reduction In Fish Impingement Mortality[3]	Estimated % Reduction In Macrocrustacean Impingement Mortality[3]	Estimated Annual Number Of Fish Saved[2]	Estimated Annual Number Of Macrocrustacean Saved[2]
Current Operation/ Technology	0.00	19,877	0.0	0.0	0	0
Mechanical Draft Cooling Towers	56.47	616	96.9	96.9	5862	13,399
Wedgewire Screen 1.0 mm	1.25	2,485	87.5	87.5	5293	12,099
Wedgewire Screen 0.8 mm	1.30	2,485	87.5	87.5	5293	12,099
Wedgewire Screen 0.69 mm	1.34	2,485	87.5	87.5	5293	12,099
Wedgewire Screen 0.6 mm	1.37	2,485	87.5	87.5	5293	12,099
Ristroph Screens	1.00	5,009	74.8	74.8	4525	10,343

[1]See cost derivation discussion above.

[2]Based on study as discussed in Section 8.2. For wedgewire screen options, *see* Excel spreadsheet #5 attached to email from P. Colarusso, EPA to S. DeMeo, EPA, 7/18/14.

[3]Basis for these values discussed in Sections 9.3 through 9.5 for each technology option. For wedgewire screen, *see* Excel spread sheet #6 attached to email from P. Colarusso, EPA to S. DeMeo, EPA, 7/18/14

* Note: This is a ratio of control technology cost to the cost of installing Ristroph screens. By definition, the ratio, or index, for Ristroph screens is 1.0, and these figures are dimensionless.

Wedgewire screens are expected to be highly effective for reducing impingement due to the low through-screen velocity that they produce, coupled with the strong sweeping currents present in the Piscataqua River. EPA determined that the wedgewire screen options are among the most cost-effective options evaluated for reducing impingement mortality.

Renovating the abandoned Unit 3 intake and installing Ristroph screens and new fish return systems for each of the three intake structures at the Station would be marginally less costly than wedgewire screens, but also would achieve an estimated reduction in impingement mortality of only 75% (by improving survival following impingement on the screens), as compared to an 87% reduction in impingement mortality with wedgewire screens. Wedgewire screens are predicted to achieve superior impingement mortality reductions because they prevent impingement and do not remove fish and other organisms from the water, whereas the Ristroph Screen Option allows organisms to come into contact with the screens, spray wash and fish return systems, which causes immediate mortality for some fish species, as discussed in Section

9.4.2 of this Fact Sheet.

In other words, the Ristroph Screen Option focuses on trying to improve fish survival after impingement, rather than preventing impingement in the first place, as wedgewire screens are likely to do. Preventing impingement would be particularly beneficial for Schiller Station because some of the species of fish impinged by Schiller Station have poor survival rates once impinged, regardless of the technology used (*e.g.* alewife, Atlantic herring, Atlantic menhaden and rainbow smelt). *See* Taft, E.P., *Fish protection technologies: a status report*, 2000, Environmental Science & Policy, Volume 3, September 1, 2000 (hereinafter Taft, 2000), pp. 349-359. These are "fragile species" when it comes to their ability to survive impingement. *See* New CWA § 316(b) Regulations, 40 C.F.R. § 125.92(m) (definition of "fragile species"). *See also* 40 C.F.R. § 125.94(c)(9) and 125.98(d). Moreover, American shad, river herring and rainbow smelt have experienced declining populations in recent years, and minimizing adverse impacts to these populations is fundamental to their recovery.

It appears that both the wedgewire screen option and the Ristroph Screen Option could potentially meet one or another of the generally applicable impingement mortality reduction criteria in the New CWA § 316(b) Regulations. *See* 40 C.F.R. § 125.94(c)(2) and (5). As discussed above, however, approximately 24% of the fish impinged by Schiller Station are fragile species. These fish would still suffer mortality with the Ristroph Screen Option, whereas they are less likely to with the wedgewire screen option.

It also appears that the two options are roughly equivalent in terms of cost-effectiveness for reducing impingement mortality at Schiller Station given how close the cost and effectiveness estimates are for the two options, and given the uncertainty inherent in these estimates. Nevertheless, EPA concludes that the wedgewire screen option should be favored because it would be likely to provide a larger reduction in impingement mortality because the above-discussed fragile species are likely to fare better with wedgewire screens than the Ristroph Screen Option. Moreover, as discussed below, the wedgewire screen option would also provide entrainment reduction benefits, while the Ristroph Screen Option would not. Furthermore, EPA concludes that the 1.0 mm slot-size wedgewire screen option could satisfy 40 C.F.R. § 125.94(c)(2) but, as discussed elsewhere in this analysis, it would not perform nearly as well as the other options for reducing entrainment mortality. Therefore, EPA rejects the 1.0 mm slot-size wedgewire screen option as a potential BTA option under 40 C.F.R. §§ 125.94(d), 125.98(f) and 125.98(g).

The closed-cycle cooling option is estimated to be the most effective, but also the most expensive, option for reducing impingement mortality. Cooling towers are expected to be able to reduce impingement mortality by about 10 percent more than wedgewire screens (a 97% reduction versus an 87% reduction), but at a cost nearly 40 times higher. While this option would satisfy 40 C.F.R. § 125.94(c)(1), and Schiller Station is free to select and implement it, EPA is not mandating it because the wedgewire screen options with slot sizes of 0.8 mm or less will satisfy 40 C.F.R. § 125.94(c)(2) at far less cost.

Finally, combining one of the wedgewire screen mesh size options with PSNH's current practice of shutting down the intake pumps when the units are on stand-by (*see* Figure 9-4 above) will further reduce impingement at no cost. Currently, Units 4 and 6 have not been operating regularly (i.e., having low capacity factors) and this status is not expected to change in the near future. Given current energy trends, EPA believes that the current practice of shutting down the pumps is achieving a higher level of reduction in impingement for Units 4 and 6 than the installation of VSP's. Unit 5, on the other hand, operates more consistently and reductions in cost and impingement may more likely be realized if variable speed pumps are installed for this unit.

10.3 Comparison of Options for Reducing Entrainment Mortality

The estimated costs and entrainment mortality reduction percentages of the available technologies are presented in Table 10-B.

Table 10-B Comparison of Cost and Degree of Entrainment Mortality Reduction for Schiller Station's Existing CWIS and the BTA Technological Options

	Normalized Net Present Value Cost Ratio[1]	Annual Fish And Macrocrustacean Entrainment Mortality[2]	Estimated % Reduction In Fish Entrainment Mortality[3]	Estimated % Reduction In Macrocrustacean Entrainment Mortality[3]	Estimated Annual Number Of Fish Eggs And Larvae Saved[2]	Estimated Annual Number Of Macrocrustacean Eggs And Larvae Saved[2]
Current Operation/ Technology	0.00	1,596,747,579	0	0	0	0
Mechanical Draft Cooling Towers	56.47	49,499,175	96.9	96.9	246,694,739	1,300,553,665
Wedgewire Screen 1.0 mm	1.25	239,311,718	6	100	15,275,216	1,342,160,645
Wedgewire Screen 0.8 mm	1.30	160,389,768	37	100	94,197,166	1,342,160,645
Wedgewire Screen 0.69 mm	1.34	142,568,683	44	100	112,018,251	1,342,160,645
Wedgewire Screen 0.6 mm	1.37	129,839,336	49	100	124,747,598	1,342,160,645
Ristroph Screens	1.00	1,596,747,579	0	0	0	

[1]See cost derivation discussion above.
[2]Based on study as discussed in Section 8.2. Also note that 100% mortality is assumed for entrained organisms
[3]The basis for these values is discussed in Sections 9.3 through 9.5 for each technology option.

As discussed above, fine-mesh wedgewire screens can significantly reduce entrainment mortality under certain circumstances. This technology works through a combination of mechanisms. By utilizing screen slot sizes smaller than the local aquatic organisms, fine-mesh wedgewire screens can prevent entrainment by excluding the organisms from the CWIS. As discussed above, this would reduce entrainment but would not reduce mortality if the organisms are killed by contacting the screens. In addition, however, wedgewire screens operate with low through-screen velocities which may enable later stage larvae with swimming ability to avoid contact with the wedgewire screens. Furthermore, low through-screen velocity combined with strong sweeping currents in the source water body, and the design of the wedgewire screens, may cause organisms to be swept past the screens without contacting them. *See, e.g.,* 79 Fed. Reg. 48331 ("Limited evidence also suggests that extremely low intake velocities can allow some egg and larval life stages to avoid the intake because of hydrodynamic influences of the crossflow."); EPRI (2003). To the extent that this occurs, it would obviously reduce entrainment mortality.

There is no way, however, for EPA to estimate with any precision whether, or how many, more eggs and larvae would avoid contact with the proposed wedgewire screens than currently avoid contact with the existing CWISs. While low intake velocity (0.5 fps or less) and strong sweeping flows might make it more likely for eggs and larvae to be swept past the screens, the larger area of screens in the water body associated with the proposed installation of multiple wedgewire screens might be a countervailing factor that would make it more likely for organisms to contact the screens. In addition, if and when passing currents are *too* strong, they may cause relatively more organisms to contact the screens. *See* EPRI, 2005, pp. 5-4 to 5-5.

In the face of these uncertainties, EPA's (and PSNH's) quantitative analysis focuses on the extent to which the numbers of eggs and larvae currently entrained by the Facility can be reduced by using fine-mesh wedgewire screens to exclude them from entering the CWIS. EPA believes this is likely a conservative approach at this site because it does not reflect any increased avoidance of the CWIS, though EPA expects that some enhanced avoidance of the screens may occur. EPA determined how many organisms would be excluded by comparing the predicted size of the eggs and larvae expected to be present with the different screen slot size options under consideration.

EPA also estimated the degree to which entrainment *mortality* would be reduced by estimating the degree to which organisms excluded by the screens would survive contact with the screens. EPA based this assessment on relevant information from the literature related to determining such survival, including information about the heartiness of the organisms involved. There is unavoidably significant uncertainty regarding these estimated survival rates because there is a dearth of such information for fine-mesh wedgewire screens generally, and no information specifically for the proposed installation of such screens at Schiller Station. Based on EPA's review of various EPRI reports (2003, 2005, 2007), EPA's TDD for the 316(b) rule and our site specific knowledge of the Piscataqua River, EPA estimated egg survival to be 80% and larval survival to be 12%. The high ambient velocity in the Piscataqua produces a substantial sweeping flow that should minimize egg and larvae contact time with the screens. Obviously, complete avoidance of the screens would produce the lowest mortality rates for larvae and eggs, but EPA believes that reducing contact time with the screen is an important factor is reducing egg and larval mortality.

Screen slot sizes of 1.0 mm, 0.8 mm, 0.69 mm and 0.6 mm were evaluated. All of the options were deemed to achieve the same 100% reduction in macrocrustacean egg and larvae entrainment due to the relatively large size of these organisms. Furthermore, EPA estimates a 100% reduction in macrocrustacean entrainment mortality on the grounds that these organisms are hearty enough to survive contact with the wedgewire screens.

With regard to fish eggs and larvae, however, performance varied due to the range in the relative size of these organisms. The 1.0 mm slot size screen option was estimated to achieve substantially lower reduction in fish egg and larvae entrainment (only 11.5% vs. 79.2%, 85% and 94.4%, respectively, for the other slot sizes) and lower reduction in entrainment mortality (only 6% vs. 37%, 44% or 49%, respectively, for the other slot sizes). As a result, and given that the

1.0 mm slot size option is only slightly less expensive than the other options, EPA rejects the 1.0 mm slot size as a BTA option for reducing entrainment at Schiller Station.

The other slot size options (0.8 mm, 0.69 mm and 0.6 mm) have only slightly different estimated costs and their estimated levels of entrainment and entrainment mortality reduction are fairly close together. All things being equal, EPA would favor the smallest slot size because it would achieve the greatest reduction in entrainment (and entrainment mortality), but EPA understands that PSNH has indicated that if wedgewire screens are to be installed, it would want to do some pilot testing to determine whether there are important differences among these options with regard to potential screen clogging and other maintenance issues. EPA regards this approach to be reasonable under the facts of this case.

Each of the wedgewire screen options is projected to be more effective for reducing entrainment than the Ristroph Screen Option, which does not reduce entrainment. The wedgewire screen options, however, are expected to be less effective than closed-cycle cooling. Nevertheless, the comparison between the wedgewire screen and closed-cycle cooling options for entrainment reduction is complicated.

EPA estimates that converting Schiller Station to closed-cycle cooling could reduce entrainment mortality by as much as 97% for both macrocrustaceans and fish eggs and larvae. Because this improvement is achieved by reducing intake flow, it is considered to be the most certain way of reducing entrainment mortality. The wedgewire screen options are all projected to achieve a similar, actually slightly better (100%), reduction in macrocrustacean entrainment mortality. This is because the screens should exclude all the macrocrustaceans and they should be hardy enough to survive any contact with the screens.

There are significant differences, however, between the two technologies' ability to reduce entrainment and entrainment mortality for fish eggs and larvae. Region 1 estimates that closed-cycle cooling can reduce entrainment mortality for fish eggs and larvae by as much as 97%, whereas the wedgewire screen options with the three smallest slot sizes are estimated to reduce such entrainment mortality by 37%, 44% or 49%, respectively. The closed-cycle cooling option, however, is estimated to cost nearly 40 times more than any of the wedgewire screen options. *See* Table 10-B above (normalized net present value ratios). Thus, closed-cycle cooling is the best performing technology for reducing entrainment mortality, but the wedgewire screen options will also achieve substantial entrainment mortality reductions and will do so at far lower cost.

Finally, combining one of the wedgewire screen mesh size options with PSNH's current practice of shutting down the intake pumps when the units are on stand-by (*see* Figure 9-4 above) will further reduce entrainment at no additional cost. As discussed above for impingement, Units 4 and 6 have not been operating regularly in recent years and this is not expected to change in the near future. Given current energy trends, EPA believes that the current practice of shutting down the pumps is achieving a higher level of reduction in flow and entrainment for Units 4 and 6 than would the installation and operation of VSP's. Of course, this could change during the permit cycle but EPA is not prepared to mandate the use of VSP's at this time. If the capacity factor of these two units rises for an extended period of time, EPA can revisit the BTA determination as a permit modification. Unit 5, on the other hand, operates as more of a baseload generator and appreciable reductions in impingement and entrainment would be unlikely from installing variable speed pumps for this unit.

10.4 Conclusions

As explained above, the permit proceeding for Schiller Station is considered an "ongoing permit proceeding" under 40 C.F.R. § 125.98(g) of the New CWA § 316(b) Regulations. For such ongoing permit proceedings, the BTA determination for reducing impingement mortality "may be based on the BTA standards for impingement mortality at § 125.95(c)" and the site-specific BTA determination for reducing entrainment mortality may be based on some or all of the factors specified in 40 C.F.R. §§ 125.98(f)(2) and (3). 40 C.F.R. § 125.98(g). Of course, if the permitting authority decides not to consider these factors from the regulations, the BTA determination must still have a rational basis, be consistent with applicable law and not be arbitrary or capricious. In this case, EPA *did* consider the factors and standards specified in the New CWA § 316(b) Regulations, in addition to other appropriate factors, as explained below.

When setting permit limits under CWA §316(b) for controlling entrainment and impingement mortality, there is a relationship or interaction between the technologies selected as the BTA for each of these two problems (*i.e.*, entrainment vs. impingement). In some cases, the same technologies will address both (*e.g.*, closed-cycle cooling), whereas in other cases, different technologies might address the two issues (*e.g.*, flow reductions with variable speed pumps and outages to address entrainment vs. modified screen and fish return systems to address impingement). The New CWA § 316(b) Regulations address the possibility of conflicts between the technologies for addressing entrainment and impingement in 40 C.F.R. § 125.94(b)(1) and (2), essentially by providing that compliance with new impingement mortality requirements must be complied with after a determination of entrainment control requirements. This draft permit addresses BTA determinations for both entrainment mortality reduction and impingement mortality reduction. The discussion below addresses entrainment first and then impingement.

BTA for Entrainment Mortality Reduction

The BTA standard for reduction entrainment mortality under the New CWA § 316(b) Regulations states (in pertinent part) that:

> [t]he Director must establish BTA standards for entrainment for each intake on a site-specific basis. These standards must reflect the Director's determination of the maximum reduction in entrainment warranted after consideration of the relevant factors as specified in § 125.98.

40 C.F.R. § 125.94(d). As explained above, however, for an ongoing permit proceeding such as this one, the permitting authority has the discretion whether or not to consider "some or all of the factors in paragraphs (f)(2) and (3) …." 40 C.F.R. § 122.98(g). In addition, 40 C.F.R. § 125.98(f)(introductory paragraph) provides (in pertinent part) that:

> [t]he Director must establish site-specific requirements for entrainment … [that] reflect the Director's determination of the maximum reduction in entrainment

> warranted after consideration of factors relevant for determining the best technology available for minimizing adverse environmental impact at each facility.

Furthermore, the New CWA § 316(b) Regulations provide that:

> [t]he Director must provide a written explanation of the proposed entrainment determination in the fact sheet or statement of basis for the proposed permit [which] … must describe why the Director has rejected any entrainment control technologies or measures that perform better than the selected technologies or measures, and must reflect consideration of all reasonable attempts to mitigate any adverse impacts of otherwise available better performing entrainment technologies.

40 C.F.R. § 125.98(f)(1). In the discussion above, EPA has explained in writing much of its assessment and comparison of the relevant technologies. The Agency's conclusions are described and summarized below.

Closed-cycle cooling is an entrainment mortality reduction option open to Schiller Station. It is both technically and financially feasible. (As discussed farther below, closed-cycle cooling would also satisfy 40 C.F.R. § 125.94(c)(1) with regard to reducing impingement mortality.) Closed-cycle cooling would also be the most effective and most certain technology option for reducing entrainment mortality due to the substantial year-round flow reductions that it could achieve.

Nevertheless, EPA is not proposing to mandate this technology as the site-specific BTA for entrainment mortality reduction at Schiller Station primarily because the Agency concludes that under the facts of this case its far greater costs, as compared to the fine-mesh wedgewire screen option, are not warranted by the additional margin of reduction in adverse environmental effects that it could achieve. Further, the added benefit of reducing thermal discharges by approximately 95% with closed cycle cooling is not a significant factor because the facility's thermal discharge is not considered particularly problematic. This is a site-specific decision and closed-cycle cooling might be the BTA at another site under different facts.

Although the benefits will not be as great or as certain as the benefits that closed-cycle cooling would achieve, the fine-mesh wedgewire screen options, with the exception of the 1.0 mm slot size option, can also achieve substantial entrainment mortality benefits at far less expense. EPA estimates that closed-cycle cooling could reduce entrainment mortality of fish eggs and larvae and macrocrustaceans by approximately 97%, while the 0.6, 0.69 and 0.90 mm wedgewire screen options are conservatively estimated to be capable of reducing entrainment mortality of fish eggs and larvae by approximately 49%, 44% and 37%, respectively, and of macrocrustaceans by 100%. EPA finds that closed-cycle cooling would cost 40 times more than the wedgewire screen option. EPA concludes that such costs are not in this case warranted for the additional margin of entrainment mortality reduction that closed-cycle cooling could achieve.

EPA reaches this conclusion in light of the moderate size of Schiller Station's water withdrawal and its relatively small withdrawal relative to the flow in the Piscataqua River. In addition, EPA's judgment is influenced by the fact that while the Facility's entrainment of eggs and larvae is significant, it has not been associated with higher level impacts, such as major effects on local populations of impacted species or the overall community of organisms in the river, or with impacts to endangered species. In addition, Schiller Station's Units 4 and 6 have been operating at a relatively low capacity factors in recent years and this trend is currently expected to continue (although such trends can change over time).

EPA clearly is *not* concluding that nothing needs to be done about Schiller Station's entrainment. To the contrary, EPA regards it to be important to reduce entrainment mortality (and impingement mortality) caused by Schiller Station's CWISs. EPA finds that current entrainment and impingement losses at Schiller Station represent avoidable mortality to aquatic organisms in a productive river of public importance that is subject to cumulative stresses from, among other sources, municipal storm water runoff, industrial discharges, land use changes, upstream flow alterations and other power plant water withdrawals. These losses are avoidable in the sense that available technology could be added to the Facility at an appropriate cost that would enable Schiller Station to continue generating electricity while harming far fewer aquatic organisms.

That said, the Agency also finds that in this case, the cost of the closed-cycle cooling option is not warranted by the benefits it would obtain. At the same time, EPA finds that the cost of the fine-mesh wedgewire screen options (along with the specified BMPs) will make improvements at a low seven-figure cost that *is* warranted by the benefits.

Based on the evaluation herein, EPA has also determined that shutting down pumps to reduce flow to the maximum amount practicable when an associated generating unit is not generating electricity, and water is not needed for fire-fighting or other emergencies, is also a component of the BTA for reducing impingement mortality and entrainment at Schiller Station. This step should actually save the company money over time due to the reduced energy costs associated with shutting off the pumps.

EPA has discussed the benefits of reducing mortality from entrainment (and impingement) above. From a quantitative standpoint, the proposed BTA is estimated to save approximately more than 1.4 billion eggs and larvae of various fish and macrocrustacean species each year. The closed-cycle cooling option would save more fish eggs and larvae and a slightly smaller number of macrocrustaceans. All things being equal, the greater the reduction in mortality from entrainment and impingement, the greater the benefits that will be achieved.

At the same time, it should also be understood that, as mentioned above, EPA has no evidence that entrainment and/or impingement losses at Schiller Station are causing or significantly contributing to declines in local populations of the affected species of aquatic organisms or to disruptions in the local community or assemblage of organisms in the Piscataqua River. This is not surprising given that Schiller Station's withdrawal of 125 MGD is only 0.5% of the tidal prism of the Piscataqua River Estuary (approximately 25,000 MGD). In addition, as discussed elsewhere in this Fact Sheet, EPA expects that the proposed permit conditions will satisfy the requirements of the Endangered Species Act, the Magnuson-Stevens Act, and the Coastal Zone Management Act. That said, some of the species affected by entrainment and impingement at Schiller Station are not doing well on a regional basis (e.g., rainbow smelt, herring) and taking reasonable steps to reduce mortality is appropriate. The proposed permit conditions will require such reasonable steps.

As discussed earlier in this document, the CWA does not *require* EPA to compare the costs and benefits of the options being considered as the possible BTA under CWA § 316(b). *Entergy,* 556 U.S. at 222-226. The statute does, however, give EPA the *discretion* to consider such cost/benefit comparisons in the process of determining the BTA, and EPA has done so for many years as part of its consideration of cost. *Id.* Consistent with the law and the Agency's practice, EPA's New CWA § 316(b) Regulations direct permitting authorities making BTA determinations for the reduction of entrainment mortality to consider the relationship of social costs and social benefits of technological options if the available information is of "sufficient rigor." 40 C.F.R. § 125.98(f)(2)(v). *See also* 40 C.F.R. §§ 125.92(x) and (y) (definitions of "social benefits" and "social costs").[51] The regulations then give the permitting authority the discretion to determine how much weight to give to this consideration of costs and benefits in making its BTA determination. 40 C.F.R. § 125.98(f)(2).

Neither statute, nor regulations, nor guidance document dictate precisely how such cost/benefit evaluations should be conducted. The regulations do, however, indicate that *social* costs and benefits should be considered and that costs and benefits should be considered both qualitatively and, if possible, quantitatively. *See also* 40 C.F.R. §§ 125.92(x) and (y) 122.21(r)(11). EPA makes reasonable efforts to make as complete an assessment as it can of the costs and benefits at issue, so that it can factor them into its evaluation. As part of a qualitative evaluation, EPA seeks to compare the cost of BTA options with "the magnitude of the estimated environmental gains (including attainment of the objectives of the Act and § 316(b)) to be derived from the modifications." *Id.* at 225 (quoting, *Central Hudson,* Decision of the General Counsel, No. 63, at p. 381). The relevant "objectives of the Act and § 316(b)," as referred to in *Central Hudson,* include minimizing adverse environmental impacts resulting from the operation of CWISs, 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).

Reducing mortality from entrainment (and impingement) by Schiller Station's CWIS will directly increase the number of recreational and forage fish (eggs, larvae, juveniles and adults), as well as other types of aquatic organisms (*e.g.,* macrocrustaceans such as rock crabs, oysters and lobsters) found in the Piscataqua River, which is part of the Great Bay Estuary. The greater the reductions, the more likely it is that they will contribute to increased populations of juvenile and adult fish. In addition, regardless of population-level effects, reducing the loss of eggs and larvae due to entrainment is valuable in and of itself because of the role these organisms play at the base of the food web and the other benefits that they may provide, such as contributing to species' compensatory reserve. (Reducing impingement losses also directly contributes to increased abundance of adult fish, which are also important to the food web and provide a commercial and recreational resource in the Piscataqua River and other connected water bodies that make up the Great Bay Estuary.) Finfishing, lobstering and shellfishing are all important activities in the Great Bay Estuary. "Anglers seek striped bass, bluefish, smelt, river herring,

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[51] Of course, as explained previously, 40 C.F.R. § 125.98(g) gives the permitting authority discretion in an "ongoing permit proceeding" whether or not to consider the factors in § 125.98(f), including the cost/benefit factor in § 125.98(f)(2)(v).

flounder, and a variety of other species in the estuary. In winter, smelt fishermen set up bobhouses, drill holes in the ice and wait patiently for smelt to nibble their lines." Mills, Kathy, Great Bay National Estuarine Research Reserve, Ecological Trends in the Great Bay Estuary, 20 Year Anniversary Report, 2009 (hereinafter 2009 Great Bay 20th Report)(AR-186). Several recreationally important species are among the species commonly impinged and/or entrained by Schiller Station, including rainbow smelt, winter flounder, blueback herring, pollock, hake species alewife, and Atlantic cod. Moreover, regional populations of American shad, river herring and rainbow smelt have all declined in the relatively recent past which supports the appropriateness of taking steps to help preserve these species.

Beyond these direct benefits to aquatic life, reducing entrainment (and impingement) is also likely to result in additional indirect benefits to the ecosystem and the public's use and enjoyment of it. Examples of such potential indirect benefits include increasing recreational and educational opportunities, increasing or maintaining biological diversity, and contributing to healthier populations of resident and migratory birds and other terrestrial wildlife reliant on the river's aquatic organisms for food.

In addition to these direct and indirect benefits of protecting fish in the Piscataqua River ecosystem, fish populations also 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. *See* C.M. Holmlund and M. Hammer, Ecosystem services generated by fish populations, Ecological Economics 29: 253-268, 1999. Within the Piscataqua River and Great Bay Estuary, nitrogen has shown a long term increasing trend, concurrent with a decrease in eelgrass and a possible increase in drift macroalgae.

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. *See* Worm B., et al., Impacts of Biodiversity Loss on Ocean Ecosystem Services, Science 314: 787-790, November 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. *See* Akpalu, W., Economics of biodiversity and sustainable fisheries management, Ecological Economics 68: 2729-2733, 2009.

The predominant economic 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 did not attempt to develop a monetized estimate of the full benefits that would accrue to society from the above-discussed impingement mortality and entrainment reductions from the preferred BTA – such as by undertaking a stated preference study or a benefits transfer analysis to estimate non-use benefits for this case – because EPA decided that doing so would be prohibitively difficult, time-consuming and expensive for this permit.[52] No such complete monetized estimate is readily available and it would take many months and substantial cost to attempt to develop such an estimate.[53] *See Entergy*, 556 U.S. at 232-235 (J. Breyer concurring opinion).

A complete monetized assessment of benefits would consider commercial use values, recreational use values, non-use values and ecological benefits. While estimating the commercial use value of lobsters and river herring that would be saved by a particular option could potentially be fairly straightforward in this case, estimating recreational use values can be complex, costly and time-consuming. Moreover, the largest component of the total benefit of saving fish in this case, is likely to be found in the ecological benefits and non-use values arising from saving those organisms. Yet, attempting to develop a monetized estimate of such ecological and non-use values is even more challenging than addressing recreational use values. In both cases, specialized expertise in natural resource economics and modeling would be needed that EPA Region 1 does not have on staff to apply on a permit-by-permit basis. It could take many months or even years to develop this type of complete monetized benefits estimate, and it could cost hundreds of thousands of dollars or more in contractor support. EPA does not have such resources to apply to this permit.

Moreover, in EPA's view, it would be unreasonable to spend those kinds of public resources, even if they could be found, in this case. This decision involves a permit for only a single, relatively small facility, Schiller Station, and Units 4 and 6 at the plant have been operating less and less in recent years. Moreover, as stated above, Schiller Station withdraws only a very small portion of the tidal flux of the Piscataqua River.

As a result, EPA has considered the benefits of reducing entrainment (and impingement) mortality *quantitatively* simply in terms of the number of organisms saved by the various options, and then has assessed the overall benefit of saving these organisms on a qualitative basis. Considering benefits qualitatively may be appropriate when monetized estimates of the full benefits of an action are not available. *See,* 40 C.F.R. §§ 125.92(x), 125.98(f)(2)(v). *See also*

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[52] EPA also notes that efforts by the Agency to develop monetized estimates of these sorts of non-use values have proven highly controversial. *See, e.g.,* Logan, Lee, "Power Sector Seeks Host Of Late Changes to Delayed Cooling Water Rule," *Inside EPA* (Jan. 23, 2014). This is not to say that EPA would not or should not undertake such an analysis in appropriate cases just because it would likely be met with opposition from some interested parties. Rather, it is to underscore both the potential difficulties and likely expense of pursuing such an analysis and the fact that completing such an analysis would be unlikely to resolve all controversies over the value of reducing entrainment and impingement. Instead, the analysis itself would likely become a new bone of contention.

[53] To the best of EPA's knowledge, the Agency has yet to conduct a stated-preference survey in the context of an individual permit in an effort to develop a monetized estimate of non-use values from entrainment and impingement reductions. EPA is aware of one case in which the Agency developed a benefits transfer-based estimate of monetized non-use values to be considered in conjunction with a qualitative assessment. *See In re Dominion Energy Brayton Point, LLC (Formerly USGen New England, Inc.) Brayton Point Station*, 12 E.A.D. 490, 675-691(EAB 2006). This effort to generate a monetized estimate was, however, time-consuming and controversial. *See id.* It was also expensive because it required outside contractor expertise to develop.

Entergy, 556 U.S. at 224; *EPA Guidelines for Preparing Economic Analyses* (EPA 2000a). This is a better approach than entirely ignoring those benefits and only considering the cost of more protective technology. Just as EPA considers the cost of technological options, it is important that the Agency also assess and consider the benefits of these options in as complete a way as possible.

Therefore, in this case, EPA has quantitatively considered the number of organisms that would be saved by the reduced entrainment (and impingement) that could be achieved by the various options. As indicated above, installing the wedgewire screens appear capable of saving a significant, though difficult to quantify, segment of the nearly 1.6 billion eggs and larvae that are estimated to be entrained by the Facility annually. More specifically, as indicated above, *see* Table 10-B, EPA estimates that the fine-mesh wedgewire screen options still under consideration could save approximately 100 million fish eggs and larvae (around 40-50% of those lost to entrainment) and approximately 1.3 billion macrocrustacean eggs and larvae (virtually all of those currently lost to entrainment). The wedgewire screen options also can save more than 17,000 fish and crustaceans per year by largely eliminating impingement mortality at the Facility.

EPA also qualitatively considered the value of the Piscataqua River's aquatic organisms that the BTA options will protect from entrainment and impingement. Minimizing impingement and entrainment by the Schiller Station CWIS would have ecological benefits for the Great Bay Estuary ecosystem. The Piscataqua River is a 12 mile long tidal estuary that spans part of the boundary between New Hampshire and Maine before reaching the Atlantic Ocean east of Portsmouth, New Hampshire. As mentioned, the Piscataqua River is part of the Great Bay Estuary, which is an area of major public conservation efforts that continue to protect and preserve the estuary and its aquatic organisms. "The New Hampshire Fish and Game Department manages the Great Bay Reserve, which was designated in 1989. The Reserve is also supported by the Great Bay Stewards, a non-profit friends group." *See* http://www.greatbay.org/.

> The Partnership includes *Principal, Associate and Community Partners* representing regional, state and federal agencies, municipalities, and land trusts serving the region. The Partnership's *Principal Partners* include:
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> Ducks Unlimited, Inc.
> Great Bay National Estuarine Research Reserve
> New Hampshire Audubon
> New Hampshire Fish and Game Department
> Society for the Protection of New Hampshire Forests
> The Nature Conservancy, New Hampshire Chapter
> U.S. Environmental Protection Agency
> U.S. Fish and Wildlife Service, Great Bay National Wildlife Refuge
> U.S.D.A. Natural Resources Conservation Service

http://www.greatbaypartnership.org/. Overall costs are not easily calculated for fish restoration efforts in the Great Bay Estuary. "Since 1995, the Partnership has invested over $65 million in land protection within the Great Bay watershed, including $56 million in funds from NOAA. Funding sources are diverse and include federal and state grants, municipal sources, foundation grants, and private donations." 2009 Great Bay 20th Report (AR-186). The Great Bay National Estuarine Research Reserve (NERR) is part of a national network of 27 protected coastal areas that was created for long-term research, education and stewardship. Established under the Coastal Zone Management Act of 1972, the NERR "partnership program between the National Oceanic and Atmospheric Administration (NOAA) and the coastal states protects more than one million acres of the nation's most important coastal resources." http://www.greatbay.org/ *See also* 2009 Great Bay 20th Report (AR-186).

Particular efforts have been made to protect and restore fish, such as the anadromous species river herring (alewife and blueback herring) and rainbow smelt, as well as others, through the construction and monitoring of fish ladders and the institution of fish stocking programs. Increases in forage fish and invertebrate populations may also benefit recreationally and ecologically 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. As mentioned above, American shad, river herring and rainbow smelt have experienced declining populations in recent years, and minimizing adverse impacts to these populations is fundamental to their recovery. In fact, rainbow smelt is listed as a Species of Concern by the National Marine Fisheries Service. (In addition, juvenile and adult life stages of the federally protected Atlantic sturgeon inhabit the river and could potentially be at risk for impingement, though none were found to have been impinged during the two-year impingement data collection efforts described farther above in this document. The wedgewire screens would address this risk.)

NHDES has designated the relevant segment of the Piscataqua River a Class B water. Class B waters are "considered as being acceptable for fishing, swimming and other recreational purposes and, after adequate treatment, for use as water supplies." (RSA 485-A:8, II) Though the standard for Class B waters does not include any specific numeric criteria that apply to cooling water intakes, it is nevertheless clear that permits must include any conditions 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 light of the public importance attributed to these ecological resources, it would be anomalous for the NPDES permit to allow Schiller Station to kill large numbers of the river's fish, at various life stages, through entrainment and impingement by CWISs that essentially have no effective means of preventing such mortality. Furthermore, these CWISs have been allowed to operate essentially without modification or limitation for approximately 50 years despite the existence of technological and/or operational restrictions that could reduce these entrainment and impingement losses.

In summary, achieving substantial reductions in impingement and entrainment by Schiller Station's CWIS will increase the number of recreational and forage fish (eggs, larvae, juveniles and adults), as well as invertebrate species in the affected segment of the Piscataqua River. These improvements are also likely to contribute to increased populations of these organisms. In turn, reducing adverse impacts from impingement and entrainment could provide a number of direct, indirect, and non-use benefits both within the river and the estuary. Benefits may also include, for example, preservation or enhancement of habitat for migratory birds and other terrestrial animals dependent on the estuary's aquatic organisms, and enhanced recreational opportunities, including bird watching, fishing, and boating. While EPA has not developed a monetized estimate of these benefits, the importance to the public of the Piscataqua River and Great Bay ecosystem and its natural resources is evident from the federal, state and public efforts to protect these public natural resources. 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.

Compliance with the BTA measures for minimizing entrainment and impingement by Schiller Station will substantially reduce avoidable mortality to millions of aquatic organisms in the affected segment of the Piscataqua River. This mortality is avoidable in that Schiller Station can reduce these adverse effects by implementing the selected BTA measures while continuing to generate electricity. There is nothing inherent in Schiller Station’s process for generating electricity that requires this mortality. It is a function of the way that the facility operates and the limitations of its existing technology. The Station’s CWIS and fish return system have not been significantly upgraded since their original installation some 50 years ago. Making the proposed upgrades would also be consistent with the New Hampshire WQS, as discussed above. Furthermore, implementing the proposed BTA measures could potentially prevent Schiller Station from killing individual members of a number of particularly important species, such as the federally protected Atlantic sturgeon, and would reduce losses of other important species such as rainbow smelt, winter flounder, Atlantic cod and river herring. Protecting other species may also have important ecological significance for the food web in the river.

EPA evaluated using wedgewire screens at Schiller Station based on a variety of other factors discussed in Section 7.3 above. The age of the Schiller Station or CWIS equipment would not preclude installing new wedgewire screens. New wedgewire screens would essentially take the place of the existing traveling screens, which are original to the facility. Upgrading such old equipment would be entirely appropriate.

Furthermore, PSNH indicates that it has no plans to close Schiller Station or any of its currently operating generating units. In particular, PSNH converted Unit 5 to a wood-burning unit fairly recently and that unit runs at a high capacity factor. Thus, the facility appears to have sufficient remaining useful life to justify the expenditures necessitated for the wedgewire screen option.

Using wedgewire screens would not change the process of generating electricity, but there could be a small period of “down time” during installation of the equipment when the facility might need to forego revenue from electricity generation from one or more units. Yet, there is no reason to expect that any such downtime would be at all lengthy given that the work would not affect the electrical generation equipment itself. Furthermore, any necessary brief downtime could be scheduled during expected downtime due to low demand or scheduled maintenance in order to avoid any significant interference with electrical generation.

In addition, EPA considered the non-water quality environmental impacts associated with the installation and use of wedgewire screens. EPA does not expect any impacts in energy consumption, water quantities in the affected water bodies, air emissions, noise, and visual impacts with these technologies. EPA recognizes that, unlike closed-cycle cooling, wedgewire screen technology will not reduce Schiller Station's thermal discharges, but as discussed in this Fact Sheet, the Facility's thermal discharges, as is, can meet CWA standards.[54] Thus, this option would have no effect on energy supply for New Hampshire or New England.

As EPA explained above, for an ongoing permit proceeding, such as this one, the New CWA § 316(b) Regulations indicate that a permitting authority may consider some or all of the factors specified in 40 C.F.R. §§ 125.98(f)(2) and (3) in making its site-specific BTA determination under 40 C.F.R. § 125.98(g). Although not required to, EPA did consider the factors in 40 C.F.R. §§ 125.98(f)(2) and (3). With regard to the factors in § 125.94(f)(2), 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)). Using cooling towers at Schiller Station would not, in EPA's view based on existing information, pose significant issues regarding the emission of particulates or other pollutants in light of the relatively small size of the power plant and its location.

Furthermore, the BTA selected by EPA, which entails a combination of steps including the use of wedgewire screens and a BMP designed to minimize unnecessary water withdrawals, rather than cooling towers, does not raise issues concerning the emission of particulates or other pollutants. EPA has also considered the issue of the remaining useful plant life, *id.* (40 C.F.R. § 125.98(f)(iv)). Although the plant is more than 50 years old, there is no indication that PSNH has any present intention or plan to close the generating units that use the cooling water intake structures because they have a limited remaining useful life. Moreover, PSNH has not made any significant recent improvements to the cooling water intake structures that EPA ought to consider before requiring new technology. In addition, based on the discussion above, EPA concludes that the relatively modest costs of the wedgewire screen option, as presented above, are warranted by the benefits that they would produce. For the closed-cycle cooling option, EPA reached a different conclusion and, instead, found that the far greater costs were not warranted by the additional benefits that they would provide. *See* Table 10-B above. EPA regards the available information to be of sufficient rigor to support the largely qualitative benefits analysis that factored into the comparison of costs and benefits.

Turning to the factors in the new 40 C.F.R. § 125.98(f)(3), EPA again 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. In particular EPA notes here that it does not expect any significant impact on energy delivery from making improvements to Schiller Station's CWISs because the cooling system changes under consideration will not preclude or

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[54] Although EPA has rejected the closed-cycle cooling option for Schiller Station, it is should be noted that that option would pose additional issues to be assessed with regard to energy effects, air emission effects, sound emissions, visual effects, icing, etc.

substantially restrict future energy production. Moreover, installation of any new equipment (*e.g.*, wedgewire screens, VFDs, or cooling towers) should be feasible without outages of any significance. Any outages needed to allow new equipment installation could be scheduled during regular maintenance outages or periods of low electricity demand, and Schiller Station is not a large generator, in any event. In addition, no units have been retired in the last 10 years at the Facility, but EPA's analysis has considered the diminished operations of Units 4 and 6 in recent years.

Finally, EPA does not regard consumptive water use concerns to be a significant issue for this BTA determination. Although the cooling tower option could result in a small amount of evaporative water loss, any such losses would be inconsequential in the tidal environment around Schiller Station. Moreover, EPA is not proposing closed-cycle cooling as the BTA and the preferred wedgewire screed option will not affect water quantities in the river.

BTA for Reducing Impingement Mortality

The BTA standard for reducing impingement mortality under the New CWA § 316(b) Regulations states that:

> [t]he owner or operator of an existing facility must comply with one of the alternatives in paragraphs (c)(1) through (7) of this section, except as provided in paragraphs (c)(11) or (12) of this section, when approved by the Director. In addition, a facility may also be subject to the requirements of paragraphs (c)(8), (c)(9), or (g) of this section if the Director requires such additional measures.

40 C.F.R. § 125.94(c)(introductory paragraph). As explained above, for an ongoing permit proceeding such as this one, the permitting authority has the discretion whether or not to base the BTA determination for reducing impingement mortality on the BTA standards for impingement mortality at § 125.94(c). 40 C.F.R. § 122.98(g). For this draft permit, EPA did look to the BTA standards in 40 C.F.R. § 125.94(c).

All of the fine-mesh wedgewire screen options would satisfy the BTA standard specified in 40 C.F.R. § 125.94(c)(2), because they each has a design through-screen velocity of 0.5 fps or less. EPA has ruled out the 1.0 mm slot-size option, however, because, as discussed above, it would be inadequate for reducing entrainment mortality. Therefore, as also discussed above, EPA is drafting permit requirements that will allow Schiller Station to conduct pilot testing to determine the optimal screen slot-size from the three remaining options (0.6 mm; 0.69 mm; and 0.80 mm). EPA also notes that closed-cycle cooling is an option open to the Facility, as that technology would satisfy 40 C.F.R. § 125.94(c)(1).

EPA considers reducing impingement mortality at Schiller Station to be an important objective. From a quantitative standpoint, the proposed BTA is estimated to save approximately 17,500 adult and juvenile aquatic organisms (fish and macrocrustaceans) from impingement mortality While the wedgewire screen and closed-cycle cooling options would achieve roughly equivalent benefits in terms of reduced impingement mortality at Schiller Station, the wedgewire screen option would be far less costly.

The Ristroph Screen Option would also reduce impingement mortality sufficiently to satisfy one part of the BTA standard for impingement mortality in the New CWA § 316(b) Regulations, 40 C.F.R. § 125.94(c)(5) (concerning "modified traveling screens"), but EPA is authorized to impose additional measures to protect fragile species under 40 C.F.R. §§ 125.4(c)(9) and 125.98(d). As discussed above, a substantial number of such fragile species are present at Schiller Station and would not be protected from impingement mortality by the Ristroph Screen Option. Therefore, EPA has determined that if a screening option is to be implemented by Schiller Station for impingement mortality reduction, it must address fragile species and be one of the preferred wedgewire screen options. This also makes sense because the wedgewire screen options also reduce entrainment mortality, but the Ristroph Screen Option would not.

Conclusion

In light of the analysis presented above, EPA is proposing for this draft permit that the BTA for Schiller Station includes the following:

1) Wedgewire screens with a mesh or slot size of 0.80 mm or less operated and maintained to maintain an intake through-screen velocity of 0.5 fps or less and equipped with an air burst system. The actual screen slot size selected will be subject to EPA approval and based upon the results of the Facility's pilot testing and demonstration report submitted to the agencies. The demonstration report will provide a justification for 1) the proposed screen slot size based on consideration of each option's ability to reduce entrainment mortality, avoid screen clogging, fouling or other maintenance issues, and any other relevant considerations; and 2) the proposed material alloy choice for the equipment in order to reduce bio-fouling; and 3) the proposed optimal screen orientation in the river (i.e., parallel or perpendicular to the flow) in order to reduce entrainment and impingement mortality;

2) A best management practice (BMP) of shutting down the intake pumps associated with a particular generating unit to the extent practicable when that generating unit is not operating and water is not needed for fire prevention or other emergency conditions; and

3) The annual outage of Unit 5 during June to maximize the reduction in entrainment mortality.

10.5 BTA Permit Requirements

After an initial pilot study is conducted, the permittee is required to install, operate, and maintain wedgewire screens and achieve a through-screen velocity of 0.5 fps to reduce the impingement and entrainment of all life stages of fish to the maximum extent practicable, consistent with the requirements described below.

The wedgewire screen units[55] shall have a maximum slot size of 0.8 millimeters and a design

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[55] EPA is aware that the permittee will need to evaluate certain design and construction variables for the use of wedgewire screens at Schiller Station. These considerations may include but not limited to the use of high grade

through-slot intake velocity of 0.5 fps or less under all facility operating conditions and all flow conditions, including during periods of minimum ambient source water surface elevation and periods of maximum head loss across the units. The actual screen slot size selected will be subject to EPA approval and based upon the results of the Facility's pilot testing and demonstration report submitted to the agencies. The wedgewire screen units shall employ a pressurized air burst system to periodically clear debris from the screens. Periodic manual cleaning will also be required. The permittee shall verify that the through slot velocity at the wedgewire screen intake is 0.5 fps or less through measurement or calculation.

The wedgewire screen units must be positioned as close to the west bank of the Piscataqua River and the CWIS as possible, while meeting all operational specifications required by this permit, the conditions of any other permits for the equipment, and assuring that the equipment performs as designed. The screen orientation in the river will also be subject to EPA approval and based upon the results of the Facility's pilot testing and demonstration report. Deflecting structures, such as debris-deflecting nose cones, are strongly recommended to eliminate the damage risk associated with free-floating debris from contacting the screen assembly.

Regarding the wedgewire screens, the permittee shall address all necessary permitting or other approvals with the National Marine Fisheries Service (NMFS) and the Army Corps of Engineers (ACOE) to schedule a favorable time for installation and to minimize environmental and navigational impacts during construction and installation. In addition, EPA will work with Schiller Station and, as appropriate, the ISO to schedule any necessary downtime of the power plant that will minimize or eliminate any effects on the adequacy of the region's supply of electricity.

Furthermore, the permittee is required to schedule the annual Unit 5 outage during June to maximize the reduction in entrainment mortality. If the permittee has a three year capacity supply obligation that would result in a penalty, the permittee is required to reconfigure the obligation within the next year to allow an outage in June without a penalty. The rescheduled outage would not be required until the obligation is reconfigured.

Moreover, as a best management practice (BMP) requirement, the permittee shall to the extent practicable not operate intake water pumps for each electrical generating unit except for when water must be withdrawn to generate electricity, or for firefighting or other emergency events. Thus, when generating units 4, 5 and/or 6 are not generating electricity and water is not needed for firefighting or other emergency conditions, the intake water pumps for that unit would be shut down to the extent practicable.

Compliance Schedule

With regard to fine-mesh wedge-wire screens, PSNH states that "[t]his technology is one of the highest ranked of the alternative CWIS technologies evaluated for this Report in terms of biological benefits … [and i]ts annual operational costs are comparable to the costs of operating

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stainless steel, hydrodynamic load, hydrostatic load, wave load, impact load, weight of the structures and the stability of the bedrock underneath, marine construction methodologies, potential concerns of having lower water levels in the intake bays and increased hydraulic head across the circulating water pumps, as well as debris and river bed saltation and the potential need for dredging and/or the use of Johnson Screens Model T-78HC half-screens.

the Station's existing traveling screens." Enercon, 2008, p. 107. However, PSNH also suggests that "[a] site specific study would be required to determine the appropriate wedgewire screen material and slot size to ensure that the screens would be able to withstand the aggressive marine environment." *Id*. With the caveat that EPA has rejected the 1.0 mm slot size option, as discussed above, EPA agrees that a one year site-specific study is a sensible idea to pin down the optimal slot size and construction materials to use. Since it has already been determined that wedgewire screen technology is feasible at Schiller Station, the study should only be used to evaluate the performance of the system and final design specifications (*i.e.*, slot size for maximum entrainment reduction while minimizing any debris loading issues).

Beyond the issue of a site-specific study, Schiller Station plainly will also need a period of time to install the new CWIS equipment. In the past EPA did not include compliance schedules for BTA requirements in NPDES permits; rather, compliance schedules for BTA requirements were included in administrative compliance orders issued in conjunction with the new NPDES permit. EPA's approach to compliance schedules, however, has changed.

EPA has long understood that when new permit conditions are issued that require new equipment that will reasonably take some time to install, a compliance schedule of some kind will typically be appropriate to provide a clear, enforceable timeline for achieving permit compliance. 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 (AR-183). 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 and cannot be extended by a permit action. *See* 33 U.S.C. § 1311(b)(1)(C). Thus, compliance schedules for meeting water quality-based effluent limits would also be handled outside the permit unless the state water quality standards at issue expressly provide for achieving 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).

The situation with regard to cooling water intake structure requirements under CWA § 316(b) is somewhat more complicated. The new Draft Permit for Schiller Station does require certain improvements to the Facility's CWISs which will require some time to plan and install in order to achieve compliance. In the past, EPA interpreted CWA § 316(b) to incorporate the compliance deadlines from CWA § 301(b)(2) and, as a result, any compliance schedule would have been handled outside an NPDES permit. *See, e.g., Cronin v. Browner*, 898 F.Supp. 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 (AR-183). 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.

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 reasonable compliance schedule in the Draft Permit by which the permittee is to achieve compliance with the Final Permit's requirements under CWA § 316(b). The time provided for evaluation and selection of the final wedgewire screen option is consistent with PSNH's own suggestion regarding a schedule for studying wedgewire screen slot size options. Furthermore, the timeline provided for installing the wedgewire screens is based on EPA's knowledge of the wedgewire screen installation schedule for the GE Lynn facility, as well as the schedule to install cooling towers at Brayton Point Station. The Draft Permit includes the following compliance schedule at Part I.A.14.b:

1. Design

   i. The permittee shall complete pilot testing of wedgewire screens no later than twelve (12) months from the effective date of this permit.

   ii. A demonstration report documenting the results of the pilot testing shall be submitted to EPA and NHDES within two (2) months of the completion of the pilot testing. The demonstration report shall include a preliminary design of the wedgewire screens at Schiller Station and include justifications for 1) the proposed screen slot size based on consideration of each option's ability to reduce entrainment mortality, avoid screen clogging, fouling or other maintenance issues, and any other relevant considerations; 2) the proposed material alloy choice for the equipment in order to reduce bio-fouling; and 3) the proposed optimal screen orientation in the river (i.e., parallel or perpendicular to the flow) in order to reduce entrainment and impingement mortality. The screen slot size and orientation selected will be subject to EPA approval and based upon the results of the pilot testing and demonstration report.

   iii. Data collection, including but not limited to topographic and bathymetric surveys, geotechnical exploration, and other design and marine construction variables that need to be evaluated shall be completed no later than sixteen (16) months from the effective date of the permit.

iv. Within four (4) months of the completion of pilot testing and after correspondence from EPA, the permittee shall submit a final design for the wedgewire screens at Schiller Station.

2. Permitting

i. Within four (4) months of the completion of the pilot testing, the permittee shall commence the process to obtain all necessary permits and approvals for installation and construction of the wedgewire screens, including those required by U.S. Army Corps of Engineers (ACOE), National Marine Fisheries Service (NMFS), NHDES, New Hampshire Division of Coastal Zone Management, local conservation commissions, and others as necessary. This shall include the engineering to support the permitting, the permit applications, and all necessary supplementary data.

ii. From the commencement of the permitting process and until all permits and approvals are issued, the permittee shall provide timely and complete responses to all requests from each permitting and approval authority.

iii. Within eight (8) months from the commencement of the permitting process, the permittee shall complete submission of all necessary permit applications and notices necessary to install wedgewire screens at the Units 4, 5, and 6 CWISs.

3. Construction

i. Within twelve (12) months of the completion of the pilot testing, the permittee shall enter into an Engineering, Procurement and Construction agreement with the permittee’s contractor.

ii. No later than nine (9) months after obtaining all permits and approvals, the permittee shall complete site preparation for the installation of wedgewire screens for the Units 4, 5 and 6 CWISs. The permittee shall minimize environmental and navigational impacts during construction and installation. In addition, EPA will work with representatives of Schiller Station and, as appropriate, the ISO to schedule any necessary downtime of the power plant that will minimize or eliminate any effects on the adequacy of the region’s supply of electricity.

iii. The permittee shall complete installation, operational modifications, test, startup and commissioning of the wedgewire screens for the CWIS’s of Units 4, 5 and 6 no later than twenty (20) months from obtaining all permits and approvals.

Compliance with New Hampshire Water Quality Standards

As explained above, New Hampshire's WQS apply to effects of Schiller Station's water withdrawals through its CWISs. As also discussed above, New Hampshire's WQS seek to protect and preserve the biological integrity of the State's waters. The NPDES permit's new requirements based on the BTA proposed herein should substantially reduce mortality to aquatic organisms from impingement and entrainment by Schiller Station's CWISs. As a result, these permit conditions should satisfy New Hampshire WQS and EPA expects that the NHDES would certify these permit conditions under CWA § 401(a)(1).

11. Stormwater Pollution Prevention Plan

On September 25, 1992, EPA promulgated through its General Permit for Stormwater Discharge Associated with Industrial Activity, that the minimum BAT/BCT requirement for stormwater discharges associated with industrial activity is a Stormwater Pollution Prevention Plan (SWPPP) [57 FR, 44438]. EPA has included SWPPP requirements in the draft permit because a significant amount of wastewater discharged from the Facility consists of stormwater and the Facility engages in activities that 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 transfer, material processing, material handling, or loading and unloading. Specifically, at this Facility, the two parking lot chemical loading zones and the two on-site tank farms are examples of material storage, processing and handling operations that must be included in the SWPPP.

To control activities/operations that could contribute pollutants to waters of the United States and potentially violate New Hampshire's WQSs, the draft permit requires the Facility to continue to implement, and maintain a SWPPP. This process involves the following four main steps:

- Forming a team of qualified Facility personnel who will be responsible for developing and updating the SWPPP and assisting the Facility manager in its implementation;
- Assessing the potential stormwater pollution sources;
- Selecting and implementing appropriate management practices and controls for these potential pollution sources; and
- Periodically re-evaluating the effectiveness of the SWPPP in preventing stormwater contamination and overall compliance with the various terms and conditions of the draft permit.

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 facilitate a systematic approach for the permittee to properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used to achieve compliance with the conditions of this permit. The SWPPP shall be prepared in 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 documents measures implemented at the

Facility to satisfy the non-numeric technology-based effluent limitations included in the draft permit. These non-numeric effluent limitations support, and are equally enforceable as, the numeric effluent limitations included in the draft permit.

Pursuant to Section 304(a) of the Act and 40 CFR 125.103(b), BMPs may be expressly incorporated into a permit on a case-by-case basis where it is determined they are necessary to carry out the provision of the CWA under Section 402(a)(1). These conditions apply to the Facility because PSNH stores and handles products containing pollutants listed as toxic under Section 307(a)(1) of the CWA or pollutants listed as hazardous under Section 311 of the CWA and have ancillary operations that could result in significant amounts of these pollutants reaching waters of the United States. BMPs have been selected based on those appropriate for this specific facility (*see* Sections 304(e) and 402(a)(1) of the CWA and 40 CFR §122.44(k)).

In essence, the SWPPP requirement directs the permittee to review the physical equipment, the operational procedures, and the operator training for the Facility. The objective of this review is to protect the local waterway by minimizing the pollutants discharged through inadequate facility design, through human error, or through equipment malfunction.

The draft permit directs the permittee to incorporate BMPs directly into the SWPPP. BMPs become enforceable elements of the permit upon submittal of a SWPPP certification within 90 days of the effective date of the permit. Therefore, BMPs are permit conditions comparable to the numerical effluent limitations and are required to minimize the discharge of any pollutants through the proper operation of the generating facility.

12. Essential Fish Habitat

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 action that it funds, permits, or undertakes, "may adversely impact any essential fish habitat." 16 U.S.C. § 1855(b). Adversely impact means any impact which reduces the quality and/or quantity of EFH (50 C.F.R. § 600.910 (a)). Adverse impacts 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. The Amendments broadly define essential fish habitat as: waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity (16 U.S.C. §1802 (10))

Essential fish habitat 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 and are identified on the NMFS website at http://www.nero.noaa.gov/hcd/webintro.html. In some cases, a narrative identifies rivers and other waterways that should be considered EFH due to present or historic use by federally managed species.

The federal action being considered in this case is the proposed NPDES permit reissuance for Schiller Station. EPA believes that the conditions and limitations contained within the Draft Permit adequately protects all aquatic life, including those with designated EFH in the receiving water, and that further mitigation is not warranted.

Attachment D provides the complete discussion of EPA's Essential Fish Habitat assessment as it relates to the renewal of Schiller Station's NPDES permit. All documents supporting the EFH assessment, including a letter under separate cover, will be made available to the NMFS Habitat Division.

Should adverse impacts to EFH be detected as a result of this permit action, or if new information is received that changes the basis for EPA's conclusions, NMFS will be contacted and an EFH consultation will be reinitiated.

13. Endangered Species Act

Section 7(a) of the Endangered Species Act of 1973, as amended (ESA) grants authority to and imposes requirements upon Federal agencies regarding endangered or threatened species of fish, wildlife, or plants ("listed species") and habitat of such species that has been designated as critical (a "critical habitat"). The ESA requires every Federal agency, in consultation with and with the assistance of the Secretary of Interior, to ensure that any action it authorizes, funds, or carries 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.

EPA has reviewed the federal endangered or threatened species of fish, wildlife, or plants to determine if any listed species might potentially be impacted by the re-issuance of this NPDES permit. The two listed species that have the potential to be present in the vicinity of Schiller Station are the shortnose sturgeon (*Acipenser brevirostrum*) and the Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*).

Based on the expected distribution of the species, EPA has determined that there are no shortnose sturgeon in the action area and that the reissuance of the permit will have no effect on the species. Therefore, consultation under Section 7 of the ESA with NMFS for shortnose sturgeon is not required.

Based on the analysis of potential impacts to Atlantic sturgeon presented in Attachment E to this Fact Sheet, EPA has made the preliminary determination that impacts to Atlantic sturgeon from the intake and discharges at Schiller Station, if any, will be insignificant or discountable. The attachment provides the complete discussion of EPA's Endangered Species Act assessment as it relates to the renewal of Schiller's NPDES permit.

Therefore, EPA has judged that a formal consultation pursuant to Section 7 of the ESA is not required. EPA is seeking concurrence from NMFS with the preliminary determination through the supporting information in this Fact Sheet, Attachment E to the Fact Sheet and the Draft Permit. A letter under separate cover will also be submitted to NMFS Protected Resources requesting concurrence.

Reinitiation of consultation will take place: (a) if new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered in the consultation; (b) if the identified action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in the consultation; or (c) if a new species is listed or critical habitat is designated that may be affected by the identified action.

14. 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 requires the permittee to report monitoring results obtained during each calendar month in the Discharge Monitoring Reports (DMRs) no later than the 15th day of the month following the completed reporting period.

The draft permit includes new provisions related to electronic DMR submittals to EPA and the State. The draft Permit requires that, no later than six months after the effective date of the permit, the permittee submit all DMRs 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 six months from the effective date of the permit), the permittee may either submit monitoring data 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 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 can be found on the EPA Region 1 NetDMR website located at http://www.epa.gov/region1/npdes/netdmr/index.html.

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 learn more about upcoming trainings, please visit the EPA Region 1 NetDMR website http://www.epa.gov/region1/npdes/netdmr/index.html .

The draft permit also includes an "opt-out" request process. Permittees who believe they cannot 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 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.

In most cases, reports required under the permit shall be submitted to EPA as an electronic attachment through NetDMR, subject to the same six month time frame and opt-out provisions as identified for NetDMR. Certain exceptions are provided in the permit such as for providing written notifications required under the Part II Standard Permit Conditions. Once a permittee begins submitting reports to EPA using NetDMR, it will no longer be required to submit hard copies of DMRs or other reports to EPA and the NHDES. 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.

15. Antidegradation

This draft permit is being reissued with some changes in permit requirements. EPA has determined that the changes, as described in this fact sheet, will not cause lowering of water quality or loss of existing water uses and that no additional antidegradation review is warranted.

16. State Certification Requirements

EPA may not issue a permit unless either the State Water Pollution Control Agency with jurisdiction over the receiving water(s) certifies that the effluent limitations and/or conditions contained in the permit are stringent enough to assure, among other things, that the discharge will not cause the receiving water to violate State's Surface Water Quality Regulations or the certification is deemed to be waived as set forth in 40 CFR §124.53. The NHDES is the certifying authority within the State of New Hampshire.

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

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

Reviews and appeals of limitations and conditions attributable to State certification shall be made through the applicable procedures of the State and may not be made through the applicable procedures of 40 CFR § 124.

The New Hampshire Department of Environmental Services, Water Division is the certifying authority. EPA has discussed this Draft Permit with the Staff of the Wastewater Engineering Bureau and expects that the Draft Permit will be certified. Regulations governing state certification are set forth in 40 CFR §§ 124.53 and 124.55.

17. Comment Period, Hearing Requests, and Procedures for Final Decisions

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 Michael Cobb, U.S. EPA, Office of Ecosystem Protection, Municipal Permits Branch, 5 Post Office Square, Suite 100, 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 final decision on the draft permit, the EPA will respond to all significant comments and make these responses available to the public at EPA's Boston office.

Following the close of the comment period, and after 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.

18. EPA Contact

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:

Mr. Michael Cobb, Environmental Engineer
U.S. Environmental Protection Agency
Office of Ecosystem Protection
5 Post Office Square, Suite 100 (OEP06-1)
Boston, Massachusetts 02109-3912
Telephone: (617) 918-1369
FAX No.: (617) 918-0995

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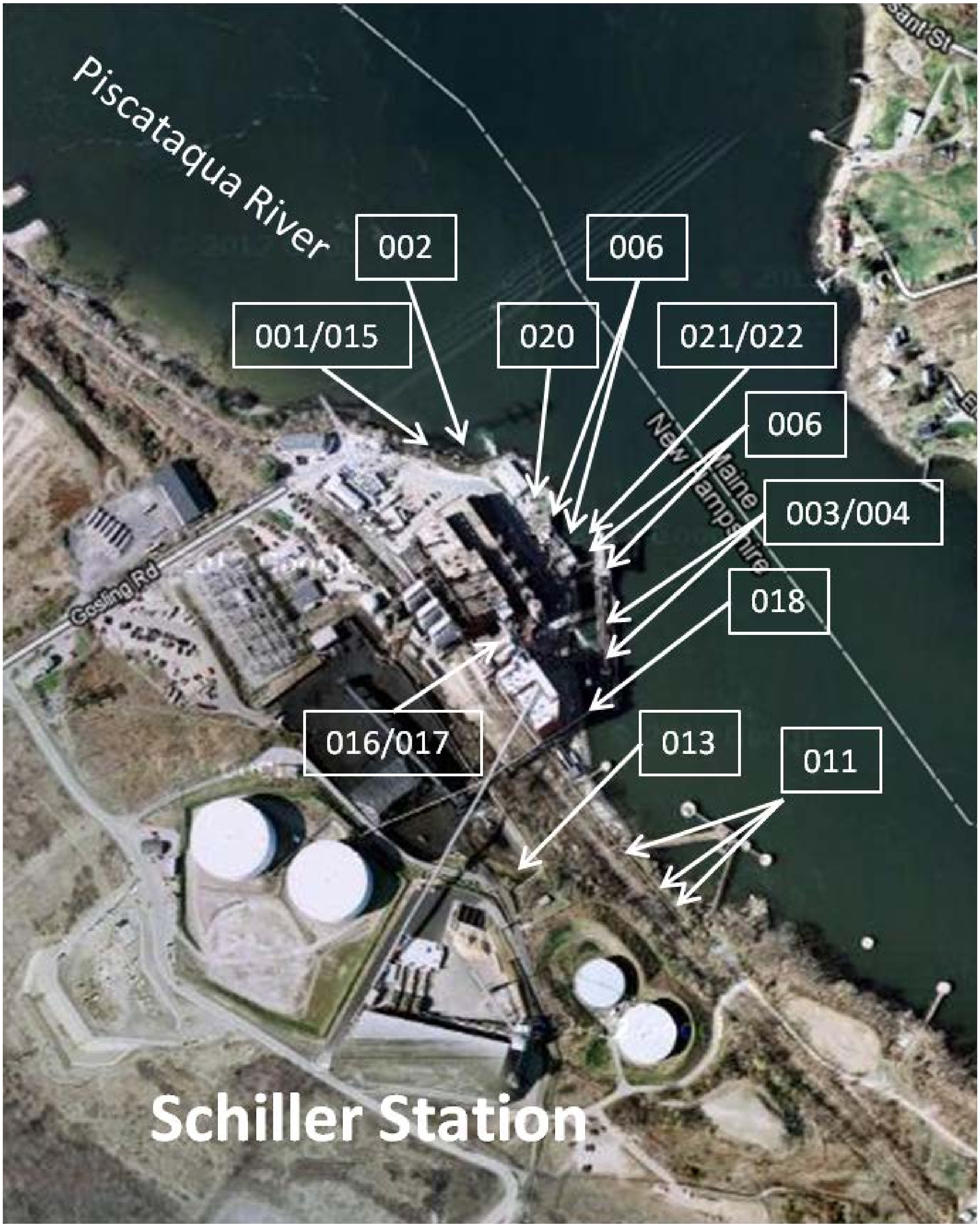
Date:

Ken Moraff, Director
Office of Ecosystem Protection
U.S. Environmental Protection Agency

ATTACHMENT A – AERIAL MAP WITH OUTFALL LOCATIONS



*Aerial image obtained from maps.google.com
**See Section 6.2 of this fact sheet for a description of each outfall

ATTACHMENT B – DMR SUMMARY

The following tables are a quantitative summary of the discharge from each outfall during the period from November 1990 through April 2014.

Outfall 001A, Monthly Reporting								
Monitoring Period End Date	Total Residual Chlorine	Ferrous Sulfate	Flow		Oil & Grease		Temperature	
	mg/L		MGD		mg/L		degree F	
	Daily Max	Daily Max	Monthly Average	Daily Max	Monthly Average	Daily Max	Difference between Intake and Discharge	Water Temp
Existing Permit Limit	0.2	0.5	40	40	15	20	25	95
Minimum	0	0	0.01	0.01	0	0	16	55.5
Maximum	0	0	39	39	13.2	16	22	89
Average	---	---	3.48	4.63	1.4	1.4	19	73
Standard Deviation	---	---	9.38	10.64	2.5	2.7	2	13
# of Measurements	2	0	188	188	306	306	11	11
# of Exceedances	0	0	0	0	0	0	0	0

Outfall 002A, Monthly Reporting						
Monitoring Period End Date	Total Residual Chlorine	Ferrous Sulfate	Flow		Temperature	
	mg/L		MGD		degree F	
	Daily Max	Daily Max	Monthly Average	Daily Max	Difference between Intake and Discharge	Water Temp
Existing Permit Limit	0.2	0.5	43.5	52.2	25	95
Minimum	0.02	0.42	0.1	4.6	0	52
Maximum	0.2	0.55	43.5	43.5	26	95
Average	0.15	0.45	32.3	40.93	23	77
Standard Deviation	0.05	0.02	11.39	3.2	3	11.5

Outfall 002A, Monthly Reporting						
Monitoring Period End Date	Total Residual Chlorine	Ferrous Sulfate	Flow		Temperature	
	mg/L		MGD		degree F	
	Daily Max	Daily Max	Monthly Average	Daily Max	Difference between Intake and Discharge	Water Temp
# of Measurements	270	112	277	277	277	277
# of Exceedances	0	1	0	0	1	0

Outfall 003A, Monthly Reporting						
Monitoring Period End Date	Total Residual Chlorine	Ferrous Sulfate	Flow		Temperature	
	mg/L		MGD		degree F	
	Daily Max	Daily Max	Monthly Average	Daily Max	Difference between Intake and Discharge	Water Temp
Existing Permit Limit	0.2	0.5	50.2	50.2	25	95
Minimum	0.01	0.4	1.3	24.4	10	22
Maximum	0.2	0.48	41.8	43.5	31	95
Average	0.17	0.45	35.4	41.52	23	77.6
Standard Deviation	0.04	0.02	9.41	1.7	2	11.4
# of Measurements	273	113	280	280	280	280
# of Exceedances	0	0	0	0	13	0

Outfall 004A, Monthly Reporting						
Monitoring Period End Date	Total Residual Chlorine	Ferrous Sulfate	Flow		Temperature	
	mg/L		MGD		degree F	
	Daily Max	Daily Max	Monthly Average	Daily Max	Difference between Intake and Discharge	Water Temp
Existing Permit Limit	0.2	0.5	50.2	50.2	25	95
Minimum	0	0.39	0.6	20.9	8	25
Maximum	0.2	0.49	41.8	41.8	28	97
Average	0.14	0.45	33.98	41.53	22.94	76.91
Standard Deviation	0.05	0.02	11.39	1.84	2.61	11.71
# of Measurements	266	113	281	281	279	281
# of Exceedances	0	0	0	0	12	1

Outfall 006A, Monthly Reporting			
Monitoring Period End Date	Total Flow	pH	
	GPD	SU	
	Daily Max	Daily Min	Daily Max
Existing Permit Limit	Report	6.5	8
Minimum	3	6	6
Maximum	15000	10	10
Average	1509	9	9
Standard Deviation	3738	1.2	1.2
# of Measurements	23	23	23

Outfall 006A, Monthly Reporting			
Monitoring Period End Date	Total Flow	pH	
	GPD	SU	
	Daily Max	Daily Min	Daily Max
# of Exceedances	N/A	1	18

Outfall 0011A, Monthly Reporting								
Monitoring Period End Date	Flow		Oil & Grease		pH		Rain pH	
	GPD		mg/L		SU			
	Monthly Average	Daily Max	Monthly Average	Daily Max	Daily Min	Daily Max	Daily Min	Daily Max
Existing Permit Limit	115,000	230,000	15	20	6.5	8	Report	Report
Minimum	1349	8542	0	0	6.5	6.5	2.8	4.2
Maximum	108959	238801	19	19	7.7	7.7	5.8	7.8
Average	44039	74903	2	2	7	7	4	5
Standard Deviation	30698	32098	3	3	0	0	1	1
# of Measurements	278	278	198	198	278	278	279	279
# of Exceedances	4	0	0	0	0	0	N/A	N/A

Outfall 013A - Monthly Reporting					
	Flow	pH		Rain pH	
	GPD	SU			
Monitoring Period End Date	Daily Max	Daily Max	Monthly Average	Daily Max	Monthly Average
Existing Permit Limit	Report	Report	Report	Report	Report
Minimum	4800	4.9	5.1	4.3	4.4
Maximum	60000	7	7.3	5.9	6.1
Average	23363	5.8	6	5.2	5.4

Outfall 013A - Monthly Reporting					
	Flow	pH		Rain pH	
	GPD	SU			
Monitoring Period End Date	Daily Max	Daily Max	Monthly Average	Daily Max	Monthly Average
Standard Deviation	22210	0.7	0.8	0.5	0.5
# of Measurements	9	9	9	9	9
# of Exceedances	N/A	N/A	N/A	N/A	N/A

Outfall 015A, Monthly Reporting						
Monitoring Period End Date	Flow		Oil & Grease		pH	
	GPD		mg/L		SU	
	Monthly Average	Daily Max	Monthly Average	Daily Max	Daily Min	Daily Max
Existing Permit Limit	61800	85300	15	20	6.5	8
Minimum	304	9120	5.2	5.2	6.5	7.8
Maximum	43540	43540	5.2	5.2	7	8
Average	21922	26330	N/A	N/A	6.75	7.9
Standard Deviation	30572	24339	N/A	N/A	0	0
# of Measurements	2	2	1	1	2	2
# of Exceedances	0	0	0	0	0	0

Outfall 016A, Monthly Reporting

Monitoring Period End Date	Total Copper	Flow		Total Iron	Oil & Grease		pH		TSS	
	mg/L	GPD		mg/L			SU		mg/L	
	Daily Max	Monthly Average	Daily Max	Daily Max	Monthly Average	Daily Max	Daily Min	Daily Max	Monthly Average	Daily Max
Existing Permit Limit	1	216000	360000	1	15	20	6.5	8	30	100
Minimum	0	33270	65614	0.03	0	0	6.5	7.3	0	1.4
Maximum	0.4	100155	194532	1.3	10.6	17	6.8	8	14.5	52.8
Average	0.06	65413	115038	0.5	1.5	3.24	6.5	8	4.75	8.42
Standard Deviation	0.05	14025	19225	0.2	2	3.59	0.1	0.1	2.43	6.09
# of Measurement s	305	282	282	282	428	403	282	282	286	282
# of Exceedances	0	0	0	1	0	0	0	0	0	0

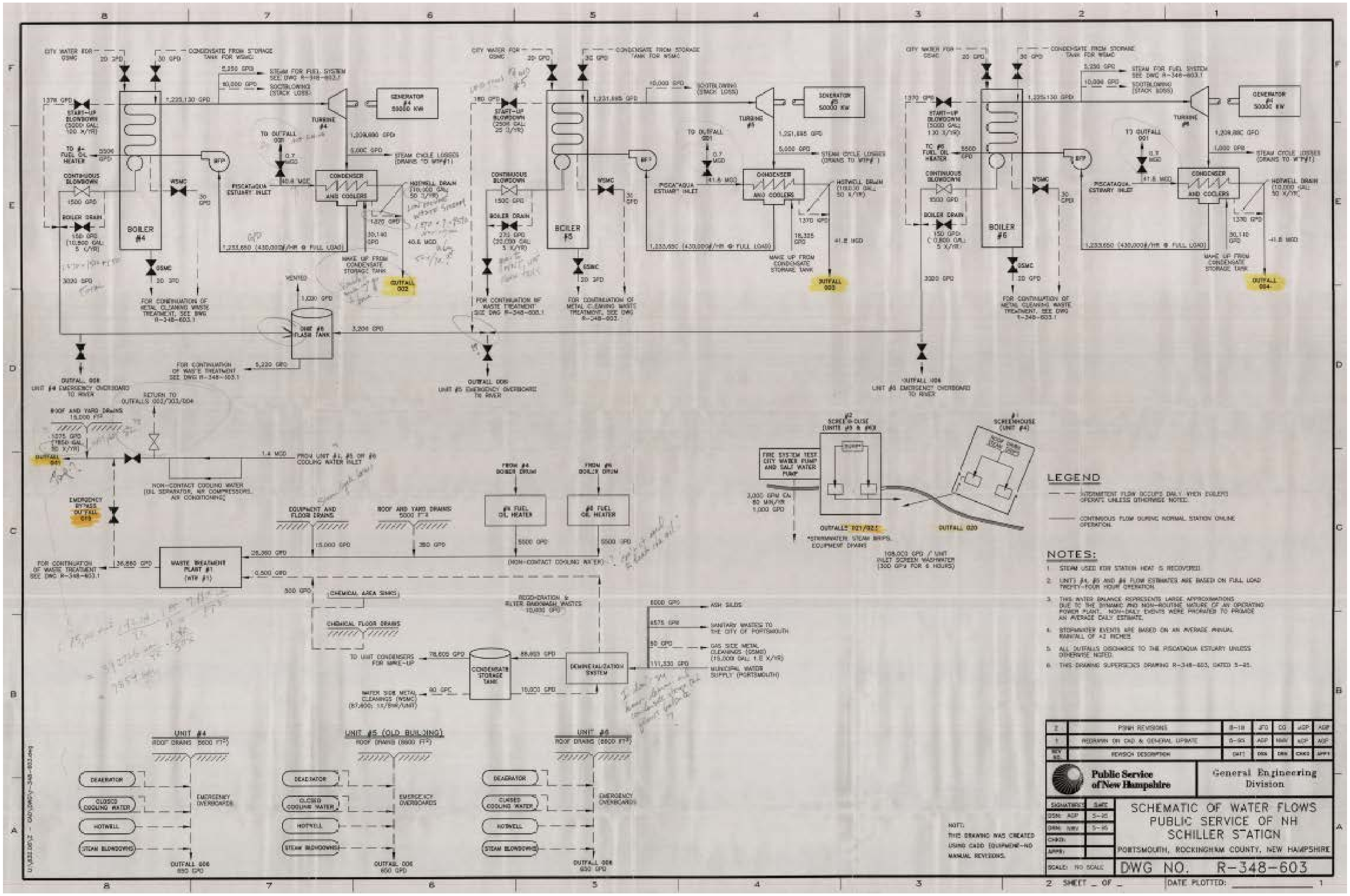
Outfall 017A, Monthly Reporting

Monitoring Period End Date	Total Copper	Flow	Total Iron	Oil & Grease		pH		TSS	
	mg/L	GPD	mg/L			SU		mg/L	
	Daily Max	Daily Max	Daily Max	Monthly Average	Daily Max	Daily Min	Daily Max	Monthly Average	Daily Max
Existing Permit Limit	1	360000	1	15	20	6.5	8	30	100
# of Measurements	1	1	1	1	1	1	1	1	1
# of Exceedances	0	0	0	0	0	0	0	0	0

Outfall 018A, Monthly Reporting								
Monitoring Period End Date	Flow		Oil & Grease		pH		pH of Rain	
	GPD		mg/L		SU		SU	
	Monthly Average	Daily Max	Monthly Average	Daily Max	Daily Min	Daily Max	Daily Min	Daily Max
Existing Permit Limit	300000	600000	15	20	6.5	8	Report	Report
Minimum	400	56	0	0	5.7	5.9	2.8	4.2
Maximum	19430549	432154	12.4	12.4	7.8	7.9	5.8	7.8
Average	82858	77332	1	1	7	7	4	5
Standard Deviation	1164632	53806	2	2	0	0	1	1
# of Measurements	278	278	265	265	265	265	278	278
# of Exceedances	1	0	0	0	6	0	N/A	N/A

Outfall 019A, 020A, 021A, 022A - Monthly Reporting				
Monitoring Period End Date	Flow 019A	Flow 020A	Flow 021A	Flow 022A
	GPD			
	Daily Max			
Existing Permit Limit	108000	108000	108000	108000
Minimum	8400	24	2688	8400
Maximum	16800	106960	100800	26880
Average	12600	14099	26747	13439
Standard Deviation	4277	16794	24439	8304
# of Measurements	28	274	279	55
# of Exceedances	0	0	0	0

ATTACHMENT C – FLOW SCHEMATIC



ATTACHMENT D – EFH ASSESSMENT

Under the 1996 Amendments (PL 104-297) 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 Service (NOAA Fisheries) if EPA's actions, or proposed actions that EPA funds, permits, or undertakes, "may adversely impact any essential fish habitat." 16 U.S.C. § 1855(b). The Amendments broadly define essential fish habitat (EFH) as, "... those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." 16 U.S.C. § 1802(10). Adverse effect 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. Id.

EFH is only designated for species for which federal Fishery Management Plans exist (16 U.S.C. § 1855(b)(1)(A)). EFH designations were approved for New England by the U.S. Department of Commerce on March 3, 1999.

Schiller Station withdraws water from and discharges effluent to the lower Piscataqua River. The Piscataqua River is a high value habitat for a variety of marine and estuarine species, and serves as the only conduit between the Gulf of Maine and Great Bay Estuary. While some fish species permanently reside in the river, most use it to either access spawning or nursery habitats in the Great Bay Estuary and associated rivers, or to migrate from these areas to marine habitats in the Gulf of Maine and beyond. Still others are seasonally present, preying on the concentrated but temporal influx of migrating forage species. The table below lists the 17 EFH fish species located in the vicinity of Schiller Station (NMFS Habitat Division).

EFH Species Located in the Vicinity of Schiller Station

Species	Eggs	Larvae	Juveniles	Adults	Spawning Adults
Atlantic salmon *(Salmo salar)*			F,M		
Atlantic cod *(Gadus morhua)*	S	S			
haddock *(Melanogrammus aeglefinus)*	S	S			
pollock *(Pollachius virens)*	S	S	S		
red hake *(Urophycis chuss)*			S	S	
white hake *(Urophycis tenuis)*	S		S	S	
redfish *(Sebastes fasciatus)*	n/a				
winter flounder *(Pleuronectes americanus)*	M,S	M,S	M,S	M,S	M,S
yellowtail flounder *(Pleuronectes ferruginea)*	S	S			

Species	Eggs	Larvae	Juveniles	Adults	Spawning Adults
windowpane flounder *(Scopthalmus aquosus)*	S	S	S	S	S
Atlantic halibut *(Hippoglossus hippoglossus)*	S	S	S	S	S
Atlantic sea herring *(Clupea harengus)*		M,S	M,S		
bluefish *(Pomatomus saltatrix)*			M,S	M,S	
long finned squid *(Loligo pealei)*	n/a	n/a			
short finned squid *(Illex illecebrosus)*	n/a	n/a			
Atlantic mackerel *(Scomber scombrus)*	M,S	M,S	S		
spiny dogfish *(Squalus acanthias)*	n/a	n/a			

S = The EFH designation for this species includes the seawater salinity zone of this bay or estuary (salinity > or = 25.0%).

M = The EFH designation for this species includes the mixing water/ brackish salinity zone of this bay or estuary (0.5% < salinity < 25.0%).

F = The EFH designation for this species includes the tidal freshwater salinity zone of this bay or estuary (0.0% < or = salinity < or = 0.5%).

n/a = These species do not have this lifestage in its life history (dogfish/ redfish), or has no EFH designation for this lifestage (squids). With regard to the squids, juvenile corresponds with pre-recruits, and adult corresponds with recruits in these species' life histories.

These EFH designations of estuaries and embayments are based on the NOAA Estuarine Living Marine Resources (ELMR) program (Jury et al. 1994; Stone et al. 1994).

Facility Description

Schiller Station, located on the southwestern bank of the Piscataqua River in Portsmouth, New Hampshire, is a four-unit, 163 megawatt (MW) steam electric generating facility. The three main generators are designated as 4, 5, and 6; all rated at 48 MW each. Units 4 and 6 are equipped with dual fuel boilers capable of firing both pulverized bituminous coal and #6 fuel oil. Unit 5 was converted to a dual fuel fluidized bed boiler that is capable of burning both wood and coal, with wood being its primary fuel. The remaining unit, designated CT-1, is a 19 MW combustion turbine fired with #1 fuel oil that is typically operated during periods of highest seasonal peak demand. Schiller Station is a base load plant and generates upwards of 1 million MW-hrs annually, with a third of the power being provided by a renewable energy resource. Schiller Station produces enough energy to supply 65,000 New Hampshire homes. However, operations over the past few years have been significantly reduced in the 2 coal-burning units (Units 4 and 6).

Schiller Station's current National Pollutant Discharge Elimination System (NPDES) Permit allows the withdrawal of cooling water from and the discharge of pollutants to the Piscataqua

River. See Attachment A of the fact sheet, showing a map of the facility including outfall locations. The Station is permitted to discharge non-contact cooling water, operational plant wastewater, process water, and runoff. The majority of stormwater runoff on the site is commingled with other non-stormwater waters, so much of the runoff is regulated under the individual permit. For any stormwater that is directly discharged, a Stormwater Prevention Pollution Plan has been drafted and a NOI will be filed to cover these outfalls under a Multi-Sector General Storm Water Permit.

Schiller Station operates two intake structures that withdraw water directly from the Piscataqua River. Each intake structure has two openings which provide cooling water to the two circulation pumps. Unit 4 has a submerged offshore intake pipe that is 6.5 feet in diameter. The opening is located 32 feet out into the river and is equipped with a course mesh (12 inch by 12 inch grating) stationary bar rack to prevent large debris from entering the intake. In addition, there is another fixed screen at the bottom of the tunnel entrance to divert lobsters from crawling into the intake. PSNH reports that the through-screen velocity is 1.38 fps at mean low water (MLW). However, the intake velocity at the tunnel entrance is 1.97 fps. Enercon, 2013, p.6.

The four screen openings used for Units 5 and 6 are approximately 5.5-feet wide each. The openings are protected by bar racks with 4 3/8-inch by 4 inch gratings. Enercon, 2008, p. 5. Furthermore, the through-screen velocities of these two units is 0.68 feet per second (ft/sec or fps). *Id*., p. 12.

Schiller Station still utilizes the same traveling screen design and technology that was originally installed with each unit: Unit 4 in 1952, Unit 5 in 1955, and Unit 6 in 1957. The mesh size of the traveling screens is 3/8-inch square, which is a size commonly used in the industry for CWIS screens. This mesh size should be small enough to prevent the entrainment of adult fish and most juvenile fish through the plant's cooling water system, but not younger and smaller lifestages (*i.e.*, eggs and larvae). In addition, narrow shelves (2–3 inches wide) are attached to the screens which carry debris and fish up as the screen rotates. These shelves are designed primarily for moving debris, not fish. Since there are no buckets or troughs used to carry fish safely to the fish return trough, fish can fall off the screen shelves as the screens emerge from the water. Consequently, fish can suffer injury or exhaustion from being dropped and re-impinged as the screens rotate.

Schiller Station maintains 16 permitted outfalls. A detailed description of each discharge is found in Section 6.3 of the Fact Sheet.

Potential Impacts to EFH Species from Schiller Station Effluent

The Schiller Station Facility, like all facilities that utilize a natural waterbody for cooling purposes, can impact aquatic resources in three major ways:

- *Entrainment* of small organisms into and through the cooling water system;
- *Impingement* of larger organisms on the intake screens; and
- *Discharge of effluent* creating adverse conditions in receiving waters.

The following discusses these three potential impacts.

Entrainment

The potential to impact aquatic organisms by entrainment largely depends on the presence and abundance of organisms that are vulnerable to entrainment, and the flow required for cooling. The EFH resources (including forage species) most vulnerable to entrainment in the vicinity of Schiller Station are species that have positively buoyant eggs, and/or pelagic larvae. Other important considerations include the location and design of the intake structure. According to Section 316(b) of the Clean Water Act, any point source that uses a cooling water intake structure must ensure that its location, design, construction, and capacity reflects the best technology available (BTA) for minimizing adverse environmental impact.

Entrainment monitoring was conducted at Schiller Station for 41 weeks over a 13-month period with the following frequency. Samples were collected 1 day a week from January 2007 to March 2007 and June 2007 to September 2007. From September 2006 to December 2006 and from April to May 2007, samples were collected every other week.

Sorting, species and life stage identification and enumeration were all completed to generate entrainment rates (# of eggs or larvae per volume of water). Entrainment losses were calculated by multiplying the entrainment rate by the weekly plant cooling water flow.

At Schiller Station, entrainment losses of ichthyoplankton peaked in July, with a much smaller peak in the winter (January-March). Cunner eggs accounted for a large percentage of the losses in the July period (Normandeau, 2008). The peak in entrainment losses in the winter was comprised of winter spawners, such as American sand lance and rock gunnel (Normandeau, 2008). Macrocrustacean entrainment losses also peaked in July and were essentially almost non-existent during spring, fall and winter.

The table below presents entrainment losses by species (adjusted raw numbers at design flow);

Estimated Annual Entrainment Losses for Fish from Schiller Station

Common Name	Eggs & Larvae
Alligator fish	134,305
American eel	8,420
American plaice	1,061,867
American sand lance	13,677,174
Atlantic cod*	329,888
Atlantic cod*/haddock*	161,177
Atlantic cod*/haddock*/witch flounder	344,498
Atlantic herring*	1,921,628
Atlantic mackerel*	5,846,389
Atlantic menhaden	633,228
Atlantic seasnail	389,677
Atlantic tomcod	53,043
Cunner	32,539,552
Cunner/yellowtail flounder	72,955,812

Common Name	Eggs & Larvae
Fourbeard rockling	1,723,189
Fourbeard rockling/hake	6,394,256
Goosefish	135,665
Grubby	3,393,233
Gulf snailfish	21,770
Haddock*	7,072
Hake family*	1,397,166
Longhorn sculpin	424,745
Northern pipefish	716,836
Pollock*	661,273
Radiated shanny	201,269
Rainbow smelt	1,752,755
Rock gunnel	7,634,337
Sculpin family	59,139
Sea raven	13,329
Sea robin family	71,494
Shorthorn sculpin	93,113
Silver hake	275,997
Striped killifish	8,420
Summer flounder	11,904
Tautog	56,294
Unidentified	246,244
Windowpane*	547,224
Winter flounder*	372,846
Witch flounder	17,617
Wrymouth	5,790
Total Entrainment	**156,179,633**

*****Indicates EFH species

According to entrainment monitoring at Schiller Station, the early life stages (ELS) of eight (8) EFH species were entrained at the facility.

Section 8.2.3 of the Fact Sheet contains a complete discussion of entrainment mortality impacts from Schiller Station operation.

Finfish Entrainment Mitigation

As part of the proposed permit Best Technology Available (BTA) requirements, EPA has identified the following technology to further mitigate ELS finfish losses, including EFH species, from current expected entrainment mortality levels at the cooling water intake structure (CWIS).

EPA proposes the installation of wedgewire screen intake structures with a mesh or slot size of 0.80 mm, 0.69 mm, or 0.60 mm to maintain an intake through-screen velocity of 0.5 fps or less. These slot sizes are estimated to reduce finfish ELS entrainment by approximately 37%, 44%

and 49% from current levels, respectively. The actual screen slot size selected will be subject to EPA approval and based upon the results of the Facility's pilot testing and demonstration report submitted to the agencies.

In addition, EPA proposes that the annual maintenance outage at Unit 5, when no water is withdrawn, take place in June. This is estimated to reduce finfish ELS entrainment mortality by another 4% from current levels.

The proposed BTA will also reduce the entrainment levels of macrocrustacean ELS, which are a food source for EFH species. Section 10 of the fact sheet includes a full discussion of a number of potential mitigation measures and their expected reduction of finfish as well as macrocrustacean ELS entrainment mortality.

In summary, EPA proposes permit requirements that are estimated to reduce finfish ELS entrainment, including the eight EFH species, by approximately 41% to 53%, depending on the slot size selected.

Impingement

Organisms that have grown to a size too large to pass through intake screens are still vulnerable to being impinged on these screens. Juvenile lifestages are particularly vulnerable to impingement, but adults of certain species are also at risk. As with entrainment, the intake location, design and cooling water flow requirements are major factors in assessing impingement potential.

Fish species that are especially vulnerable to impingement tend to have one or more of the following characteristics:

- pass intake structure in large, dense schools as juveniles or adults;
- are actively pursued as major forage species;
- are attracted to the intake structure as a source of forage or refuge;
- are slow moving or are otherwise unable to escape intake current; and
- are structurally delicate, and likely to die if impinged.

Fish for impingement sampling were collected in the fish and debris return sluice coming off of the traveling screens for each unit. Impingement sampling was conducted from August 31, 2006, through September 27, 2007. Impingement samples were collected over a continuous 24 hour period, once a week for 57 consecutive weeks. Each individual sample represented a six hour collection period. Impingement sampling was only conducted when the plant was operational. Operational is defined as having at least 1 circulating pump running at the time of sampling.

Schiller Station conducted an impingement collection efficiency study to determine what percentage of impinged fish on the screens they were able to collect within the fish return sluice as well as an impingement survival study.

Fish impingement losses peaked in April, with secondary peaks in the fall and early winter.

White hake, Atlantic herring and cunner were fish exhibiting the highest impingement losses in April (Normandeau, 2008). In the fall, rainbow smelt, grubby and white hake were the species with the highest impingement losses (Normandeau, 2008).

The table below presents entrainment losses by species (adjusted raw numbers at design flow);

Estimated Annual Fish Impingement Losses from Schiller Station

Common Name	Fish Impinged
Alewife	25
American sand lance	9
Atlantic cod*	38
Atlantic herring*	297
Atlantic menhaden	328
Atlantic silverside	122
Atlantic tomcod	50
Blueback herring	68
Bluegill	64
Cunner	668
Emerald shiner	33
Grubby	491
Herring family*	9
Inland silverside	16
Lumpfish	357
Ninespine stickleback	149
Northern pipefish	621
Pollock*	25
Pumpkinseed	9
Rainbow smelt	622
Red hake*	9
Roch gunnel	26
Sea raven	16
Shorthorn sculpin	8
Silver hake	9
Skate family	17
Striped bass	25
Tautog	9
Threespine stickleback	53
Unidentifiable	0
White hake*	736
White perch	198
Windowpane*	75
Winter flounder*	573
Total Impingement	**5,557**

***Indicates EFH species**

According to impingement monitoring at Schiller Station, adult and juvenile life stages of seven (7) EFH species were impinged at the facility.

Section 8.2.3 of the Fact Sheet contains a complete discussion of impingement mortality impacts from Schiller Station operation.

Finfish Impingement Mitigation

As part of the proposed permit Best Technology Available (BTA) requirements, EPA has identified the following technology to further mitigate adult and juvenile finfish losses, including EFH species, from current expected impingement mortality levels at the cooling water intake structure (CWIS).

EPA proposes the installation of wedgewire screen intake structures with a mesh or slot size of 0.80 mm, 0.69 mm, or 0.60 mm to maintain an intake through-screen velocity of 0.5 fps or less. These slot sizes are estimated to reduce adult and juvenile finfish impingement by approximately 87% from current levels.

Discharge of Heated Effluent

The discharge of heated effluent may kill or impair organisms outright, or create intolerable conditions in otherwise high value habitats, and interfere with spawning. Thermal impacts associated with the discharge are related primarily to the dilution capacity of the receiving water, the rate of discharge, and the change in temperature (delta-T or ΔT) of the effluent compared to ambient water temperatures. Another important consideration is the presence of temperature-sensitive organisms and vegetated habitats.

As discussed in detail in Section 6.4 of the Fact Sheet, Schiller Station's existing permit's thermal discharge requirements are based on a CWA § 316(a) variance. The Facility initially requested that its new permit retain the same thermal discharge limits based on a renewal of its CWA § 316(a) variance. Schiller's request maintains, in essence, that the Facility's existing thermal discharge has not caused appreciable harm to the BIP and, indeed, could not have caused such harm given how small it is relative to the large volume and cold temperatures of the waters of the Piscataqua River estuary.

Based on the analysis of thermal plume monitoring and mapping data collected in the summer and fall of 2010, along with other supporting information (see Section 6.4.4. of the Fact Sheet), EPA concludes that Schiller Station's existing thermal discharge has not caused appreciable harm to the BIP. Moreover, EPA concludes that the record provides reasonable assurance that with the same thermal discharge limits in place, the Facility's thermal discharge will not cause such harm to the BIP in the future – in other words, will allow for the protection and propagation of the BIP. Indeed, the Facility's declining capacity factors indicate that, if anything, Schiller Station's thermal discharges will decrease overall in the future, though EPA cannot be sure of whether or when such reductions may occur.

Thus, EPA's new draft permit for Schiller Station proposes to retain the thermal discharge limits from the existing permit.

- A daily maximum discharge temperature limit (Max-T) of 95ºF;

- A daily maximum temperature differential between the intake and discharge temperatures (Delta-T) of 25ºF (this limit is increased to 30ºF for a two-hour period during condenser maintenance); and

- A prohibition of discharges that cause the receiving water to exceed a maximum temperature of 84°F at any point beyond a distance of 200 feet in any direction from the point of discharge.

Consistent with the Facility's request, EPA is proposing to issue these permit limits pursuant to a variance under CWA § 316(a).

Proposed Limits on Other Pollutants

The Draft Permit also proposes limits on the following pollutants:

Effluent Characteristic	Average Monthly	Maximum Daily
Total Residual Chlorine	---	0.2 mg/L
Oil and Grease	15 mg/L	20 mg/L
Total Suspended Solids (TSS)	30 mg/L	100 mg/L
Total Copper	1.0 mg/L	1.0 mg/L
Total Iron	1.0 mg/L	1.0 mg/L
pH	6.5 – 8.0 S.U. (range)	

These limits are calculated to meet water quality standards and protect all aquatic organisms in the receiving water, including EFH species.

EPA's Finding of all Potential Impacts to EFH Species

- This Draft Permit action does not constitute a new source of pollutants. It is the reissuance of an existing NPDES permit;
- The BTA requirements of the CWIS are estimated to reduce entrainment impacts by 41 to 53% and reduce impingement impacts by 87%;
- Thermal discharge from the facility is limited to 95°F and satisfies a CWA § 316(a) variance with a limited mixing zone;
- Effluent is discharged into the Piscataqua River, with rapid mixing characteristics from the high energy tidal exchange;
- Chlorine, oil and grease, TSS, total copper, total iron and pH are regulated by the Draft Permit to meet water quality standards;
- The Draft Permit prohibits the discharge of pollutants or combination of pollutants in toxic amounts;
- The effluent limitations and conditions in the Draft Permit were developed to be protective of all aquatic life; and
- The Draft Permit prohibits violations of the state water quality standards.

EPA believes that the conditions and limitations contained within the Schiller Station Draft Permit adequately protects all aquatic life, including those with designated EFH in the receiving water, and that further mitigation is not warranted. Should adverse impacts to EFH be detected as a result of this permit action, or if new information is received that changes the basis for EPA's conclusions, NMFS will be contacted and an EFH consultation will be re-initiated.
As part of the renewal of the NPDES permit for this facility, EPA has made the Draft Permit and the Fact Sheet available to NMFS. In addition, a letter will be sent under separate cover to NMFS Habitat Division to satisfy EPA's notification responsibility regarding EFH.

ATTACHMENT E – ESA ASSESSMENT

Section 7(a) of the Endangered Species Act of 1973, as amended (ESA) grants authority to and imposes requirements upon Federal agencies regarding endangered or threatened species of fish, wildlife, or plants ("listed species") and habitat of such species that has been designated as critical (a "critical habitat"). The ESA requires every Federal agency, in consultation with and with the assistance of the Secretary of Interior, to insure that any action it authorizes, funds, or carries 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) administers Section 7 consultations for freshwater species. The National Marine Fisheries Service (NMFS) administers Section 7 consultations for marine species and anadromous fish.

EPA has reviewed the federal endangered or threatened species of fish, wildlife, or plants to determine if any listed species might potentially be impacted by the re-issuance of the Schiller Station NPDES permit. The two listed species that have the potential to be present in the vicinity of Schiller Station (the Facility) are the shortnose sturgeon (*Acipenser brevirostrum*) and the Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*).

Shortnose sturgeon

The shortnose sturgeon was placed on the original endangered species list in 1967 [32 Fed. Reg. 4001 (1967)] by the USFWS. Currently, NMFS has authority over this species under Section 4(a) (2) of the ESA, 16 U.S.C. Section 1533 (a) (2). At present, there are 19 recognized distinct population segments (Shortnose Sturgeon Recovery Plan, NMFS, 1998), which all remain listed as endangered.

The Shortnose Sturgeon Recovery Plan states that “There are no known shortnose sturgeon populations in the rivers between the Androscoggin and Merrimack rivers.” However, information contained in the NMFS Protected Resources website at http://www.nmfs.noaa.gov/pr/species/fish/shortnosesturgeon.htm lists the shortnose sturgeon as occurring in the Piscataqua River. In addition, the Atlantic States Marine Fisheries Commission, *Atlantic Sturgeon Stock Assessment*, *Peer Review Report*, March 1998, reported that “… two captures of shortnose sturgeon have been documented [in the Piscataqua River] (New Hampshire Fish & Game, 1989).”

In order to obtain the most up-to-date assessment regarding the occurrence of shortnose sturgeon in the Piscataqua River, EPA contacted NMFS directly. As part of a communication with NMFS for the Dover Wastewater Treatment Facility (WWTF), NMFS reported that shortnose sturgeon are not known to utilize the portion of the Piscataqua River in the vicinity of the Dover WWTF (e-mail from C. Vaccaro, NMFS to D. Arsenault, EPA, September 12, 2011). Since Schiller Station is approximately five and a half miles downstream of the Dover WWTF, shortnose sturgeon are not expected to be present in the vicinity of this facility either.

Based on this evaluation and the expected distribution of the species, EPA has determined that there are no shortnose sturgeons in the action area and that the reissuance of the permit will have no effect on the species. Therefore, consultation under Section 7 of the ESA with NMFS for shortnose sturgeon is not required.

Atlantic Sturgeon

On February 6, 2012, NOAA's Fisheries Service published in the federal register a final decision to list five distinct population segments of Atlantic sturgeon under the Endangered Species Act. The Chesapeake Bay, New York Bight, Carolina, and South Atlantic populations of Atlantic sturgeon were listed as endangered, while the Gulf of Maine population was listed as threatened. The decision became effective on April 6, 2012. Atlantic sturgeon found in the Piscataqua River are part of the Gulf of Maine population and therefore listed as threatened. The Atlantic States Marine Fisheries Commission, *Atlantic Sturgeon Stock Assessment*, *Peer Review Report*, March 1998, reported that, "An occasional Atlantic sturgeon (Hoff 1980) has been captured in the Piscataqua River…" However, since 1990, NH F&G has not observed or received any reports of Atlantic sturgeon of any age-class being captured in the Great Bay Estuary and its tributaries (B. Smith, NH F&G, Pers. Comm. to the Atlantic Sturgeon Status Review Team, 2006). The Atlantic Sturgeon Status Review Team and NH F&G biologists concluded that the Great Bay Atlantic sturgeon population is likely extirpated. *See* Atlantic Sturgeon Status Review Team. 2007. Status Review of Atlantic sturgeon (Acipenser oxyrinchus oxyrinchus). Report to National Marine Fisheries Service, Northeast Regional Office. February 23, 2007. 174 pp.

As part of a more recent communication with NMFS for the Dover WWTF, NMFS reported that Atlantic sturgeon do in fact use the portion of the Piscataqua River in the vicinity of the Dover WWTF (E-mail from C. Vaccaro, NMFS to D. Arsenault, EPA, September 12, 2011). Since Schiller Station is approximately five and a half miles downstream of the Dover WWTF, Atlantic sturgeon are expected to be present in the vicinity of this facility as well.

Based on this information and the expected distribution of the species, EPA has determined that Atlantic sturgeon may be present in the action area and this species may be affected by the discharges authorized by the proposed permit. EPA must consult with NMFS under Section 7 of the ESA. EPA has evaluated the potential impacts of the permit action on Atlantic sturgeon. On the basis of this evaluation, which is discussed below, EPA's determination is that this action "is not likely to adversely affect listed species or critical habitat." [56] 16 C.F.R. § 402.13(a). As a result, based on the justification contained in this attachment and a letter sent to NMFS under separate cover, request NMFS's written concurrence with EPA's determination in order to complete the consultation with NMFS on an "informal" basis. *See* 16 C.F.R. § 402.13(a). If NMFS does not concur, then a "formal consultation" will be necessary.

Receiving Water Description

Schiller Station withdraws water from and discharges effluent to the lower Piscataqua River.

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[56] A project can be considered "unlikely to adversely affect" a listed species "when direct or indirect effects of the proposed project on listed species are expected to be discountable, insignificant or completely beneficial." August 20, 2009, Letter from Patricia A. Kurkul, Regional Administrator, NOAA, National Marine Fisheries Service, Northeast Region, to Melville P. Cote, EPA Region 1 ("NOAA's August 20, 2009, Rockport Consultation Letter") (addressing ESA issues concerning EPA's proposed NPDES permit for the Rockport, MA, POTW).

The Piscataqua River is high value habitat for a variety of marine and estuarine species, and serves as the only conduit between the Gulf of Maine and Great Bay Estuary. While some fish species permanently reside in the river, most use it to either access spawning or nursery habitats in the Great Bay Estuary and associated rivers, or to migrate from these areas to marine habitats in the Gulf of Maine and beyond. Still others are seasonally present, preying on the concentrated but temporal influx of migrating forage species.

The Piscataqua is a tidal river approximately 13 miles long, which empties into Portsmouth Harbor/ Atlantic Ocean. The tide in this river is semi-diurnal with an average period of 12.4 hours. The lower portion of the Piscataqua River has been characterized as a well-mixed estuary. Tidal flushing requires six to 12 tidal cycles (3 to 6 days) and tidal mixing forces cause the water column to be vertically well mixed.

The Piscataqua River is classified as a Class B water body pursuant to the State of New Hampshire Surface Water Quality Regulations (N.H. Code of Administrative Rules, PART Env-Wq 1703.01) and N.H. RSA 485-A:8. Class B waters are "considered as being acceptable for fishing, swimming and other recreational purposes and, after adequate treatment, for use as water supplies." (RSA 485-A:8, II)

Section 303(d) of the Federal Clean Water Act (CWA) requires states to identify those water-bodies that are not expected to meet surface water quality standards after the implementation of technology-based controls and, as such require the development of total maximum daily loads (TMDL). The section of the Piscataqua River that Schiller Station discharges into is on the 2010, CWA 303(d) list for polychlorinated biphenyls (PCB's), mercury and dioxin.

Facility Description

Schiller Station, located on the southwestern bank of the Piscataqua River in Portsmouth, New Hampshire, is a four-unit, 163 megawatt (MW) steam electric generating facility. The three main generators are designated as 4, 5, and 6; all rated at 48 MW each. Units 4 and 6 are equipped with dual fuel boilers capable of firing both pulverized bituminous coal and #6 fuel oil. Unit 5 was converted to a dual fuel fluidized bed boiler that is capable of burning both wood and coal, with wood being its primary fuel. The remaining unit, designated CT-1, is a 19 MW combustion turbine fired with #1 fuel oil that is typically operated during periods of highest seasonal peak demand. Schiller Station is a base load plant and generates upwards of 1 million MW-hrs annually, with a third of the power being provided by a renewable energy resource. Schiller Station produces enough energy to supply 65,000 New Hampshire homes. However, operations over the past few years have been significantly reduced in the 2 coal-burning units (Units 4 and 6).

Schiller Station's current National Pollutant Discharge Elimination System (NPDES) Permit allows the withdrawal of cooling water from and the discharge of pollutants to the Piscataqua River. See Attachment A of the fact sheet, showing a map of the facility including outfall locations. The Station is permitted to discharge non-contact cooling water, operational plant wastewater, process water, and runoff. The majority of stormwater runoff on the site is commingled with other non-stormwater waters, so much of the runoff is regulated under the individual permit. For any stormwater that is directly discharged, a Stormwater Prevention Pollution Plan has been drafted and a NOI will be filed to cover these outfalls under a Multi-Sector General Storm Water Permit.

Schiller Station operates two intake structures that withdraw water directly from the Piscataqua River. Each intake structure has two openings which provide cooling water to the two circulation pumps. Unit 4 has a submerged offshore intake pipe that is 6.5 feet in diameter. The opening is located 32 feet out into the river and is equipped with a course mesh (12 inch by 12 inch grating) stationary bar rack to prevent large debris from entering the intake. In addition, there is another fixed screen at the bottom of the tunnel entrance to divert lobsters from crawling into the intake. PSNH reports that the through-screen velocity is 1.38 fps at mean low water (MLW). However, the intake velocity at the tunnel entrance is 1.97 fps. Enercon, 2013, p.6.

The four screen openings used for Units 5 and 6 are approximately 5.5-feet wide each. The openings are protected by bar racks with 4 3/8-inch by 4 inch gratings. Enercon, 2008, p. 5. Furthermore, the through-screen velocities of these two units is 0.68 feet per second (ft/sec or fps). *Id*., p. 12.

Schiller Station still utilizes the same traveling screen design and technology that was originally installed with each unit: Unit 4 in 1952, Unit 5 in 1955, and Unit 6 in 1957. The mesh size of the traveling screens is 3/8-inch square, which is a size commonly used in the industry for CWIS screens. This mesh size should be small enough to prevent the entrainment of adult fish and most juvenile fish through the plant's cooling water system, but not younger and smaller lifestages (*i.e.*, eggs and larvae). In addition, narrow shelves (2–3 inches wide) are attached to the screens which carry debris and fish up as the screen rotates. These shelves are designed primarily for moving debris, not fish. Since there are no buckets or troughs used to carry fish safely to the fish return trough, fish can fall off the screen shelves as the screens emerge from the water. Consequently, fish can suffer injury or exhaustion from being dropped and re-impinged as the screens rotate.

Schiller Station maintains 16 permitted outfalls. A detailed description of each discharge is found in Section 6.3 of the Fact Sheet.

Action Area of Schiller Station Effluent

As described in detail in Section 6.4.4. of the Schiller Station Fact Sheet, EPA performed an analysis to determine the volume and configuration of the thermal plume that is discharged from outfalls 001, 002, 003 and 004. EPA used temperature data collected in the summer and fall of 2010 from eleven fixed monitoring stations placed approximately 200 feet from the four thermal discharge outfalls. Each station collected continuous river temperature data at near-surface, mid-depth and near- bottom positions in the water column. Two monitoring stations were placed well outside the influence of the station discharge (one upstream and one downstream) to collect ambient river temperature data (see Figure 6.1 of the Fact Sheet).

In addition, on August 31, 2010, an EPA field crew recorded river temperatures by conducting multiple transects through the Station's discharge plume while towing a boat mounted temperature sonde. A pressure transducer on the temperature sonde recorded its exact depth as it recorded the temperature measurements. Temperature, depth and GPS positioning data were recorded and stored every 10 seconds during a transect run. Multiple bank-to-bank transects, perpendicular to the flow of the river, as well as down river and up river, were conducted within and outside of the Station's thermal plume. This one-day monitoring effort was designed to be a "snap shot" of thermal plume conditions over a brief time period. Late August was selected for the monitoring effort to capture seasonally high ambient river temperatures along with expected high electric generation by the facility, which would result in near maximum permitted discharge flows and temperatures. This constituted approximate "worst-case" conditions for the receiving water (see Figure 6.2 of the Fact Sheet).

Based on these data sets, EPA confirmed that the receiving water did not exceed a maximum temperature of 84°F at any point beyond a distance of 200 feet in any direction from the thermal discharge outfalls. The selection of 84°F as defining the edge of the mixing zone of the thermal discharge was established in this site-specific case in consultation with the New Hampshire Department of Environmental Services (NHDES) and the New Hampshire Fish and Game Department (NHF&G) to meet state water quality standards. In fact, during the entire three month study (see Table 6-B of the Fact Sheet), temperature data from the fixed monitoring stations did not record a temperature within 5°F of the mixing zone limit. The highest instantaneous maximum temperature recorded during the study was 78.8°F, at one surface station (Station A7). This station was approximately 200 feet directly offshore from outfalls 003 and 004 (see Figure 6.1 of the Fact Sheet). This monitoring station consistently recorded the highest relative temperatures throughout the study. In general, the temperatures recorded at Station A7 were approximately 3.6°F to 5.4°F above ambient river temperatures in most cases, with highs briefly reaching a difference of approximately 7.2°F, likely during slack tide events. The near ambient temperatures recorded throughout the study at the mid-depth and near bottom fixed monitors confirmed that the thermal plume from Schiller Station is a surface feature in the receiving water.

In addition, during the one-day thermal mapping field event, the highest temperature recorded was a surface reading of 82.4°F, noted as a small "hot spot" well within the 200 foot mixing zone. The thermal mapping results (see Figure 6.2), along with the fixed temperature monitoring station data, confirm that the high energy tidal exchange and volume of the Piscataqua River in the vicinity of Schiller Station results in an action area that is confined to the near-surface of the river and encompasses an area approximately 200 feet in all directions from the discharge. While this limited action area is based on an analysis of the thermal component of the Schiller Station's effluent, other pollutants in the draft permit are regulated to meet water quality standards at the point of discharge (unlike the CWA § 316(a) thermal variance). Also, other regulated pollutants at Schiller Station, including total suspended solids and heavy metals, are discharged at much lower flows than the thermal effluent (360,000 gallons per day as opposed to 40 million gallons per day), further reducing the action area of these pollutants before mixing with the Piscataqua River makes their presence in the receiving water insignificant or discountable to protected species.

Potential Impacts to Atlantic Sturgeon from Facility Operation

Schiller Station, like all facilities that utilize a natural waterbody for cooling purposes, can impact aquatic resources in three major ways: (1) by the impingement of larger organisms on the intake screens and the entrainment of small organisms into and through the cooling water system; (2) by creating adverse conditions in the receiving waters from the discharge of heated effluent; and (3) by creating adverse conditions in the receiving waters from the discharge of pollutants. The following information details these three potential impacts.

Impingement

Organisms that have grown to a size too large to pass through intake screens are still vulnerable to being impinged on these screens. Juvenile lifestages are particularly vulnerable to impingement, but adults of certain species are also at risk. As with entrainment, the intake location, design and cooling water flow requirements are major factors in assessing impingement potential.

Fish species that are especially vulnerable to impingement tend to have one or more of the following characteristics:

- pass intake structure in large, dense schools as juveniles or adults;
- are actively pursued as major forage species;
- are attracted to the intake structure as a source of forage or refuge;
- are slow moving or are otherwise unable to escape intake current; and
- are structurally delicate, and likely to die if impinged.

Fish from impingement sampling were collected in the fish and debris return sluice coming off of the traveling screens for each unit. Impingement sampling was conducted from August 31, 2006, through September 27, 2007. Impingement samples were collected over a continuous 24 hour period, once a week for 57 consecutive weeks. Each individual sample represented a six hour collection period. Impingement sampling was only conducted when the plant was operational. Operational is defined as having at least 1 circulating pump running at the time of sampling.

Schiller Station conducted an impingement collection efficiency study to determine what percentage of impinged fish on the screens they were able to collect within the fish return sluice as well as an impingement survival study.

Fish impingement losses peaked in April, with secondary peaks in the fall and early winter. White hake, Atlantic herring and cunner were fish exhibiting the highest impingement losses in April (Normandeau, 2008). In the fall, rainbow smelt, grubby and white hake were the species with the highest impingement losses (Normandeau, 2008).

The table below presents entrainment losses by species (adjusted raw numbers at design flow);

Estimated Annual Fish Impingement Losses from Schiller Station

Common Name	Fish Impinged
Alewife	25
American sand lance	9
Atlantic cod	38

Common Name	Fish Impinged
Atlantic herring	297
Atlantic menhaden	328
Atlantic silverside	122
Atlantic tomcod	50
Blueback herring	68
Bluegill	64
Cunner	668
Emerald shiner	33
Grubby	491
Herring family	9
Inland silverside	16
Lumpfish	357
Ninespine stickleback	149
Northern pipefish	621
Pollock	25
Pumpkinseed	9
Rainbow smelt	622
Red hake	9
Roch gunnel	26
Sea raven	16
Shorthorn sculpin	8
Silver hake	9
Skate family	17
Striped bass	25
Tautog	9
Threespine stickleback	53
Unidentifiable	0
White hake	736
White perch	198
Windowpane	75
Winter flounder	573
Total Impingement	**5,557**

No Atlantic sturgeon were collected as part of the impingement study at Schiller Station. Section 8.2.3 of the Fact Sheet contains a complete discussion of impingement mortality impacts from Schiller Station operation.

Finfish Impingement Mitigation

As part of the proposed permit Best Technology Available (BTA) requirements, EPA has identified the following technology to further mitigate adult and juvenile finfish losses, including the potential for Atlantic sturgeon impacts, from current expected impingement mortality levels at the cooling water intake structure (CWIS).

EPA proposes the installation of wedgewire screen intake structures with a mesh or slot size of

0.80 mm, 0.69 mm, or 0.60 mm to maintain an intake through-screen velocity of 0.5 feet per second (fps) or less. These slot sizes are estimated to reduce adult and juvenile finfish impingement by approximately 87% from current levels. The torpedo shaped intake structures will be installed parallel with the tidal currents of the river, approximately three feet off the bottom. EPA assumes that the expected swim speed of adult and juvenile Atlantic sturgeon can overcome a through-screen velocity of 0.5 fps (the average critical swim speed velocity of white sturgeon is estimated to be approximately 1.9 fps; see EPRI, 2000, Table A). Based on this information, EPA has made the preliminary determination that impingement of Atlantic sturgeon by the wedgewire screen CWIS will be unlikely.

Entrainment

The potential to impact aquatic organisms by entrainment largely depends on the presence and abundance of organisms that are vulnerable to entrainment, and the flow required for cooling. Organisms (including forage species) most vulnerable to entrainment in the vicinity of this proposed facility are species that have positively buoyant eggs, and/or pelagic larvae. Other important considerations include the location and design of the intake structure. According to section 316(b) of the Clean Water Act, any point source that uses a cooling water intake structure (CWIS) must ensure that its location, design, construction, and capacity reflects the best technology available (BTA) for minimizing adverse environmental impact.

Entrainment monitoring was conducted at Schiller Station for 41 weeks over a 13-month period with the following frequency. Samples were collected 1 day a week from January 2007 to March 2007 and June 2007 to September 2007. From September 2006 to December 2006 and from April to May 2007, samples were collected every other week.

Sorting, species and life stage identification and enumeration were all completed to generate entrainment rates (# of eggs or larvae per volume of water). Entrainment losses were calculated by multiplying the entrainment rate by the weekly plant cooling water flow.

At Schiller Station, entrainment losses of ichthyoplankton peaked in July, with a much smaller peak in the winter (January-March). Cunner eggs accounted for a large percentage of the losses in the July period (Normandeau, 2008). The peak in entrainment losses in the winter was comprised of winter spawners, such as American sand lance and rock gunnel (Normandeau, 2008). Macrocrustacean entrainment losses also peaked in July and were essentially almost non-existent during spring, fall and winter.

The table below presents entrainment losses by species (adjusted raw numbers at design flow);

Estimated Annual Entrainment Losses for Fish from Schiller Station

Common Name	Eggs & Larvae
Alligator fish	134,305
American eel	8,420
American plaice	1,061,867
American sand lance	13,677,174

Common Name	Eggs & Larvae
Atlantic cod	329,888
Atlantic cod/haddock	161,177
Atlantic cod/haddock/witch flounder	344,498
Atlantic herring	1,921,628
Atlantic mackerel	5,846,389
Atlantic menhaden	633,228
Atlantic seasnail	389,677
Atlantic tomcod	53,043
Cunner	32,539,552
Cunner/yellowtail flounder	72,955,812
Fourbeard rockling	1,723,189
Fourbeard rockling/hake	6,394,256
Goosefish	135,665
Grubby	3,393,233
Gulf snailfish	21,770
Haddock	7,072
Hake family	1,397,166
Longhorn sculpin	424,745
Northern pipefish	716,836
Pollock	661,273
Radiated shanny	201,269
Rainbow smelt	1,752,755
Rock gunnel	7,634,337
Sculpin family	59,139
Sea raven	13,329
Sea robin family	71,494
Shorthorn sculpin	93,113
Silver hake	275,997
Striped killifish	8,420
Summer flounder	11,904
Tautog	56,294
Unidentified	246,244
Windowpane	547,224
Winter flounder	372,846
Witch flounder	17,617
Wrymouth	5,790
Total Entrainment	**156,179,633**

According to entrainment monitoring at Schiller Station, no early life stages (ELS) of Atlantic sturgeon were identified in entrainment samples at the facility.

Section 8.2.3 of the Fact Sheet contains a complete discussion of entrainment mortality impacts from Schiller Station operation.

The area of the Piscataqua River influenced by Schiller Station is not considered to be a likely spawning area for Atlantic sturgeon due to its salinity range of up to 30 parts per thousand at high tide. If any limited spawning does occur in the vicinity, sturgeon egg and larval stages are not considered vulnerable to entrainment. That is because sturgeon eggs are highly adhesive and are deposited on the bottom, usually on hard surfaces (i.e. cobble) (Smith and Clugston 1997). The yolksac larval stage and older life stages of young also assume a demersal existence. The habitat utilized by these early life stages keeps them away from the influence of the facility's current intake, which is closer to the surface.

Finfish Entrainment Mitigation

As part of the proposed permit Best Technology Available (BTA) requirements, EPA has identified the following technology to further mitigate ELS finfish losses, including EFH species, from current expected entrainment mortality levels at the cooling water intake structure (CWIS).

EPA proposes the installation of wedgewire screen intake structures with a mesh or slot size of 0.80 mm, 0.69 mm, or 0.60 mm to maintain an intake through-screen velocity of 0.5 fps or less. These slot sizes are estimated to reduce finfish ELS entrainment by approximately 37%, 44% and 49% from current levels, respectively. The actual screen slot size selected will be subject to EPA approval and based upon the results of the Facility's pilot testing and demonstration report submitted to the agencies.

In addition, EPA proposes that the annual maintenance outage at Unit 5, when no water is withdrawn, take place in June. This is estimated to reduce finfish ELS entrainment mortality by another 4% from current levels.

The proposed BTA will also reduce the entrainment levels of macrocrustacean ELS, which are a food source for Atlantic sturgeon. Section 10 of the fact sheet includes a full discussion of a number of potential mitigation measures and their expected reduction of finfish as well as macrocrustacean ELS entrainment mortality.

In summary, EPA proposes permit requirements that are estimated to reduce finfish ELS entrainment by approximately 41% to 53%, depending on the wedgewire slot size selected.

Based on the expected location in the Piscataqua River of Atlantic sturgeon early life stages vulnerable to entrainment, the habitat where they reside, and the expected performance of the proposed BTA for entrainment reduction, EPA has made the preliminary determination that there is minimal potential for Atlantic sturgeon ELS entrainment, if at all. The operation of the CWIS is expected to have an insignificant or discountable effect on Atlantic sturgeon.

Discharge of Heated Effluent

The discharge of heated effluent may kill or impair organisms outright, or create intolerable conditions in otherwise high value habitats, and interfere with spawning. Thermal impacts associated with the discharge are related primarily to the dilution capacity of the receiving water, the rate of discharge, and the change in temperature (detla-T or ΔT) of the effluent compared to ambient water temperatures. Another important consideration is the presence of temperature-sensitive organisms and vegetated habitats.

As discussed in detail in Section 6.4 of the Fact Sheet, Schiller Station's existing permit's thermal discharge requirements are based on a CWA § 316(a) variance. The Facility initially requested that its new permit retain the same thermal discharge limits based on a renewal of its CWA § 316(a) variance. Schiller's request maintains, in essence, that the Facility's existing thermal discharge has not caused appreciable harm to the BIP and, indeed, could not have caused such harm given how small it is relative to the large volume and cold temperatures of the waters of the Piscataqua River estuary.

Based on the analysis of thermal plume monitoring and mapping data collected in the summer and fall of 2010, along with other supporting information (see Section 6.4.4. of the Fact Sheet), EPA concludes that Schiller Station's existing thermal discharge has not caused appreciable harm to the BIP. Moreover, EPA concludes that the record provides reasonable assurance that with the same thermal discharge limits in place, the Facility's thermal discharge will not cause such harm to the BIP in the future – in other words, will allow for the protection and propagation of the BIP. Indeed, the Facility's declining capacity factors indicate that, if anything, Schiller Station's thermal discharges will decrease overall in the future, though EPA cannot be sure of whether or when such reductions may occur.

Thus, EPA's new draft permit for Schiller Station proposes to retain the thermal discharge limits from the existing permit.

- A daily maximum discharge temperature limit (Max-T) of 95ºF;
- A daily maximum temperature differential between the intake and discharge temperatures (Delta-T) of 25ºF (this limit is increased to 30ºF for a two-hour period during condenser maintenance); and
- A prohibition of discharges that cause the receiving water to exceed a maximum temperature of 84°F at any point beyond a distance of 200 feet in any direction from the point of discharge.

Consistent with the Facility's request, EPA is proposing to issue these permit limits pursuant to a variance under CWA § 316(a).

Since the thermal plume has been documented as a near-surface feature which is relatively small in surface area (approximately 200 feet in any direction from the thermal outfalls; see Action Area of Schiller Station Effluent, above) and the maximum temperatures observed have not exceeded 82.4°F, the potential for acute or chronic impacts to finfish in the vicinity of the facility is discountable. In addition, since adult and juvenile Atlantic sturgeon are expected to be more closely associated with the benthic habitat, their encounter with the Schiller Station thermal plume is not likely.

It is unlikely that early lifestages of Atlantic sturgeon are present in that reach of the river. However, any larvae that are adrift in the water column and cannot avoid the discharge may become entrained in the plume. Lethal thermal conditions are not expected within the defined mixing zone. Non-lethal effects may render some organisms less fit for survival, but since organisms will be exposed for such a brief period of time (in most cases, a matter of seconds) adverse effects will likely be limited to a temporary increase in vulnerability to predation.

Based on relatively small size and intensity of the temperature plume and the brief exposure time of any lifestage of Atlantic sturgeon that may encounter the plume, this discharge is likely to have an insignificant or discountable effect on Atlantic sturgeon. Section 6.4 of the Fact Sheet discusses the thermal discharge from Schiller Station in detail.

Discharge of Pollutants

The Draft Permit also proposes limits on the following pollutants:

Effluent Characteristic	Average Monthly	Maximum Daily
Total Residual Chlorine	---	0.2 mg/L
Oil and Grease	15 mg/L	20 mg/L
Total Suspended Solids (TSS)	30 mg/L	100 mg/L
Total Copper	1.0 mg/L	1.0 mg/L
Total Iron	1.0 mg/L	1.0 mg/L
pH	6.5 – 8.0 S.U. (range)	

These limits are calculated to meet water quality standards and protect all aquatic organisms in the receiving water, including EFH species.

Chlorine

The Draft Permit limit for total residual chlorine is based on the existing permit in accordance with the antibacksliding requirements found in 40 CFR §122.44. This limit was originally established based on New Source Performance Standards (NSPS) established in the Federal Guidelines for the Steam Electric Power Generating Point Source Category (40 CFR Part 423.15(j)(1)).

Section 423.15(j)(1) limits the maximum and average concentration of free available chlorine discharged in cooling tower blowdown as shown below. The quantity of pollutant (mass limit) is determined by multiplying the flow of cooling tower blowdown by the concentration listed in the table. However, the existing and Draft Permit limits' are expressed as concentration limits pursuant to Section 423.15(m).

40 C.F.R. Part 423.15(j)(2) prohibits the discharge of free available chlorine or total residual chlorine (TRC) from any unit for more than two hours in any one day, and; not more than one unit in any plant may discharge free available or total residual chlorine at any one time unless the utility can demonstrate that the units in a particular location cannot operate at or below this level of chlorination.

At these extremely low chlorine concentrations, coupled with the limited duration of such an event, the discharge of this pollutant is likely to have an insignificant or discountable effect on Atlantic sturgeon.

Total Suspended Solids

The Draft Permit limits for Total Suspended Solids (TSS) and Oil and Grease (O&G) are based on the existing permit in accordance with the antibacksliding requirements found in 40 CFR §122.44. These limits were originally established based on NSPS established in the Federal Guidelines for the Steam Electric Power Generating Point Source Category (40 CFR Part 423.15(c) for low volume waste source(s)).

Section 423.15(c) limits the maximum and average concentration of TSS and O&G discharged in low volume waste source(s) as shown below. The quantity of pollutant (mass limit) is determined by multiplying the flow of low volume waste source by the concentration listed in the table. However, the existing permit, as well as the Draft Permit limits, are expressed as concentration limits pursuant to Section 423.15(m). The permit reflects these limits prior to mixing with cooling water in the tower.

Studies of the effects of turbid waters on fish suggest that concentrations of suspended solids can reach thousands of milligrams per liter before an acute toxic reaction is expected (Burton 1993). The studies reviewed by Burton demonstrated lethal effects to fish at concentrations of 580mg/L to 700,000mg/L depending on species. Sublethal effects have been observed at substantially lower turbidity levels. For example, prey consumption was significantly lower for striped bass larvae tested at concentrations of 200 and 500 mg/L compared to larvae exposed to 0 and 75 mg/L (Breitburg 1988 in Burton 1993). Studies with striped bass adults showed that pre-spawners did not avoid concentrations of 954 to 1,920 mg/L to reach spawning sites (Summerfelt and Moiser 1976 and Combs 1979 in Burton 14 F993). While there have been no directed studies on the effects of TSS on Atlantic sturgeon, shortnose sturgeon juveniles and adults are often documented in turbid water. Dadswell (1984) reports that shortnose sturgeon are more active under lowered light conditions, such as those in turbid waters. Based on the general similarity of the two sturgeon species, Atlantic sturgeon are assumed to be as least as tolerant to suspended sediment as other estuarine fish such as striped bass. Based on this information, it is likely that the discharge of total suspended solids in the low concentrations allowed by the Draft Permit will have an insignificant effect on Atlantic sturgeon.

Oil and Grease

This extremely low concentration of oil and grease will be localized within a small mixing zone area. Levels of O&G will quickly drop below the detection limit in the high energy tidal currents of the Piscataqua River. Based on this information, it is likely that the discharge of O&G in the low concentrations allowed by the Draft Permit will have an insignificant effect on Atlantic sturgeon.

pH

EPA, in consultation with NHDES has determined that the current permit as well as this Draft Permit retains the pH limited range of 6.5 - 8.0 S.U. Since this pH range is generally considered harmless to marine life in Great Bay, no adverse effects to Atlantic sturgeon are likely to occur as a result of a discharge meeting the permitted pH range.

Heavy Metals

EPA's draft permit proposes to require (a) that the non-chemical metal cleaning waste be discharged from Outfall 016A subject to the 1.0 mg/L limits for total copper and total iron, and (b) that compliance monitoring for this type of metal cleaning waste occur after treatment but before discharge being comingled with any other waste streams. Furthermore, the draft permit allows low volume, runoff and drainage waste streams to be combined and discharged through Outfall 016 subject to the relevant effluent limits other than the technology-based copper and iron limits. Copper and iron limits will no longer be in Outfall 016 but will instead be in Outfall 016A.

These limits are calculated to meet water quality standards and protect all aquatic organisms in the receiving water, including protected species.

Polynuclear Aromatic Hydrocarbons (PAHs)

PAHs are a group of organic compounds that form through the incomplete combustion of hydrocarbons. PAHs are also present in crude oil and some heavier petroleum derivatives and residuals such as No. 6 fuel oil. Discharge of these products can introduce PAHs into the environment where they strongly adsorb to suspended particulates and biota. PAHs can also bio-accumulate in fish and shellfish. The ultimate fate of those PAHs which accumulate in the environment is believed to be biodegradation and biotransformation by benthic organisms. Several PAHs are well known animal carcinogens, while others are not carcinogenic alone but can enhance the response of the carcinogenic PAHs.

There are 16 PAH compounds identified as priority pollutants under the CWA (*see* Appendix A to 40 C.F.R. Part 423). In view of evidence of PAH-induced animal carcinogenicity and the type of petroleum products stored at the facility, the draft permit establishes monitoring requirements, without limits, for these Group I and II PAHs, as listed below.

Group 1 PAHs comprise seven known animal carcinogens:

- Benzo(a)anthracene
- Benzo(a)pyrene
- Benzo(b)fluoranthene
- Benzo(k)fluoranthene
- Chrysene
- Dibenzo(a,h)anthracene
- Indeno(1,2,3-cd)pyrene

Quarterly monitoring of the above Group I PAHs, without limits, is required.

Group II PAHs comprise nine priority pollutants which are not considered carcinogenic alone, but which can enhance or inhibit the response of the carcinogenic PAHs:

- Acenaphthene
- Acenaphthylene
- Anthracene
- Benzo(g,h,i)perylene
- Fluoranthene
- Fluorene
- Napthalene
- Phenanthrene
- Pyrene

Quarterly monitoring of the above Group II PAHs, without limits, is required. Of these, naphthalene is considered an important limiting pollutant parameter based upon its prevalence in petroleum products and its toxicity (i.e., naphthalene has been identified as a possible human carcinogen).

For the maximum protection of human health from the potential carcinogenic effects of exposure to PAHs through ingestion of contaminated water and contaminated aquatic organisms, EPA established human health "organism only" *National Recommended Water Quality Criteria* for individual PAH compounds based on the increase of cancer risk over the lifetime and consumption of contaminated fish. The human health criteria for Group I PAHs were established in ng/L, which is many orders of magnitude below the current Practical Quantitation Limits (PQLs) for determining PAH concentrations in aqueous solutions.

The draft permit also requires that the quantitative methodology used for PAH analysis must achieve a minimum level for analysis ("ML") using approved analytical methods in 40 C.F.R. Part 136. The ML is not the minimum level of detection, but rather the lowest level at which the test equipment produces a recognizable signal and acceptable calibration point for an analyte, representative of the lowest concentration at which an analyte can be measured with a known level of confidence. The ML for each Group I PAH compound must be <0.1 µg/L. The ML for each Group II PAH compound must be <1 µg/L. These MLs are based on those listed in Appendix VI of EPA's Remediation General Permit. Sample results for an individual compound that is at or below the ML should be reported according to the latest EPA Region 1 *NPDES Permit Program Instructions for the Discharge Monitoring Report Forms (DMRs)*. These values may be reduced by modification pursuant to 40 CFR §122.62 as more sensitive tests become available or are approved by EPA and the State.

EPA believes these requirements are necessary for the protection of human health, to maintain the water quality standards established under Section 303 of the CWA, and to meet New Hampshire's water quality criteria. Should monitoring data indicate the presence of PAHs in concentrations that may cause or contribute to an excursion above water quality criteria, the permit may be modified, reissued or revoked pursuant to 40 CFR §122.62.

Finding

As detailed in this attachment and the Draft Permit's Fact Sheet, the proposed CWIS BTA is designed to reduce current levels of impingement by 87% and entrainment by from 41% to 53%. The thermal discharge has been granted a CWA §316(a) variance. During discharge, any regulated pollutants rapidly mix in all tidal occurrences, with the exception of the brief slack tide period. Based on these factors and the analysis of potential impacts to Atlantic sturgeon presented in this attachment, EPA has determined that impacts to Atlantic sturgeon from Schiller Station's CWIS and regulated effluent, if any, will be insignificant or discountable.

Therefore, EPA has judged that a formal consultation pursuant to Section 7 of the ESA is not required. EPA is seeking concurrence from NMFS regarding this determination through the information in this attachment, as well as supporting information contained in the Fact Sheet and the Draft Permit. In addition, a letter under separate cover will be sent to NMFS from EPA to request concurrence.

Reinitiation of consultation will take place: (a) if new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered in the consultation; (b) if the identified action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in the consultation; or (c) if a new species is listed or critical habitat is designated that may be affected by the identified action.

NEW HAMPSHIRE DEPARTMENT OF ENVIRONMENTAL SERVICES WATER DIVISION P.O. BOX 95 CONCORD, NEW HAMPSHIRE 03302-0095	U.S. ENVIRONMENTAL PROTECTION AGENCY-REGION 1 OFFICE OF ECOSYSTEM PROTECTION 5 POST OFFICE SQUARE BOSTON, MASSACHUSETTS 02109

JOINT PUBLIC NOTICE OF A DRAFT NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) PERMIT TO DISCHARGE INTO THE WATERS OF THE UNITED STATES UNDER SECTIONS 301 AND 402 OF THE CLEAN WATER ACT (THE "ACT"), AS AMENDED, AND REQUEST FOR STATE CERTIFICATION UNDER SECTION 401 OF THE ACT, AND ISSUANCE OF A STATE SURFACE WATER PERMIT UNDER NH RSA 485-A:13, I(a).

DATE OF NOTICE: **September 30, 2015**

PERMIT NUMBER: **NH0001473**

PUBLIC NOTICE NUMBER: **NH-008-15**

NAME AND MAILING ADDRESS OF APPLICANT:

Schiller Station
Public Service Company of New Hampshire
Attn: Bill Smagula, Vice President
780 North Commercial Street
Manchester, NH 03101

NAME AND LOCATION OF FACILITY WHERE DISCHARGE OCCURS:

Schiller Station
400 Gosling Road
Portsmouth, NH 03801

RECEIVING WATER: Piscataqua River – Class B

PREPARATION OF THE DRAFT PERMIT:

The U.S. Environmental Protection Agency (EPA) and the New Hampshire Department of Environmental Services, Water Division (NHDES-WD) have cooperated in the development of a draft permit for the PSNH Schiller Station, which discharges non-contact cooling water and treated industrial wastewater. The effluent limits and permit conditions imposed have been drafted to assure compliance with the Clean Water Act, 33 U.S.C. sections 1251 et seq., Chapter 485-A of the New Hampshire Statutes: Water Pollution and Waste Disposal, and the New Hampshire Surface Water Quality Regulations, Env-Wq 1700 et seq. EPA has formally requested that the State certify the draft permit pursuant to Section 401 of the Clean Water Act and expects that the draft permit will be certified.

INFORMATION ABOUT THE DRAFT PERMIT:

The draft permit and explanatory fact sheet may be obtained at no cost at http://www.epa.gov/region1/npdes/draft_permits_listing_nh.html or by contacting:

Michael Cobb
U.S. Environmental Protection Agency – Region 1
5 Post Office Square, Suite 100 (OEP06-1)
Boston, MA 02109-3912
Telephone: (617) 918-1369

The administrative record containing all documents relating to this draft permit including all data submitted by the applicant is also posted at the above website or may be inspected at the EPA Boston office mentioned above between 9:00 a.m. and 5:00 p.m., Monday through Friday, except holidays.

PUBLIC COMMENT AND REQUEST FOR PUBLIC HEARING:

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 **November 28, 2015**, to the address listed above. Any person, prior to such date, may submit a request in writing to EPA and NHDES for a public hearing to consider this draft permit. Such requests shall state the nature of the issues proposed to be raised in the hearing. A public hearing may be held after at least thirty days public notice whenever the Regional Administrator finds that response to this notice indicates significant public interest. In reaching a final decision on the draft permit, the Regional Administrator will respond to all significant comments and make these responses available to the public at EPA's Boston office.

FINAL PERMIT DECISION:

Following the close of the comment period, and after a public hearing, if such hearing is held, the Regional Administrator will issue a final permit decision and forward a copy of the final decision to the applicant and each person who has submitted written comments or requested notice.

EUGENE J. FORBES, P.E., DIRECTOR
WATER DIVISION
NEW HAMPSHIRE DEPARTMENT OF
ENVIRONMENTAL SERVICES

KEN MORAFF, DIRECTOR
OFFICE OF ECOSYSTEM PROTECTION
U.S. ENVIRONMENTAL PROTECTION
AGENCY - REGION I

NEW HAMPSHIRE DEPARTMENT OF ENVIRONMENTAL SERVICES WATER DIVISION P.O. BOX 95 CONCORD, NEW HAMPSHIRE 03302-0095	U.S. ENVIRONMENTAL PROTECTION AGENCY-REGION 1 OFFICE OF ECOSYSTEM PROTECTION 5 POST OFFICE SQUARE BOSTON, MASSACHUSETTS 02109

NOTICE OF EXTENSION OF PUBLIC COMMENT PERIOD

JOINT PUBLIC NOTICE OF AN **EXTENSION TO** THE PUBLIC COMMENT PERIOD PERTAINING TO A DRAFT NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) PERMIT TO DISCHARGE INTO THE WATERS OF THE UNITED STATES UNDER SECTIONS 301 AND 402 OF THE CLEAN WATER ACT (THE "ACT"), AS AMENDED, AND REQUEST FOR STATE CERTIFICATION UNDER SECTION 401 OF THE ACT, AND ISSUANCE OF A STATE SURFACE WATER PERMIT UNDER NH RSA 485-A:13, I(a).

DATE OF NOTICE: **October 30, 2015**

PERMIT NUMBER: **NH0001473**

PUBLIC NOTICE NUMBER: **NH-001-16**

NAME AND MAILING ADDRESS OF APPLICANT:

Schiller Station
Public Service Company of New Hampshire
Attn: Bill Smagula, Vice President
780 North Commercial Street
Manchester, NH 03101

NAME AND LOCATION OF FACILITY WHERE DISCHARGE OCCURS:

Schiller Station
400 Gosling Road
Portsmouth, NH 03801

RECEIVING WATER: Piscataqua River – Class B

PREPARATION OF THE DRAFT PERMIT:

The U.S. Environmental Protection Agency (EPA) and the New Hampshire Department of Environmental Services, Water Division (NHDES-WD) have cooperated in the development of a draft permit for the PSNH Schiller Station, which discharges non-contact cooling water and treated industrial wastewater. The effluent limits and permit conditions imposed have been drafted to assure compliance with the Clean Water Act, 33 U.S.C. sections 1251 et seq., Chapter 485-A of the New Hampshire Statutes: Water Pollution and Waste Disposal, and the New Hampshire Surface Water Quality Regulations, Env-Wq 1700 et seq. EPA has formally requested that the State certify the draft permit pursuant to Section 401 of the Clean Water Act and expects that the draft permit will be certified.

INFORMATION ABOUT THE DRAFT PERMIT:

In the draft permit that became available on September 30, 2015, EPA neglected to include language required in accordance with 40 C.F.R. § 125.98(b)(1). EPA is correcting this oversight by including the following language to Part I.A.13.a of the draft permit: “Nothing in this permit authorizes take for the purposes of a facility’s compliance with the Endangered Species Act.” The corrected draft permit and explanatory fact sheet can may be obtained at no cost at http://www.epa.gov/region1/npdes/draft_permits_listing_nh.html or by contacting:

Michael Cobb
U.S. Environmental Protection Agency – Region 1
5 Post Office Square, Suite 100 (OEP06-1)
Boston, MA 02109-3912
Telephone: (617) 918-1369

The administrative record containing all documents relating to this draft permit including all data submitted by the applicant is also posted at the above website or may be inspected at the EPA Boston office mentioned above between 9:00 a.m. and 5:00 p.m., Monday through Friday, except holidays.

PUBLIC COMMENT (REVISED) AND REQUEST FOR PUBLIC HEARING:

The original public comment period for this proposed permit was from September 30, 2015, to November 28, 2015. EPA, in response to requests for an extension of the public comment period, has extended that period to January 27, 2016. Therefore, 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 **January 27, 2016**, to the address listed above. Any person, prior to such date, may submit a request in writing to EPA and NHDES for a public hearing to consider this draft permit. Such requests shall state the nature of the issues proposed to be raised in the hearing. A public hearing may be held after at least thirty days public notice whenever the Regional Administrator finds that response to this notice indicates significant public interest. In reaching a final decision on the draft permit, the Regional Administrator will respond to all significant comments and make these responses available to the public at EPA's Boston office.

FINAL PERMIT DECISION:

Following the close of the comment period, and after a public hearing, if such hearing is held, the Regional Administrator will issue a final permit decision and forward a copy of the final decision to the applicant and each person who has submitted written comments or requested notice.

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